भारत हेवी इलेक्ट्रिकल्स लिमिटेड
(भारत सरकार का उपक्रम)
BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)

Ref: PSER:SCT:KLN-E2060:8037 Date: 09-07-2020

NOTICE INVITING TENDER

NOTE: INTENDING BIDDER TO PARTICIPATE MAY DOWNLOAD FROM WEB SITES

Sealed offers in two part bid system are invited from reputed & experienced bidders meeting PRE QUALIFICATION CRITERIA as mentioned in Annexure-1 through E-Procurement Portal https://bhel.abcprocure.com or hard copy mode, for the subject job by the undersigned on the behalf of BHARAT HEAVY ELECTRICALS LIMITED as per the tender document. Issue/ forwarding intimation regarding tender to any bidder shall not construe that the bidder is considered to be qualified. Consideration of their offer is subject to compliance of loading criteria as per clause no. 8.0 of NIT etc. specified below. 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	PSER:SCT:KLN-E2060:20	
ii	Broad Scope of job	*Erection, Testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears, HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1, FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP, Rampal, Bangladesh.*	
iii	DETAILS OF TENDER DOCUMENT		
a	Volume-IA	*General conditions of contract (Supply)*	*Not Applicable.*
b	Volume-IB	*General conditions of contract (Service)*	***Applicable.***
c	Volume-IC	*Special conditions of contract (Supply)*	*Not Applicable.*
d	Volume-ID	*Special conditions of contract (Service)*	***Applicable.***
e	Volume-IE	*Forms and Procedures etc.*	***Applicable.***
f	Volume-IF	*Technical Conditions of Contract (TCC) (CML, TS, DRG, FQP)*	***Applicable.***
g	Volume-III	*Price Schedule (Absolute value) – Rev-00*	***Applicable.***
iv	ISSUE OF TENDER DOCUMENTS	*1. Sale from BHEL PSER office: Start: 09-07-2020 Close: 20-07-2020* *2. From BHEL website (www.bhel.com & CPP Portal)* *3. E-Procurement Site* https://bhel.abcprocure.com *Tender documents can be downloaded from above website till due date of submission.*	***Applicable.***
v	DUE DATE & TIME OF OFFER SUBMISSION	*Date: 20-07-2020, Time: 15-00 Hrs.* ***The bidder may respond by submitting their offer either online in our e-Procurement platform at*** https://bhel.abcprocure.com ***or through hard copy mode. Offers are invited in two-parts only.*** *For details regarding Digital Signature etc, interested*	*Applicable.*

		bidders are requested to go through the details mentioned in www.bhel.com (tender section) available in this link http://www.bhel.com/pdf/DSC_checklist_web.pdf	
vi	OPENING OF TENDER	*Date: 20-07-2020* *1 hours after the latest due date and time of Offer submission* *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.*	*Applicable.*
vii	EMD AMOUNT	*INR 25,70,046 /- (or Equivalent in BTD/USD/Other Foreign Currency (Exchange rate shall be as per tender provision)).*	*Applicable.*
viii	COST OF TENDER	*INR 10,000/- (or Equivalent in BTD/USD/Other Foreign Currency (Exchange rate shall be as per tender provision)).*	*Applicable.*
ix	LAST DATE FOR SEEKING CLARIFICATION	*Date: 15-07-2020* *Along with soft version also, addressing to undersigned & to others as per contact address given below*	*Applicable.*
x	SCHEDULE OF Pre Bid Discussion (PBD)	--	*Not Applicable (In case BHEL decides to conduct PBD, date, time & venue of PBD will be intimated suitably thru TCN.)*
xi	INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM)	*IEM DETAILS:* *Refer Clause No 34.0 below.*	*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 (www.bhel.com), CPP portal & E-Procurement Site https://bhel.abcprocure.com only. Bidders to keep themselves updated with all such information.	*Shall be intimated to bidder.*

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 and stamped (digitally signed & stamped in case of e mode of bidding) 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 (non-refundable) and courier charges if applicable, in the form of Demand Draft drawn in favour of Bharat Heavy Electricals Ltd, payable at Kolkata, issuing the Tender, along with techno-commercial offer. Bidder may also choose to deposit the Tender document cost by cash at the Cash Office, 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 PSER, at KOLKATA, Sundays and second/ last Saturdays.

4.0 Unless specifically stated otherwise, bidder shall have to deposit EMD through Demand Draft/Pay Order in favour of Bharat Heavy Electricals Ltd, payable at Kolkata. For other details please refer General Conditions of Contract.
Bidders may please be noted that "OEMD" provision stands deleted. Hence, bidders who have deposited Rs. 2 Lakh as OEMD are also requested to submit fresh EMD as mentioned in sl no vii under clause no 1.0 of NIT.

5.0 Procedure for Submission of Tenders: The Tenderers must submit their Tenders as detailed below:

FOR HARD COPY SUBMISSION OF OFFER

- 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 tender documents shall be retained by the bidder for their reference

- Two additional copies of Techno-commercial bid, along with original shall be submitted.

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

Sl no	Description	Remarks
	Part-I A	
	ENVELOPE – I superscribed as : PART-I (TECHNO COMMERCIAL BID) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION:	
	CONTAINING THE FOLLOWING:-	
i.	Covering letter/Offer forwarding letter of Tenderer.	
ii.	Duly filled-in `No Deviation Certificate' as per prescribed format to be placed after document under sl no (i) above. Note: 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. b. BHEL reserves the right to accept/reject the deviations without assigning any reasons, and BHEL decision is final and binding. i). In case of acceptance of the deviations, appropriate loading shall be done by BHEL ii). In case of unacceptable deviations, BHEL reserves the right to reject the tender	
iii.	Supporting documents/ annexures / schedules/ drawing etc as required in line with Pre-Qualification criteria. It shall be specifically noted that all documents as per above shall be indexed	

	properly and credential certificates issued by clients shall distinctly bear the name of organization, contact ph 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)	Applicable.
vi.	Duly filled-in annexures, formats etc as required under this Tender Specification/NIT	
vii.	Notice inviting Tender (NIT)	
viii.	Volume – I F : Technical Conditions of Contract (TCC)	
ix.	Volume – I D : Special Conditions of Contract (SCC)-Service	
x.	Volume - I B : General Conditions of Contract (GCC)-Service	
xi.	Volume – I E : Forms & Procedures etc.	
xii.	Volume – III- (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	
	ENVELOPE – II superscribed as: PART-I (EMD &/or COST of TENDER) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION:	
	CONTAINING THE FOLLOWING:-	
i.	1. Earnest Money Deposit (EMD) in the form as indicated in this Tender 2. Cost of Tender (Demand Draft or copy of Cash Receipt as the case may be)	

	PART-II	
	PRICE BID consisting of the following shall be enclosed	
	ENVELOPE-III superscribed as: 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 III – 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:	
	CONTAINING THE FOLLOWING:	
i	o Envelopes I o Envelopes II o Envelopes III	

FOR SUBMISSION OF OFFER THROUGH E-PROCUREMENT SITE (https://bhel.abcprocure.com)

DOCUMENTS TO BE UPLOADED & MODALITY OF UPLOADING

Sl no	Description	Remarks
PART-I A	(TECHNO COMMERCIAL BID)	
	CONTAINING THE FOLLOWING:-	
i.	Covering letter/Offer forwarding letter of Tenderer. (**To be attached in relevant Attachment section**)	
ii.	Duly filled-in `No Deviation Certificate' as per prescribed format. (**To be attached in relevant Attachment section**) Note: 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 **attached in relevant attachment section of the e –procurement portal**. It shall be specifically noted that deviation recorded elsewhere shall not be entertained. b. BHEL reserves the right to accept/reject the deviations without assigning any reasons, and BHEL decision is final and binding. i). In case of acceptance of the deviations, appropriate loading shall be done by BHEL ii). In case of unacceptable deviations, BHEL reserves the right to reject the tender	
iii.	Supporting documents/ annexures / schedules/ drawing etc as required in line with Pre-Qualification criteria. It shall be specifically noted that all documents as per above **shall be attached in relevant attachment section** and credential certificates issued by clients shall distinctly bear the name of organization, contact ph no, FAX no, etc.	
iv.	All Amendments/Correspondences/Corrigenda/Clarifications/Changes/ Errata etc pertinent to this NIT. **(To be attached in relevant Attachment section)**	
v.	Integrity Pact Agreement (Duly signed by the authorized signatory)	Applicable.
vi.	Duly filled-in annexures, formats etc as required under this Tender Specification/NIT **(To be attached in relevant Attachment section)**	
vii.	Notice inviting Tender (NIT) **(To be attached in relevant Attachment section)**	
viii.	Volume – I F : Technical Conditions of Contract (TCC) **(To be attached in relevant Attachment section)**	
ix.	Volume – I D : Special Conditions of Contract (SCC)-Service **(To be attached in relevant Attachment section)**	
xi.	Volume – I B : General Conditions of Contract (GCC)-Service	

	(To be attached in relevant Attachment section)	
xii.	Volume – I E : Forms & Procedures etc. **(To be attached in relevant Attachment section)**	
xiii.	Volume–III - (UNPRICED – without disclosing rates/price, but mentioning only 'QUOTED' or 'UNQUOTED' against each item. **(To be attached in Unpriced Bid Attachment section)**	
xiv.	Any other details preferred by bidder with proper indexing. **(To be attached in relevant Attachment section)**	

PART-I B	EMD/ COST OF TENDER (To be submitted offline within due date of offer submission)	
	CONTAINING THE FOLLOWING:-	
i.	1. Earnest Money Deposit (EMD) in the form as indicated in this Tender 2. Cost of Tender (Demand Draft or copy of Cash Receipt as the case may be)	

PART-II	PRICE BID (TO BE ATTACHED IN PRICE BID ATTACHMENT SECTION)	
	CONTAINING THE FOLLOWING:-	
i	Covering letter/Offer forwarding letter of Tenderer enclosed in Part-I	
ii	Volume III – PRICE BID (Duly Filled in Schedule of Rates – rate/price to be entered in words as well as figures) Any other document uploaded in the price bid, apart from above tender format, shall not be taken into cognizance for evaluation of offer.	

SPECIAL NOTE:

A) Your offer & documents submitted along with offer shall be (digitally signed in case of submission of offer through BHEL's e-procurement site) signed & stamped in each page by your authorised representative. No overwriting/ correction in tender documents by bidders shall be allowed. However, if correction is unavoidable, the same may be signed by authorized signatory.
B) The credentials/ documents submitted towards compliance of Pre-qualification requirement shall be physically signed by the authorized signatory & stamped before uploading/submission of offer.
C) 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 (or attached in the respective sections in case of submission of offer through BHEL's e-procurement site). BHEL shall not be responsible for any missing documents.

6.0 No Deviation with respect to tender clauses and no additional clauses/ suggestions/ in Techno-commercial bid/ Price bid shall normally be considered by BHEL. Bidders are requested to positively comply with the same.

7.0 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).

8.0 Assessment of Capacity of Bidders:

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

I. LOAD: Load takes into consideration ALL the contracts of the Bidder under execution with BHEL Regions, irrespective of whether they are similar to the tendered scope or not. The cut off month for reckoning 'Load'

shall be the 3rd Month preceding the month corresponding to the 'latest date of bid submission', in the following manner -
(Note: For example, if latest bid submission is in Jan 2017, then the 'load' shall be calculated up to and inclusive of Oct 2016)

Total number of Packages in hand = Load (P)

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

II. PERFORMANCE: Here 'Monthly Performance' of the bidder for all the packages (under execution/ executed during the 'Period of Assessment' in all Power Sector Regions of BHEL) SIMILAR to the packages covered under the tendered scope, excepting packages not commenced shall be taken into consideration. The 'Period of Assessment' shall be 6 months preceding and including the cut off month. The cut off month for reckoning 'Period of Assessment' shall be the 3rd Month preceding the month corresponding to 'latest date of bid submission', in the following manner:
(Note: For example, if 'latest date of bid submission' is in Jan 2017, then the 'performance' shall be assessed for a 6 months' period up to and inclusive of Oct 2016 (i.e. from May 2016 to Oct 2016), for all the unit wise identified packages (refer Table I))

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

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

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

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

c) Sum 'S_1 'of 'Monthly Performance Evaluation' Scores ($S_{1\text{-}1}, S_{1\text{-}2}, S_{1\text{-}3}, S_{1\text{-}4}, S_{1\text{-}5}\ldots. S_{1\text{-}T1}$) for similar package P_1, for the 'period of assessment' 'T_1' (i.e. $S_1 = S_{1\text{-}1} + S_{1\text{-}2} + S_{1\text{-}3} + S_{1\text{-}4} + S_{1\text{-}5} + \ldots S_{1\text{-}T1}$). Similarly, S_2 for package P_2 for period T_2, S_3 for package P_3 for period T_3 etc. for the tendered scope for all Regions. Now calculate cumulative sum 'S_T' of 'Monthly Performance Evaluation' Scores for total similar Packages 'P_T' for all Regions (i.e. 'S_T '$= S_1 + S_2 + S_3 + S_4 + S_5 + \ldots S_N$.)

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

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

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

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

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

Sl. No.	Item Description	Details for all Regions							Total
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
1	Similar Packages for all Regions → (under execution/ executed during period of assessment)	P_1	P_2	P_3	P_4	P_5	…	P_N	Total No. of similar packages for all Regions = P_T i.e. 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 Packages (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 at least 6 evaluation scores for 'similar Package/Packages' for the tendered scope ARE NOT AVAILABLE, during the 'Period of Assessment':

This shall be obtained by summing up the 'Monthly Performance Evaluation' scores obtained by the bidder in all Regions for ALL the packages, divided by the total number of Package months for which evaluation should have been done. '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' i.e. 6 months preceding and including the cut-off month
b) 12 months preceding and including the cut-off month
c) 24 months preceding and including the cut-off month

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

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

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

III. 'Assessment of Capacity of Bidder':

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

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

Note:

i). In case the value of P_{Max} results in a fraction, the value of P_{Max} is to be rounded off to next whole number

ii). For R_{BHEL} = 60, P_{Max} = '1'

iii). For R_{BHEL} ≥ 80, there will be no upper limit on P_{Max}

The Bidder shall be considered 'Qualified' as per 'Assessment of Capacity of Bidder' for the subject Tender if P ≤ P_{Max}
(Where P is calculated as per clause 'I' above)

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

Higher of the results obtained out of both shall be considered for 'Assessment of Capacity of Bidder'.

IV. Explanatory note:

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

ii). Identified Packages (Unit wise)

Table-1

Civil	Electrical and C&I	Mechanical
i). Enabling works ii). Pile and Pile Caps iii). Civil Works including foundations iv). Structural Steel Fabrication & Erection v). Chimney vi). Cooling Tower vii). Others (Civil)	i). Electrical ii). C&I iii). Others (Elect. and C&I)	i). Boiler & Aux (All types including CW Piping if applicable) ii). Power Cycle Piping/Critical Piping iii). ESP iv). LP Piping v). Steam Turbine Generator set & Aux vi). Gas Turbine Generator set & Aux vii). Hydro Turbine Generator set & Aux

		viii). Turbo Blower (including Steam Turbine) ix). Material Management x). Others (Mechanical)

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

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

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

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

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

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

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

a) All the bidders having Overall Performance Rating ('R_{BHEL}') ≥60 shall be considered qualified against criteria of 'Assessment of Capacity of Bidders'.
b) If even after using option "a", the number of qualified bidders remains less than four, then in addition to bidders considered as per option "a", "First timer" bidders having average of available performance scores ≥60 upto and including the Cut Off month shall also be considered qualified against criteria of 'Assessment of Capacity of Bidders'.
c) If even after using option "a" and "b", the number of qualified bidders remains less than four, then in addition to bidders considered as per option "a" and "b", "First timer" bidders for whom no performance score is available in the system upto and including the Cut Off month, shall also be considered qualified against criteria of 'Assessment of Capacity of Bidders'.

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

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

a. Up to execution of 90% of anticipated Contract Value in case of Civil, MM, Structural and Turbo Blower Packages
b. Up to Steam Blowing in case of Boiler/ESP/Piping Packages
c. Up to Synchronization in all Balance Packages

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

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

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

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

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

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

ix). Performance evaluation in CL 8 above is applicable to Prime bidder and Consortium partner (or Technical tie up partner) for their respective scope of work.

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

10.0 For any clarification on the tender document, the bidder may seek the same in writing, through e-mail or through E-Procurement Site https://bhel.abcprocure.com, 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 any delay. Any clarification / query received after last date for seeking clarification may not be normally entertained by BHEL and no time extension will be given.

11.0 BHEL may decide holding of 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.

12.0 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.

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

14.0 Bidders shall submit Integrity Pact Agreement (Duly signed by authorized signatory who signs in the offer), 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 (xi) of 1 above.

15.0 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.

16.0 In case BHEL decides on a `Public Opening', the date & time of opening of the PRICE BID shall be intimated to the qualified bidders.

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

18.0 BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on www.bhel.com) for this tender. RA shall be conducted among all the techno-commercially qualified bidders.

Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered as initial bids of bidders in RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking.

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

20.0 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.

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

22.0 Consortium Bidding (or Technical Tie up) shall be allowed only if specified in Pre Qualifying Requirement (PQR) criteria, and in such a case the details to be complied with is enclosed herewith as per Annexure-5 UNLESS SPECIFIED OTHERWISE IN PQR.

23.0 The bidder shall submit documents in support of possession of 'Qualifying Requirements' duly self certified and stamped/ digitally signed (as applicable) 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.

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

25.0 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 Website (www.bhel.com).

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

a) Commitment by BHEL:

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

b) Commitment by Bidder/ Supplier/ Contractor:

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

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

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

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

26.0 It may please be noted that Guidelines/Rules in respect of Suspension of business dealings (Hold- 12 to 24 Months/ Banning – 3 years etc), Vendor Evaluation formats, quality, safety and HSE guidelines , standard T&P hire charges of BHEL etc may undergo change from time to time and the latest one shall be followed. Latest "Guidelines for Vendor Evaluation" is web based, quality, safety & HSE"; standard T&P hire charges shall be available at site and shall be given to the successful vendors/ subcontractors during execution.

27.0 MSE suppliers can avail the intended benefits in respect of the procurements related to the Goods and Services only (Definition of Goods and Services as enumerated by Govt. of India vide Office Memorandum F. No. 21(8)/2011-MA dtd. 09/11/2016 office of AS & DC, MSME) if they submit along with the offer, attested copies of either EM II certificate having deemed validity (five years from the date of issue of acknowledgement in EM II) or valid NSIC certificate or Udyog Aadhar Memorandum (UAM) & Acknowledgement or EM II certificate along with attested copy of a CA certificate (Format enclosed at Annexure – C where deemed validity of EM II certificate of five years has expired) applicable for the relevant financial year (latest audited). Date to be reckoned for determining the deemed validity will be the date of bid opening (Part 1 in case of two part bid). Non submission of such documents will lead to consideration of their bid at par with other bidders. No benefit shall be applicable for this enquiry if any deficiency in the above required documents are not submitted before price bid opening. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal. Documents should be notarized or attested by a Gazetted officer.

Any Bidder falling under MSME category, shall furnish the following details & submit documentary evidence/Govt. Certificate etc. in support of the same along with their techno-commercial offer: -

Type under MSME	SC/ST owned	Women owned	Others
Micro			
Small			
Medium			

Note: - If the bidder does not furnish the above, offer shall be processed construing that the bidder is not falling under MSME category.

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

29.0 Annexure-A -Amendment to GCC/SCC shall be read in conjunction with GCC-Volume-IB & SCC-Volume-ID. This Annexure-A (Amendment to GCC/SCC) of NIT shall not be considered as part of the NIT but addendum/corrigendum to the GCC/SCC only.

30.0 Annexure-B - Terms & conditions of Reverse Auction is enclosed herewith.

31.0 Annexure-E – Guidelines/ rules for Bank Guarantee submission by Foreign vendor.

32.0 Duly filled & signed Annexure- CPP-GST/I to be submitted by bidders along with their techno-commercial offer.

33.0 For sale & import transactions, Foreign Bidders are required to submit the following documents before raising first bill for payment –

a) Tax Residency Certificate.
b) Form 10F as attached to be signed by the vendor (To avail the benefit of DTAA).
c) A declaration from vendor stating he does not have a Business Connection or Permanent Establishment in India (if applicable).

34.0 Integrity Pact (IP) –

(a) IP is a tool to ensure that activities and transactions between the Company and its Bidders/ Contractors are handled in a fair, transparent and corruption free manner. Following Independent External Monitors (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

Sl	IEM	Email
1.	Shri Arun Chandra Verma, IPS (Retd.)	acverma1@gmail.com
2.	Shri VirendraBahadur Singh, IPS (Retd.)	vbsinghips@gmail.com

(b) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (Part-I, in case of two/three part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.

(c) Please refer Section-8 of IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to any of the above IEM(s). All correspondence with the IEMs shall be done through email only.

Note:

No routine correspondence shall be addressed to the IEM (phone/ post/ email) regarding the clarifications, time extensions or any other administrative queries, etc. on the tender issued. All such clarification/ issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are provided below:
Details of contact person(s):

Name	Aditya Kumar	Subrata Sen
Dept	SCT Dept, BHEL PSER, Kolkata	SCT Dept, BHEL PSER, Kolkata
Address	DJ-9/1, Sector – II, Salt Lake, Kolkata – 700091	DJ-9/1, Sector – II, Salt Lake, Kolkata – 700091
Phone	033-2339 8231	033-2339 8226
Email	aditya.kr@bhel.in/ papori@bhel.in	subrata.sen@bhel.in
FAX	033-2321 1960	033-2321 1960

35.0 For this procurement, Public Procurement (Preference to Make in India), Order 2017 dated 15.06.2017 & 28.05.2018,29.05.2019 & 04.06.2020 and subsequent Orders issued by the respective Nodal Ministry shall be applicable even if issued after issue of this NIT but before finalization of contract/ PO/ WO against this NIT. In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and/ or local content in respect of this procurement, same shall be applicable.

Duly filled & signed Form-2 (Format for local content), as applicable, to be submitted by bidders along with their techno-commercial offer.

36.0 Bidders are requested to submit their best price as per latest price schedule of the tender.

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

All overwriting/ cutting, etc. will be numbered by bid opening officials and announced during bid opening.

38.0 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-Volume-III
d. Technical Conditions of Contract (TCC) -- Volume-IF
e. Special Conditions of Contract (SCC) — Volume-ID
f. General Conditions of Contract (GCC) — Volume-IB
g. Forms and Procedures —Volume-IE

for BHARAT HEAVY ELECTRICALS LTD

Sr. Engr (SCT)

Agency	Contact details	
BHEL, PSER, Kolkata	Address	DJ-9/1, Sector – II, Salt Lake, Kolkata – 700 091
	Phone no	033-2339 8000/ 8231
	FAX no	033-2321 1960
	E-mail	aditya.kr@bhel.in/ papori@bhel.in/subrata.sen@bhel.in

Enclosure

01. Annexure-1: Pre Qualification Criteria.
02. Annexure-2: Format for No deviation Certificate.
03. Annexure-3: Format for seeking clarification.
04. Annexure-4: Check List.
05. Annexure-5: Conditions for consortium/tie up.
06. Annexure –A- Amendment to GCC/SCC.
07. Annexure -B- Terms & conditions of Reverse Auction.
08. Annexure –C- CA certificate Format.
09. Annexure-E – Guidelines/ rules for Bank Guarantee submission by Foreign vendor.
10. Annexure– CPP-GST/I.
11. Integrity Pact Agreement Format (Separate).

12. Form 10F (Separate).
13. Form-2 (Format for local content)
14. Currency Matrix (Separate)
15. Other Tender documents as per this NIT.

ANNEXURE - 1

PRE QUALIFICATION CRITERIA

JOB	**ERECTION, TESTING & COMMISSIONING OF CABLE TRAYS, CABLING, LIGHTING AND EARTHING PROTECTION, HT/LT TRANSFORMER, HT/LT BUS DUCT, HT/LT SWITCHGEARS,HT/LT MOTORS, VARIOUS PANELS, DG SET, OTHER MISC ELECTRICAL EQUIPMENT FOR MAIN PLANT AREA-U#1,FGD U#1 AND BOP AREA-COMMON FOR U#1&2 OF 2X660 MW MAITREE STPP,RAMPAL,BANGLADESH.**
TENDER NO	PSER:SCT:KLN-E2060:20

Sl No.	CRITERIA
1.0 (a)	BIDDER SHOULD HAVE AVERAGE MINIMUM ANNUAL FINANCIAL TURNOVER OF USD 623670.204 OR EQUIVALENT AMOUNT* DURING THE LAST 3 (THREE) YEARS, ENDING ON 31-03-2019 OR CORRESPONDING FINANCIAL YEAR FOLLOWED BY THE BIDDER AND HAVING POSITIVE NET WORTH AS ON LATEST AUDITED ACCOUNTS AS SUBMITTED FOR PARA 1(C).
(b)	BIDDER MUST HAVE EARNED PROFIT IN ANY ONE OF THE LAST THREE FINANCIAL YEARS ENDING ON 31-03-2019 OR CORRESPONDING FINANCIAL YEAR FOLLOWED BY THE BIDDER. AUDITED BALANCE SHEET AND PROFIT & LOSS ACCOUNT OF THE COMPANY FOR LAST 3 (THREE) FINANCIAL YEARS, ENDING ON 31-03-2019 OR CORRESPONDING FINANCIAL YEAR FOLLOWED BY THE BIDDER NEED TO BE SUBMITTED IN SUPPORT OF ABOVE.
(c)	IN CASE AUDITED BALANCE SHEET AND PROFIT AND LOSS ACCOUNT HAS NOT BEEN SUBMITTED FOR ALL THREE YEARS INDICATED ABOVE THEN THE APPLICABLE FINANCIAL AUDITED STATEMENTS SUBMITTED BY THE BIDDERS AGAINST THE REQUISITE THREE YEARS WILL BE AVERAGED FOR THREE YEARS.
(d)	IF FINANCIAL STATEMENTS ARE NOT REQUIRED TO BE AUDITED STATUTORILY, THEN INSTEAD OF AUDITED FINANCIAL STATEMENTS, FINANCIAL STATEMENTS ARE REQUIRED TO BE CERTIFIED BY CHARTERED ACCOUNTANT.
2.0	BIDDER SHOULD HAVE EXECUTED ELECTRICAL(E&C) WORKS OR ELECTRICAL & C&I (E&C) WORKS IN THE CONSTRUCTION OF POWER/ INDUSTRIAL PROJECTS DURING LAST 7 (SEVEN) YEARS, ENDING ON THE LASTEST DUE DATE OF SUBMISSION OF OFFER, VALUE OF WHICH SHOULD BE EITHER OF THE FOLLOWING.: RELEVANT DOCUMENT IN SUPPORT OF ABOVE SHALL BE SUBMITTED.
A	1 (SINGLE) WORK OF VALUE NOT LESS THAN **USD 1039450.34 OR EQUIVALENT AMOUNT***
	OR
B	2 (TWO) WORKS OF VALUE NOT LESS THAN **USD 519725.17 OR EQUIVALENT AMOUNT*** EACH
	OR
C	3 (THREE) WORKS OF VALUE NOT LESS THAN **USD 311835.102 OR EQUIVALENT AMOUNT*** EACH
3.0	BIDDER SHOULD HAVE EXECUTED FOLLOWING ELECTRICAL WORKS IN POWER PLANT DURING LAST 7 YEARS, ENDING ON LATEST DUE DATE OF OFFER SUBMISSION. RELEVANT SUPPORTING DOCUMENT SHALL BE SUBMITTED.
3.1	POWER TRANSFORMER OF 200 MVA OR HIGHER.
3.2	HT BUS DUCT.
3.3	HT SWITCHGEARS.
3.4	HT CABLING (MINIMUM 3.3KV).

NOTE:
(BIDDER SHALL SPECIFICALLY NOTE FOLLOWING POINTS WHICH ALSO FORM MANDATORY REQUIREMENT FOR CONSIDERATION/ PROCESSING OF OFFER)

A	CONSORTIUM/ JV BIDDING IS NOT ALLOWED.
B	THE TERM 'EXECUTED' AT SL NO. 3.0 ABOVE MEANS 'CHARGING' IN RESPECT OF TRANSFORMER, BUS DUCT, SWITCHGEAR AND HT CABLING.
C	IN CASE THE JOB IS UNDER EXECUTION/ ONGOING JOB, THE VALUE OF EXECUTED PORTION OF THE JOB SHALL AT LEAST CORRESPOND TO THE RESPECTIVE VALUES SPECIFIED ABOVE EVEN IF THE CONTRACT HAS NOT BEEN COMPLETED OR CLOSED.

D	THE VENDOR SHOULD HAVE ACHIEVED THE CRITERIA SPECIFIED IN THE PRE-QUALIFICATION CRITERIA, EVEN IF THE CONTRACT HAS NOT BEEN COMPLETED OR CLOSED.
E	BIDDER SHALL SUBMIT ABOVE PRE-QUALIFICATION CRITERIA FORMAT, DULY FILLED-IN, SPECIFYING RESPECTIVE ANNEXURE NUMBER AGAINST EACH CRITERIA AND FURNISH RELEVANT DOCUMENT IN THE RESPECTIVE ANNEXURES IN THEIR OFFER
F	AFTER SATISFACTORY FULFILLMENT OF ALL ABOVE CRITERIA, OFFER SHALL BE CONSIDERED FOR FURTHER EVALUATION & PARTICIPATION AS PER NIT & ALL OTHER TERMS OF TENDER.
G	(*) EQUIVALENT AMOUNT MEANS THAT IT IS THE CONVERTED RATES OF OTHER CURRENCY TO USD AS PER CURRENCY MATRIX.

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

1. Bidder to submit Audited Balance Sheet and Profit and Loss Account for the respective years as indicated along with all annexures.
2. In case audited Financial statements have not been submitted for all the three years as indicated, 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. Net Worth (Only in case of companies) of the bidder should be positive. Net worth shall be calculated based on the latest Audited Accounts as furnished.Net worth = Paid up share capital + Reserves.
4. PROFIT shall be PBT earned during any one year of last three financial years.
5. 'Additional' Criteria in respect of 'Technical' criteria of PQR for Civil, Electrical, CI, unless otherwise specified:

    i) 'Similar' work means
        a. Piling or Civil or Structure or 'Civil and Structural works' or RCC Chimney or RCC Cooling Tower or RCC Silo or Mill Bunker or any combination of these shall be considered similar works for all packages mentioned under 'CIVIL WORKS'
        b. Electrical or C&I or 'Electrical and C&I' shall be considered similar works for all packages mentioned under 'ELECTRICAL AND C&I WORKS'

6. For evaluation of PQR of Civil, Electrical and C&I packages, in case Bidder alone does not meet the 'Additional' pre-qualifying technical criteria, bidder may utilize the experience of its Parent/ Subsidiary Company along with its own experience, subject to following:
    a. The parent company shall have a controlling stake of ≥50% in the subsidiary company (as per Format-1).
    b. The Parent Company/ Subsidiary Company of which experience is being utilized for bidding shall submit Security Deposit(SD) equivalent to 1% of the total contract value.
    c. The parent/ subsidiary company and bidder shall provide an undertaking that they are jointly or severally responsible for successful performance of the contract (as per Format-2).
    d. In case Bidder is submitting bid as a Consortium Partner, option of utilizing experience of parent/subsidiary Company can be availed by Prime Bidder only.
    e. Parent Company/ Subsidiary Company of which experience is being used for bidding, cannot participate as a 'Standalone Bidder' or as a 'Consortium bidder'.
7. Completion date for achievement of the technical criteria specified in the Common QR should be in the last 7 years ending on the 'latest date of Bid Submission' of Tender irrespective of date of the start of work.
8. 'EXECUTED' means the bidder should have achieved the criteria specified in the Technical criteria of PQR even if the Contract has not been completed or closed
9. In case the Experience/PO/WO certificate enclosed by bidders do not have separate break up of prices for the E&C portion for Electrical and C&I works (i.e. the certificates enclosed are for composite order for supply and erection of Electrical and C&I and other works if any), then value of Erection & Commissioning for the Electrical and C&I portion shall be considered as 15% of the price for supply & erection of Electrical and C&I.
10. Unless otherwise specified, for the purpose of "Technical Criteria" of PQR , the word 'EXECUTED' means achievement of milestones as defined below -
    - "ACHIEVEMENT OF PHYSICAL QUANTITIES" as per PQRs.
    - "READINESS FOR COAL FILLING" of at least one Bunker, in respect of Mill Bunker Structure.
    - "CHARGING" in respect of Power Transformers/ Bus Ducts/ "HT/LT Switchgears" / "HT/LT Cabling".
    - For C&I works: "SYNCHRONISATION" in case of power project / "WORK EXECUTION of the value as defined in PQR" in case of industry.
    - "BOILER LIGHT UP" in respect of Boiler / CFBC / ESP.
    - "CHARGING OF ATLEAST ONE PASS" in respect of ESP(R&M)
    - "GAS IN" in respect of HRSG.
    - "STEAM BLOWING" in respect of Power Cycle Piping.
    - "HYDRAULIC TEST"/ ANY OTHER EQUIVALENT TEST LIKE "100% RT/UT OF WELDED JOINTS" of the system in respect of Pressure parts/ LP Piping/CW Piping.
    - "FULL LOAD OPERATION OF THE UNIT" in respect of Insulation work.
    - "SYNCHRONISATION" in respect of STG / GTG.
    - "SPINNING" in respect of HTG.
    - "GAS IN" in respect of FGD
11. Boiler means HRSG or WHRB or any other types of Steam Generator
12. Power Cycle piping means Main Steam, Hot Reheat, Cold Reheat, HP Bypass

13. For the purpose of evaluation of the PQR, one MW shall be considered equivalent to 3.5 TPH where ever rating of HRSG/BOILER is mentioned in MW. Similarly, where ever rating of Gas Turbine is mentioned in terms of Frame size, ISO rating of the same in terms of MW shall be considered for evaluation.
14. Value of work is to be updated with indices for "All India Avg. Consumer Price index for industrial workers" and "Monthly Whole Sale Price Index for All Commodities" with base month as per last month of work execution and indexed up to three (3) months prior to the month of latest due date of bid submission as per following formula-

$$P = R + 0.425 \times R \times \frac{(X_N - X_0)}{X_0} + 0.425 \times R \times \frac{(Y_N - Y_0)}{Y_0}$$

Where

P = Updated value of work

R = Value of executed work

X_N = All India Avg. Consumer Price index for industrial workers for three months prior to the month of latest due date of bid submission (e.g. If latest bid submission date is 02-Mar-17, then bid submission month shall be reckoned as March'17 and index for Dec'2016 shall be considered).

X_0 = All India Avg. Consumer Price index for industrial workers for last month of work execution

Y_N = Monthly Whole Sale Price Index for All Commodities for three months prior to the month of latest due date of bid submission (e.g. If latest bid submission date is 02-Mar-17, then bid submission month shall be reckoned as March'17 and index for Dec'2016 shall be considered).

Y_0 = Monthly Whole Sale Price Index for All Commodities for last month of work execution

15. Bidder must not be under Bankruptcy Code Proceedings (IBC) by NCLT or under Liquidation / BIFR, which will render him ineligible for participation in this tender, and shall submit undertaking to this effect.

Format-1 /PQ Explanatory Note

Certificate for relationship between Parent Company / Subsidiary Company and the bidder

To,
…….

…….

Dear Sir,

Sub: Bid for NIT No ……..dated…… for "……." (name of the tender).

We hereby certify that M/s……..…… is Parent Company/ Subsidiary Company of M/s ..... ……(the bidder) and details of equity holding of the Parent Company in Subsidiary Company as on ……(not earlier than seven days prior to the Bid Submission Date) are given as below:

Name of Parent Company	Name of Subsidiary Company	Percentage of Equity Holding of Parent Company in Subsidiary Company

(Insert Name and Signature of Statutory Auditor or practicing Company Secretary of the Bidder)

Format-2 /PQ Explanatory Note

Undertaking from the Parent Company/ Subsidiary Company of the bidder

(On the Letter Head of Parent Company/ Subsidiary Company, as applicable)

From,
Name:
Full Address:

Telephone No.:
E-mail address:
Fax/No.:

To,
……..
……..

Dear Sir,

We refer to the NIT No..... dated…… for "……" (name of the Tender).

"We have carefully read and examined in detail the NIT/Tender Terms and Conditions, including in particular, Clause .... of the NIT/Tender, regarding submission of an Undertaking, as per the prescribed Format 1 of the NIT/ Tender.

We confirm that M/s……(the Bidder) has been authorized by us to use our Technical capability for meeting the Technical Criteria as specified in Clause……..of the PQR of the NIT/Tender referred above.

We agree to submit the Security Deposit equivalent to 1% of the total contract value in addition to Security Deposit to be submitted by Bidder as per Clause…….....of the NIT/Tender for fulfillment of all obligations in terms of provisions of the contract, in the event of ……..(the Bidder) being selected as the Successful Bidder.

We confirm that we along with M/s……(the bidder), are jointly or severally responsible for successful performance of the contract.
We confirm that our company shall not participate in the above tender as a 'Standalone Bidder' or as a 'Consortium bidder' and also shall not authorize any other bidder to use our Technical capability for the above tender.

All the terms used herein but not defined, shall have the meaning as ascribed to the said terms under the referred NIT/Tender.

Signature of Managing Director/Authorized signatory of Parent/ Subsidiary Company

ANNEXURE - 2

FORMAT FOR NO DEVIATION CERTIFICATE
(To be submitted in the bidder's letter head)

BHARAT HEAVY ELECTRICALS LIMITED,
Power Sector - Eastern Region,
Plot no 9/1, DJ Block, Sector – II, Salt Lake City,
Kolkata – 700 091

Sub	No Deviation Certificate.	
Job	Erection, Testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears, HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1, FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP, Rampal, Bangladesh.	
Ref	1.0	Tender no PSER:SCT:KLN-E2060:20
	2.0	BHEL's NIT, vide reference no PSER:SCT:KLN-E2060:8037, Date: 09-07-2020
	3.0	All other pertinent issues till date.

Dear Sirs,

With reference to above, this is to confirm that as per tender conditions, we have visited site before submission of our offer and noted the job content & site conditions etc. We also confirm that we have not changed/ modified the tender documents as appeared in the website/ issued by you and in case of such observance at any stage, it shall be treated as null and void.

We hereby confirm that we have not taken any deviation from tender clauses together with other references as enumerated in the above referred NIT. We hereby confirm our unqualified acceptance to all terms & conditions, unqualified compliance to technical specification, integrity pact (if applicable) and acceptance to reverse auctioning process.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null & void.

We confirm to have submitted/uploaded offer/documents in accordance with tender instructions with acceptance of the terms & conditions of the tender by us and as per aforesaid references.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized
representative of the bidder)

ANNEXURE - 3

FORMAT FOR SEEKING CLARIFICATION

JOB	Erection, Testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears, HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1, FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP, Rampal, Bangladesh.
TENDER NO	PSER:SCT:KLN-E2060:20

Sl no	Reference clause of tender document	Existing provision	Bidder's query	BHEL's clarification

ANNEXURE - 4

CHECK LIST

NOTE:- Tenderers are required to fill in the following details and no column should be left blank

1	Name and Address of the Tenderer		
2	Details about type of the Firm/Company		
3.a	Details of Contact person for this Tender	Name : Mr/Ms Designation: Telephone No: Mobile No: Email ID: Fax No:	
3.b	Details of alternate Contact person for this Tender	Name : Mr/Ms Designation: Telephone No: Mobile No: Email ID: Fax No:	
4	EMD DETAILS	DD No: Date : Bank : Amount: Please tick (√) whichever applicable:- ONE TIME EMD / ONLY FOR THIS TENDER	
5	Validity of Offer	TO BE VALID FOR SIX MONTHS FROM DUE DATE	
		APPLICABILITY(BY BHEL)	ENCLOSED BY BIDDER
6	Whether the format for compliance with PRE QUALIFICATION CRITERIA (ANNEXURE-I) is understood and filled with proper supporting documents referenced in the specified format	Applicable	YES / NO
7	Audited profit and Loss Account for the last three years	Applicable/Not Applicable	YES/NO
8	Copy of PAN Card	Applicable/Not Applicable	YES/NO
9	Whether all pages of the Tender documents including annexures, appendices etc are read understood and signed	Applicable/Not Applicable	YES/NO
10	Integrity Pact	Applicable/Not Applicable	YES/NO
11	Declaration by Authorised Signatory	Applicable/Not Applicable	YES/NO
12	No Deviation Certificate	Applicable/Not Applicable	YES/NO
13	Declaration confirming knowledge about Site Conditions	Applicable/Not Applicable	YES/NO
14	Declaration for relation in BHEL	Applicable/Not Applicable	YES/NO
15	Non Disclosure Certificate	Applicable/Not Applicable	YES/NO
16	Bank Account Details for E-Payment	Applicable/Not Applicable	YES/NO
17	Capacity Evaluation of Bidder for current Tender	Applicable/Not Applicable	YES/NO
18	Tie Ups/Consortium Agreement are submitted as per format	Applicable/Not Applicable	YES/NO
19	Power of Attorney for Submission of Tender/Signing Contract Agreement	Applicable/Not Applicable	YES/NO
20	Analysis of Unit rates	Applicable/Not Applicable	YES/NO
21	Bankruptcy Code Proceedings (IBC) by NCLT or under Liquidation / BIFR (Undertaking to be enclosed if not applicable)	Applicable/Not Applicable	YES/NO

NOTE: STRIKE OFF 'YES' OR 'NO', AS APPLICABLE. TENDER NOT ACCOMPANIED BY THE PRESCRIBED ABOVE APPLICABLE DOCUMENTS ARE LIABLE TO BE SUMMARILY REJECTED.

DATE :

AUTHORISED SIGNATORY
(With Name, Designation and Company seal)

ANNEXURE-5

CONDITIONS TO BE COMPLIED WITH FOR CONSORTIUM BIDDING (TECHNICAL TIE UP)

1 Prime Bidder and Consortium Partner or partners are required to enter into a consortium agreement with a validity period of six months initially. In case the consortium is awarded the contract, then the Consortium Agreement between the Prime Bidder and Consortium Partner or partners shall be extended till contractual completion period including extension periods if any applicable.

2 Standalone' bidder cannot become a 'Prime Bidder' or a 'Consortium bidder' or 'Technical Tie up bidder' in a consortium (or Technical Tie up) bidding. Prime bidder shall neither be a consortium partner to other prime bidder nor take any other consortium partners. However, consortium partner may enter into consortium agreement with other prime bidders. In case of non compliance, consortium bids of such Prime bidders will be rejected.

3 Number of partners for a consortium Bidding (or Technical Tie up) shall be as specified in the PQR.

4 Prime Bidder shall be as specified in the Pre Qualification Requirement, else the bidder who has the major share of work.

5 In order to be qualified for the tender, Prime Bidder and Consortium partner or partners shall satisfy (i) the Technical 'Pre Qualifying Requirements' specified for the respective package, (ii) "Assessment of Capacity of Bidder' as specified in clause 8.0

6 Prime Bidder shall comply with additional 'Technical' criteria of PQR as defined in 'Explanatory Notes for the PQR'

7 Prime Bidder shall comply with all other Pre Qualifying criteria for the Tender unless otherwise specified

8 In case customer approval is required, then Prime Bidder and Consortium Partner or partners shall have to be individually approved by Customer for being considered for the tender.

9 Prime Bidder shall be responsible for the overall execution of the contract

10 In case of award of job, Performance shall be evaluated for Prime Bidder and Consortium Partner or partners for their respective scope of work(s) as per prescribed formats

11 In case the Consortium partner or partners back out, their SDs shall be encashed by BHEL. In such a case, other consortium partner or partners meeting the PQR have to be engaged by the Prime Bidder, and if not, the respective work will be withdrawn and executed on risk and cost basis of the Prime Bidder. The new consortium partner or partners shall submit fresh SDs as applicable.

12 In case the prime Bidder withdraws, the whole contract shall be considered cancelled and short closed.

13 After successful execution of one work with a consortium partner under direct orders of BHEL, the Prime Bidder shall be eligible for becoming a 'standalone' bidder for works similar to that for which consortium partner was engaged, for subsequent tenders.

14 The consortium partner shall submit SD equivalent to 1% of the total contract value in addition to the SD to be submitted by the prime Bidder for the total contract value. In case there are two consortium partners, then each partner shall submit SD equivalent to 0.5% of the total contract value in addition to the SD to be submitted by the prime Bidder for the total contract value.

15 In case of a Technical Tie up, all the clauses applicable for the Consortium partner shall be applicable for the Technical Tie up partner also.

Annexure - A

Amendment to GCC/SCC (Vol-IB/Vol-ID)

1. Introduction of Clause No 1.15.13 in GCC as below:

Clause No 1.15.13: Additional security deposit (SD) has to 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 estimate - 'Additional Security Deposit' will be required to be submitted by the successful bidder with value as follows:

Additional Security Deposit = 30 % of (A-B) limited to a maximum of 10% of the 'Total Price/Contract Value', where,

A = 80% of BHEL estimate

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

OR

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

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 the successful bidder (on their request) at appropriate juncture in case 'Additional Security Deposit' is applicable."

2. Clause no. 1.9.1(ii) of GCC shall be read as below:

The EMD may be accepted only in the following forms:

(a) Cash deposit as permissible under the extant Income Tax Act (before tender opening)

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

(c) Banker's cheque/ Pay order/ Demand draft, in favour of BHEL (along with offer)

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

In addition to above, the EMD amount in excess of Rs. 2 Lakh may also be accepted in the form of Bank Guarantee from scheduled bank. The Bank Guarantee in such cases shall be valid for atleast six months. EMD of successful tenderer will be retained as part of Security Deposit.

Clause no. 1.9.1(iv) & (v) of GCC stands deleted.

3. Clause no. 1.10.1 of GCC shall be read as below:

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

4. Clause no. 1.10.2 of GCC shall be read as below:

At least 50% of the required Security Deposit, including the EMD, should be furnished before start of the work. Balance of the Security Deposit can be deposited by deducting 10% of the gross amount progressively from each of the running bills of the Contractor till the total amount of the required Security Deposit is collected.

The recoveries made from running bills (cash deduction towards balance SD amount) can be released against submission of equivalent Bank Guarantee in acceptable form, but only once, before completion of work, with the approval of competent authorities.

5. Clause no. 1.10.3 of GCC shall be read as below:

The balance amount to make up the required Security Deposit of 5% of the contract value may be accepted in the following forms:

a) Cash (as permissible under the extant Income Tax Act)
b) Local cheques of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favour of BHEL
c) Bank Guarantee from Scheduled Banks/ Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format should have the approval of BHEL
d) Fixed Deposit Receipt issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL)
e) Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL)

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

6. Introduction of Clause No. 1.10.8 in GCC as below:

Clause No 1.10.8: SDBG to be furnished by the vendor before start of work. No payment will be released till SDBG is submitted by the vendor.
If requested by the vendor, cash recovery equivalent to SDBG value to be made from bills submitted by the vendor.
Also recovery of interest calculated @SBI PLR +2% on amount equivalent to SDBG / PBG value to be made for the gap period (difference between date of start of work and date of submission of BG / cash recovery).
In case of delay in extension of SDBG, in case of validity expiry, SDBG shall be invoked. However if the vendor submits a new BG after invocation of the previous BG then, it shall be refunded and recovery for the gap period, i.e. the duration for which BG is not available shall be made as stated above.

7. Clause no. 1.11 of GCC shall be read as below:

Security Deposit shall be refunded/Bank Guarantee(s) released to the Contractor along with the 'Final Bill' after deducting all expenses / other amounts due to BHEL under the contract / other contracts entered into with them by BHEL upon fulfilment of contractual obligations as per terms of the contract.

8. Clause no. 2.8.3, 2.8.4 and 2.8.5 of GCC shall be read as below:

Clause no. 2.8.3: The contractor shall comply with all applicable Laws, Statutory Rules, Regulations, Notifications, etc. such as Payment of Wages Act, Minimum Wages Act, Workmen Compensation Act, Employer's Liability Act, Industrial Disputes Act, Employers Provident Act, Employees State Insurance Scheme, Contract Labour (Regulation and Abolition) Act, Payment of Bonus & Gratuity Act, Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, or any other Acts, Rules, and Regulations for labour/workers or governing execution of the work as may be enacted by the Bangladesh Government during the tenure of the Contract and having force or jurisdiction at Site. The Contractor shall also comply with provisions of and give all such notices to the local Governing Body, Police and other relevant Authorities as may be required by the Law of the land.

Clause no. 2.8.4: The Contractor shall obtain independent License for engaging contract labour/workers as required from the concerned Authorities issued by the Principal Employer/Customer/Statutory Bodies as per the prevailing Act or Rules/Regulations of Bangladesh.

Clause no. 2.8.5: The contractor shall pay and bear all taxes, fees, license charges, Cess, duties, deposits, tolls, royalties, commission or other charges which may be leviable on account of his operations in executing the contract.

9. Clause 2.12 of GCC (Overrun Compensation) of GCC stands revised as follows:

2.12 OVERRUN COMPENSATION (ORC)

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

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

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

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

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

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

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

2.12.3.3 For the purpose of calculation of ORC, executed value of work in the month shall be divided in Part-1 and Part-2 in proportion of percentage shortfall attributable to BHEL and contractor respectively, based on the last delay analysis as worked out in 2.12.3.2.
ORC shall be payable only on Part-1 and no ORC shall be payable on Part-2.

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

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

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

(ii) 50% of ORC is allocated for achieving of planned progress agreed as per the joint programme drawn vide 2.11.4. ORC Payment shall be reduced in proportion to percentage shortfall attributable to contractor w.r.t. "Plan - Shortfall attributable to BHEL" for the month, as per Form-14.

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

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

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

i). Contractor has not been permitted by BHEL to de-mobilize
   a) ORC amount of Rs. 1,00,000/- per month shall be applicable during the period of HOLD provided resources as planned are deployed (not demobilised) during the period of hold.
   b) Subsequent to lifting of HOLD, Period of HOLD shall not be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1.

ii). Contractor has been permitted to demobilize and to remobilize after lifting of HOLD
   a) No ORC shall be payable to contractor for the period of HOLD.
   b) Subsequent to lifting of HOLD, Period of HOLD shall not be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1.

2.12.3.8 In case Force Majeure is invoked:
   (i) No ORC shall be applicable during the period of Force Majeure.
   (ii) Subsequent to revocation of Force Majeure, period of Force Majeure shall be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1.

2.12.4 Applicability of ORC: ORC shall not be applicable for following activities.
   (i) Area cleaning, removal of temporary structures and return of scrap.
   (ii) Punch list points / pending points liquidation pending due to reasons attributable to contractor
   (iii) Submission of "As built Drawing"
   (iv) Material Reconciliation
   (v) Completion of Contract Closure formalities like HR Clearance/ No dues from various dept./ Statutory Authorities etc.

2.12.5 Total Over Run Compensation shall be limited to 10% of the cumulatively executed contract value till the month (excluding Taxes and Duties if payable extra). For this purpose, executed contract value excludes PVC, ORC and Extra/Supplementary Works.

10. Clause 2.14 of GCC (Quantity Variation)

a) Existing Clause 2.14.1 of GCC stands revised as follows:

"The quantities given in the contract are tentative and may change to any extent (both in plus side and minus side). The quoted rates for individual items shall remain firm irrespective of any variations in the individual quantities No compensation becomes payable in case the variation of the final executed contract value is within the limit of Minus (-) 15% of awarded contract value"

b) Existing Clause 2.14.2 ii). of GCC stands revised as follows:

"In case the finally executed contract value increases above the awarded Contract Value due to quantity variation, there will be no upward revision in the rates for the individual items and also contractor is not eligible for any compensation."

11. Clause 2.17 of GCC (Price Variation Compensation) stands revised as follows:

2.17 PRICE VARIATION COMPENSATION

2.17.1 In order to take care of variation in cost of execution of work on either side, due to variation in the index of LABOUR, HIGH SPEED DIESEL OIL, WELDING ROD, CEMENT, STEEL, MATERIALS,
Price Variation Formula as described herein shall be applicable (only for works executed during extended period, if any, subject to other conditions as described in this section)

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

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

Note: A) Cement & Steel:Free Issue (BHEL Scope)
B) Cement & Steel :In Contractor Scope
C) Cement in Contractor Scope, and Steel is Free Issue (BHEL Scope)
D) For Composite packages (i.e. Civii+Mechanicai+Eiectrical and/or CI or Civil+Mechanical or Mechanicai+Eiectrical and/or CI}, the COMPONENT ('K') for various categories shall be as per respective packages as above.
E) As per the 'MONTHLY WHOLE SALE PRICE INDEX' for the respective Commodity and Type, published by Office of Economic Adviser, Ministry of Commerce and Industry, Government of India. (Website: http://eaindustry.nic.in/home.asp). Revisions in the index or commodity will be re adjusted accordingly.

2.17.3 #

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

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

Where

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

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

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

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

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

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

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

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

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

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

However total quantum of Price Variation amount payable/recoverable shall be regulated as follows:

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

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

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

1. Base date shall be revised: Revised base date =Previous base date+ duration of Force majeure. No PVC will be applicable for the work done till revised base date.

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

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

1. PVC shall be applicable for the work done after revocation of force majeure.

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

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

12. Clause 2.2 of GCC (Law governing the contract and court jurisdiction) stands revised as follows:

"The contract shall be governed by the Law for the time being in force in the Republic of India. Subject to Clause 2.21.1 or 2.21.2 of this Contract, the Civil Court having original Civil Jurisdiction at Delhi for PSNR, at Kolkata for PSER, at Nagpur for PSWR and at Chennai for PSSR, shall alone have exclusive jurisdiction in regard to all matters in respect of the Contract."

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

2.21 ARBITRATION & CONCILIATION

2.21.1 ARBITRATION:

2.21.1.1 Except as provided elsewhere in this Contract, in case Parties are unable to reach amicable settlement (whether by Conciliation to be conducted as provided in Clause 2.21.2 herein below or otherwise) in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or. in any manner touching upon the Contract (hereinafter referred to as the 'Dispute'), then, either Party may, commence arbitration in respect of such Dispute by issuance of a notice in terms of section 21 of the Arbitration & Conciliation Act, 1996 (hereinafter referred to as the 'Notice'). The Notice shall contain the particulars of all claims to be referred to arbitration in sufficient detail and shall also indicate the monetary amount of such claim. The arbitration shall be conducted by a sole arbitrator to be appointed by the Head of the BHEL Power Sector Region issuing the Contract within 60 days of receipt of the complete Notice. The language of arbitration shall be English.

The Arbitrator shall pass a reasoned award.

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

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

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

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

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

2.21.2 CONCILIATION:

If at any time (whether before, during or after the arbitral or judicial proceedings), any Disputes (which term shall mean and include any dispute, difference, question or disagreement arising in connection with construction, meaning, operation, effect, interpretation or breach of the agreement, contract), which the Parties are unable to settle mutually, arise inter-se the Parties, the same may, be referred by either party to Conciliation to be conducted through Independent Experts Committee (IEC) to be appointed by competent authority of BHEL from the BHEL Panel of Conciliators.

Notes:

1. No serving or a retired employee of BHEL/Administrative Ministry of BHEL shall be included in the BHEL Panel of Conciliators.

2. Any other person(s) can be appointed as Conciliator(s) who is/are mutually agreeable to both the parties from outside the BHEL Panel of Conciliators.

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

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

2.21.3 No Interest payable to Contractor

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

14. Clause no. 2.7.2 and 2.7.3 of Volume-IB-GCC shall be revised as follows:

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

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

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

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

iv). Termination of Contract on account of any other reason (s) attributable to Contractor.
v). Assignment, transfer, subletting of Contract without BHEL's written permission.
vi). Non-compliance to any contractual condition or any other default attributable to Contractor.

Risk & Cost Amount against Balance Work:

Risk & Cost amount against balance work shall be calculated as follows: Risk & Cost Amount= [(A-B) + (A x H/100)]
Where,
A= Value of Balance scope of Work (*) as per rates of new contract
B= Value of Balance scope of Work (*) as per rates of old contract being paid to the contractor at the time of termination of contract i.e. inclusive of PVC & ORC, if any.
H = Overhead Factor to be taken as 5

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

* Balance scope of work (in case of termination of contract):
Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for 'Termination of Contract', shall be taken as balance scope of Work for calculating risk & cost amount. Contract quantities are the quantities as per original contract. If, Contract has been amended, quantities as per amended Contract shall be considered as Contract Quantities.
Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items total Quantities as per issued drawings would be deemed to be contract quantities.
Substitute/ extra items whose rates have already been approved would form part of contract quantities for this purpose. Substitute/ extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions.
However, increase in quantities on account of additional scope in new tender shall not be considered for this purpose.

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

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

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

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

i). Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1
ii) Let the value of executed work till the time of termination of contract= X
iii) Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y
iv) Delay in executed work attributable to contractor i.e. T2=[1-(X/Y)] x T1
v) LD shall be calculated in line with LD clause (clause 2.7.9) of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

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

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

Following sequence shall be applicable for recoveries from contractor:

a) Dues available in the form of Bills payable to contractor, SD, BGs against the same contract.
b) Demand notice for deposit of balance recovery amount shall be sent to contractor, if funds are insufficient to effect complete recovery against dues indicated in (a) above.
c) If contractor fails to deposit the balance amount to be recovered within the period as prescribed in demand notice, following action shall be taken for balance recovery:
   i) Dues payable to contractor against other contracts in the same Region shall be considered for recovery.
   ii) If recovery cannot be made out of dues payable to the contractor as above, balance amount to be recovered, shall be informed to other Regions/Units for making recovery from the Unpaid Bills/Running Bills/SD/BGs/Final Bills of contractor.
   iii) In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.

15. Clause 2.24 of GCC (Performance Guarantee for Workmanship)

Term "Special Conditions of Contract" appearing in 3rdline of the current clause 2.24.1,is replaced by "Technical Conditions of Contract"

16. Clause 4.2.1.7 of Special Condition of Contract (SCC)

At the end of Clause 4.2.1.7 (i.e. after the line "Decision of BHEL shall be final and binding on the contractor") following para is to be added

"It is not obligatory on the part of BHEL to provide any tools and tackles or other materials other than those specifically agreed to do so by BHEL. However, depending upon the availability, BHEL /BHEL's Customer handling equipment and other plants may be made available to the contractor on payment of hire charges as fixed, subject to the conditions laid down by BHEL/Customer from time to time. Unless paid in advance, such hire charges, if applicable, shall be recovered from contractor's bill / security deposit or any other due payment in one installment."

17. Clause 9.61 of SCC (NON-COMPLIANCE)

Under NON-COMPLIANCE, at the end of Clause 9.61 (i.e. after the line "Also the amount will be spent for purchasing the safety appliances and supporting the safety activity at site.") following para is to be added:

"In case of any financial deduction made by Customer for lapses of safety other than what is provided above or elsewhere in the contract, the same shall be charged on back-to-back basis on the defaulting contractor without prejudice to any other right spelt anywhere in the tender / contract"

18. Clause 2.15 of GCC (EXTRA WORKS)

Existing Clause 2.15.5 of GCC stands revised as follows:

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

MAN-HOUR RATE FOR ELIGIBLE EXTRA WORKS: Single composite average labour man-hour rate, including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals,

consumables for carrying out any major rework/ repairs/ rectification/ modification/ fabrication as certified by site as may arise during the course of erection, testing, commissioning or extra works arising out of transit, storage and erection damages, payment, if found due will be at Rs 108/- per man hour."

19. Clause 9.1 & 9.2 to 9.62 of SCC (HSE & OHSAS Obligations)

Cl. no. 9.0	No change
Cl. no. 9.1	HSE (Health, safety & Environment): Contractor will comply with HSE (Health, safety & Environment) requirements of BHEL as per "HSE Plan for Site Operations by Sub-contractors" (Document no. HSEP:14, Rev.00) attached with this tender.
Cl. no. 9.2 to 9.62	Deleted

Annexure -B

Terms & Conditions of Reverse Auction

Against this enquiry for the subject item/ system with detailed scope of supply/service as per tender specifications, BHEL *shall be resorting* 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).

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

3. Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered as initial bids of bidders in RA.

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.

4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained for participation in the reverse auction.

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

6. Bidders have to fax /*e-mail* the Compliance form (annexure III) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.

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" which is inclusive of all cost elements in line with terms & conditions of the tender for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.

8. Reverse auction will be conducted on scheduled date & time.

9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.

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 IV) as provided on case-to-case basis to Service provider within two working days of Auction without fail.

11. *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.*

12. 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.

13. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.

14. *In case of more than four techno commercially qualified bidders, H1 bidder (whose quote is highest in sealed envelope price bid) shall not be allowed to participate in RA. However, there will be no H1 removal in case H1 happens to be MSE or qualifying under PPP-MII, Order 2017 irrespective of the number of bidders qualifying techno-commercially. In case of multiple H1 bidders, all H1 bidders (excluding MSEs and bidders qualifying under PPP-MII, Order 2017) shall be removed provided minimum three bidders remain in fray, else no H1 removal.*

Annexure -C

Certificate by Chartered Accountant on letter head

This is to 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.0.1722(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 is ..... (dd/mm/yyyy) which is within the period of 3 years from 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 the gazette notification dated 04.11.2013 by Ministry of MSME.

Date:

(Signature)

Name-

Membership number-

Seal of Chartered Accountant

Form-2 (Format for local content)

Format for Certification regarding Local content (LC) for Services or Works
[Certificate to be provided by local supplier from the Statutory Auditor or Cost Auditor of the company (in the case of companies) or from a practicing Cost Accountant or practicing Chartered Accountant (in respect of local suppliers other than companies)

Date:

I < name of Statutory Auditor/Cost Auditor/ practicing Cost Accountant/practicing Chartered Accountant > do hereby certify that < name of authorized signatory of bidder > S/o, D/o, W/o _____, Resident of _____ has solemnly affirmed and declared as under:

That the percentage of local content for the product/service offered by the bidder/supplier against the subject tender is _____%.

That he/she agreed to abide by terms and conditions of Department of Industrial Policy & Promotion issued vide Notification No: P-45021/2/2017-B.E.-II Dated: 15-06-2017 & P-45021/2/2017-PP (BE-II) Dated: 28-05-2018.

That the information furnished hereinafter by him/her is correct to best of my knowledge and belief and I undertake to produce relevant records before the procuring entity or any other authority so nominated by the Government of India for the purpose of assessing the LC.

That the LC for all inputs which constitute the said Product/Services/Works has been verified by me and I am responsible for the correctness of the claims made therein.

That in the event of the LC of the Product/ Services/ Works mentioned herein is found to be incorrect and not meeting the prescribed LC norms, based on the assessment of an authority so nominated by the Government of India and he/she will be liable as under clause 9 (f) of Public Procurement (Preference to Make in India) order 2017.

He/she agrees to maintain all information regarding his/her claim for LC in the Company's record for a period of 2 years and shall make this available for verification to any statutory authorities

i. Name and details of the Local supplier (registered Office, Manufacturing and location, nature of legal entity)
ii. Date on which this certificate is issued
iii. Product / Services/ Works for which the certificate is produced
iv. Procuring agency to whom the certificate is furnished
v. Percentage of LC claimed.
vi. Name and contract details of the unit of the manufacturer
vii. Sale Price of the product
viii. Ex-Factory Price of the product
ix. Freight, insurance and handling
x. Total Bill of Material
xi. List and total cost value of inputs used for manufacture of the Products/ Services/Works
xii. List and total cost of inputs which are locally sourced. Please attach LC certificates from local suppliers, if the input is not in-house.
xiii. List and cost of inputs which are imported, directly or indirectly

For and behalf of _____ <Name of Statutory Auditor/Cost Auditor/ practicing Cost Accountant/practicing Chartered Accountant>

Stamped & signed by Authorized signatory
<Insert Name, Designation and Contract No and date>

Annexure –E

Guidelines/ rules for Bank Guarantee submission by Foreign vendor

As per tender provision Bank Guarantees shall be furnished by the contractor from scheduled Banks/ Public Financial Institutions in line with the following guidelines/rules for acceptance of the BG:

I. In case of Bank Guarantees submitted by the Foreign Vendors-

a) From Nationalized/ Public sector/ Private Sector/ Foreign Banks (BG issued by Branches in India) can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the unit is located i,e. Demand can be presented at the Branch Located in the town / city or at nearest branch where the unit is located.

b) From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)

b.1) In such cases, Bank Guarantee issued by any of the Consortium Banks only will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter – Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank)(List of BHEL's Consortium Bank is given below). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor.

b.2) In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank, the same is acceptable. However, the procedure at sl.no. b.1 will required to be followed.

b.3) The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time).

b.4) The BG should clearly specify that the demand or other document can be presented in electronic form.

II. Currency of BG shall be the currency indicated in the Letter of Intent (LOI).

List of Consortium Banks					
	Nationalised Bank		Nationalised Bank		Foreign bank
1	Allahabad bank	13	State Bank of Hyderabad	21	CITI Bank N.A
2	Andhra bank	14	Syndicate Bank	22	Deutsche Bank AG
3	Bank of Baroda	15	State Bank of Travancore	23	The Hongkong and Shanghai Banking Corporation Limited
4	Canara Bank	16	UCO Bank	24	Standard Chartered Bank
5	Corporation bank	17	Union Bank of India	25	J P Morgan
6	Central bank	18	United Bank of India		Private bank
7	Indian Bank	19	Vijaya Bank	26	Axis Bank
8	Indian Oversea Bank			27	The Federal Bank Limited
9	Oriental bank of Commerce		Public Sector Banks	28	HDFC
10	Punjab National Bank	20	IDBI	29	Kotak Mahindra Bank
11	Punjab & Sindh Bank			30	ICICI
12	State Bank of India			31	Indusind Bank
				32	Yes Bank

Annexure- CPP-GST/I

Please arrange to submit this filled-up format along with Tender

Name of the Company	
Address of Company*	
Company Registration Number*	
Name of Partners / Directors	
ALL THE STATES WHERE BIDDER HAS A PLACE OF BUSINESS*	
ALL ADDRESS OF VENDOR MENTIONING THEIR PIN AS PER THE LATEST GST REGISTRATION*	
GSTN OF ALL THE ABOVE NOTED PLACES OF VENDOR*	
Bidder Type: Indian/ Foreign*	
City*	
State*	
Country*	
Postal Code*	
PAN/TAN Number*	
Company's Establishment Year	
Company's Nature of Business*	
Company's Legal Status* {limited /undertaking/joint venture/partnership/other}	
Company Category* {micro unit as per MSME/small unit as per MSME/medium unit as per MSME/ UAN as per Udyog Aadhaar Memorandum/ Ancillary unit/project affected person of this company/ssi/ other} Relevant documents to be submitted as applicable.	
Enter Company's Contact Person Details	
Title(Mr. / Mrs. / Ms. / Dr. / Shri)*	
Contact Name*	
Date Of Birth*	
Correspondence Email*	
(Correspondence Email ID can be same	
as your Login ID. All the mail correspondence	
will be sent only to the Correspondence Email ID.)	
Designation	
Phone*	
Fax*	
Mobile*	

INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi - 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for _____ _____ _____ . The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint Independent External Monitor(s), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1- Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:-

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions:

Section 2 - Commitments of the Bidder(s)/ Contractor(s)

2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant Indian Penal Code (IPC) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

2.1.4 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and will await their decision in the matter.

Section 3 - Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 4 - Compensation for Damages

4.1 If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent Earnest Money Deposit/ Bid Security.

4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to

demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee, whichever is higher.

Section 5 - Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 - Equal treatment of all Bidders/ Contractors / Sub-contractors

6.1 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors. In case of sub-contracting, the Principal contractor shall be responsible for the adoption of IP by his sub-contractors and shall continue to remain responsible for any default by his sub-contractors.

6.2 The Principal will disqualify from the tender process all bidders who do not sign this pact or violate its provisions.

Section 7 - Criminal Charges against violating Bidders/ Contractors /Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 - Independent External Monitor(s)

8.1 The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

8.2 The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.

8.3 The Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/ Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Sub-contractor(s) with confidentiality in line with Non- disclosure agreement.

8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

8.5 The role of IEMs is advisory, would not be legally binding and it is restricted to resolving issues raised by an intending bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.

8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process, the matter should be examined by the full panel of IEMs jointly as far as possible, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.

8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to CMD, BHEL, at the earliest. They may also send their report directly to the CVO and the Commission, in case of suspicion of serious irregularities requiring legal/ administrative action. IEMs will tender their advice on the complaints within 10 days as far as possible.

8.8 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.

8.9 IEM should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the organization should be looked into by the CVO of the concerned organisation.

8.10 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code/ Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.11 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.

8.12 The word 'Monitor' would include both singular and plural.

Section 9 - Pact Duration

9.1 This Pact shall be operative from the date IP is signed by both the parties till the final completion of contract for successful bidder and for all other bidders 6 months after the contract has been awarded. Issues like warranty / guarantee etc. should be outside the purview of IEMs.

9.2 If any claim is made/ lodged during currency of IP, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 - Other Provisions

10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.

10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those bidders / contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

For & On behalf of the Principal

(Office Seal)

For & On behalf of the Bidder/ Contractor

(Office Seal)

Place----------

Date----------

Witness:_____

(Name & Address) _____

_____

Witness:_____

(Name & Address) _____

_____

सुब्रत सेन / Subrata Sen
महाप्रबंधक (उप संविदा) / Addl. General Manager (Sub Contract)
बी. एच. ई. एल. / पी.एस.ई.आर / BHEL / PSER
डी जे - 9/1, सॉल्ट लेक / DJ-9/1, SALT LAKE
कोलकाता-700 091 / KOLKATA-700 091

ANNEXURE-C

ON BIDDER'S LETTER HEAD

Certificate of Declaration for Confirming the Knowledge of Site Conditions, Laws and Regulations

We, _ hereby declare and confirm that we have visited the project site under the subject namely Project Site of 2 x 660 MW MAITREE SUPER THERMAL POWER PROJECT which is located in Moithara Village, Rampal Upazila, Bagerhat District, Bangladesh and acquired full knowledge and information about the site condition, wages structure, industrial climate and total work involved.

We confirm to agree and acknowledge that we are fully aware of all the Applicable Laws and Regulations applicable in Project Site in Bangladesh including the Bangladesh Labour Act 2006 and the Bangladesh Labour Rules 2015. We further confirm to ensure our respective employees, servants, consultants and agents abide by the all Applicable Laws (i) relating to the performance of the Work (ii) by all rules and regulation of those Governmental Authorities who have control or jurisdiction over the Site or the countries where we may reside or perform work, directly or indirectly under this Contract (including the timely payment of any or all fees, assessments or other governmental charges and registrations with relevant agencies or other Governmental Authorities required in connection therewith) and (iii) with the terms and conditions of any Authorizations.

We further confirm that the above information is true and correct and we will not raise any claim of any nature due to lack of knowledge of site conditions and Laws and Regulations.

Bidder's Name and Address

(Signature of the Bidder's with Seal)

Place :

Dated :

ANNEXURE B

UNDERTAKING
(To be submitted in the company's letter head)

THIS UNDERTAKING ("Undertaking") executed at **(Location)** on this **(Date)** by:

1. **(Company Name)**, registered office at _____,

IN FAVOUR OF

2. **Bharat Heavy Electricals Limited**, a company incorporated under the company Act, 1956 of India having its registered office at BHEL House, Siri Fort, New Delhi-110049 and Power Sector Eastern Region Office at DJ-9/1, Sector-II, Saltlake City, Kolkata-700091, India.

1. UNDERTAKING

1.1 We hereby confirm that we are not a black listed company/organization by EXIM Bank of India as on the latest due date of bid submission.

1.2 During scrutiny if it is found otherwise w.r.t. undertaking furnished above, BHEL shall have right to cancel our bid for further evaluation.

Signed & Delivered on behalf of

(Company Name):
Official Representative:-
Designation:-
Date:-

FORM NO. 10F

[See sub-rule (1) of rule 21AB]

Information to be provided under sub-section (5) of section 90 or sub-section (5) of section 90A of the Income-tax Act, 1961

I_____ *son/daughter of Shri. _____in the capacity of _____ (designation) do provide the following information, relevant to the previous year_____ *in my case/in the case of_____ for the purposes of sub-section (5) of * section 90/section 90A:-

SI.No.	***Nature of information***	***Details#***
(*i*)	Status (individual; company, firm etc.) of the assessee	
(*ii*)	Permanent Account Number (PAN) of the assessee if allotted	
(*iii*)	Nationality (in the case of an individual) or Country or specified territory of incorporation or registration (in the case of others)	
(*iv*)	Assessee's tax identification number in the country or specified territory of residence and if there is no such number, then, a unique number on the basis of which the person is identified by the Government of the country or the specified territory of which the assessee claims to be a resident	
(*v*)	Period for which the residential status as mentioned in the certificate referred to in sub-section (4) of section 90 or sub-section (4) of section 90A is applicable	
(*vi*)	Address of the assessee in the country or territory outside India during the period for which the certificate, mentioned in (v) above, is applicable	

2. I have obtained a certificate referred to in sub-section (4) of section 90 of sub-section (4) of section 90A from the Government of_____(name of country or specified territory outside India).

Signature: _____

Name: _____

Address: _____

Permanent Account Number: _____

Verification

I_____ do hereby declare that to the best of my knowledge and belief what is stated above is correct complete and is truly stated.

Verified today the _____ day of_____

_____

Signature of the person providing the information

Place: _____

Notes:

1. *Delete whichever is not applicable.

2. #Write N.A. if the relevant information forms part of the certificate referred to in sub-section (4) of section 90 or sub-section (4) of section 90A.

TENDER NO: PSER:SCT:KLN-E2060:20

VOLUME -IB

GENERAL CONDITIONS OF CONTRACT

(SERVICE)

FOR

Erection, Testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears, HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1, FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP, Rampal, Bangladesh.

BHARAT HEAVY ELECTRICALS LIMITED

(A GOVT. OF INDIA UNDERTAKING)
POWER SECTOR – EASTERN REGION
PLOT NO. – 9 / 1, DJ – BLOCK,
SECTOR – II, KARUNAMOYEE,
SALT LAKE CITY,
KOLKATA – 700091.

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CHAPTER -1

1. GENERAL INSTRUCTION TO TENDERERS

1.1. DESPATCH INSTRUCTION

i) The General Conditions of Contract form part of the Tender specifications. All pages of the tender documents shall be duly signed, stamped and submitted along with the offer in token of complete acceptance thereof. The information furnished shall be complete by itself. The tenderer is required to furnish all the details and other documents as required in the following pages

ii) Tenderers are advised to study all the tender documents carefully. Any submission of tender by the tenderer shall be deemed to have been done after careful study and examination of the tender documents and with the full understanding of the implications thereof. Should the tenderers have any doubt about the meaning of any portion of the Tender Specification or find discrepancies or omissions in the drawings or the tender documents issued are incomplete or shall require clarification on any of the technical aspect, the scope of work etc., he shall at once, contact the authority inviting the tender well in time (so as not to affect last date of submission) for clarification before the submission of the tender. Tenderer's request for clarifications shall be with reference to Sections and Clause numbers given in the tender documents. The specifications and terms and conditions shall be deemed to have been accepted by the tenderer in his offer. Non compliance with any of the requirements and instructions of the tender enquiry may result in the rejection of the tender.

iii) Integrity pact (IP) shall be applicable for all tenders / contracts if indicated in NIT. This integrity pact shall be issued as part of the Tender documents and shall be returned by the bidder along with Techno-commercial bid duly filled, signed and stamped by the authorized signatory who signs the bid. Only those vendors / bidders who have entered into such an IP with BHEL shall be considered qualified to participate in the bidding. Entering into this pact shall be a preliminary qualification.

1.2. SUBMISSION OF TENDERS

1.2.1 The tenderers must submit their tenders to Officer inviting tender as per instructions in the NIT

1.2.2 Tenders submitted by post shall be sent by 'REGISTERED POST ACKNOWLEDGEMENT DUE / by COURIER' and shall be posted with due allowance for any postal/courier delays. BHEL takes no responsibility for delay, loss or non-receipt of tenders sent by post/courier. The tenders received after the specified time of their submission are treated as 'Late Tenders' and shall not be considered under any circumstances. Offers received by Fax/Email/Internet shall be considered as per terms of NIT.

1.2.3 Tenders shall be opened by authorised Officer of BHEL at his office at the time and date as specified in the NIT, in the presence of such of those tenderers or their authorised representatives who may be present

1.2.4 Tenderers whose bids are found techno commercially qualified shall be informed the date and time of opening of the Price Bids and such Tenderers may depute their representatives to witness the opening of the price bids. BHEL's decision in this regard shall be final and binding.

1.2.5 Before submission of Offer, the tenderers are advised to inspect the site of work and the environments and be well acquainted with the actual working and other prevalent conditions, facilities available, position of material and labour, means of transport and access to Site, accommodation, etc. No claim will be entertained later on the grounds of lack of knowledge of any of these conditions.

1.3. LANGUAGE

1.3.1 The tenderer shall quote the rates in English language and international numerals. These rates shall be entered in figures as well as in words. For the purpose of the tenders, the metric system of units shall be used.

1.3.2 All entries in the tender shall either be typed or written legibly in ink. Erasing and over-writing is not permitted and may render such tenders liable for rejection. All cancellations and insertions shall be duly attested by the tenderer.

1.4 PRICE DISCREPANCY:

1.4.1 Conventional (Manual) Price Bid opening : In the case of price bid opening without resorting to Reverse Auction, if there are differences between the rates given by the tenderer in words and figures or in amount worked out by him, the following procedure for evaluation and award shall be followed:

i) When there is a difference between the rates in figures and in words, the rates which corresponds to the amounts worked out by the contractor, shall be taken as correct

ii) When the amount of an item is not worked out by the contractor or it does not correspond with the rate written either in figure or in words, then the rate quoted by the contractor in words shall be taken as correct

iii) When the rate quoted by the contractor in figures and words tallies but the amount is not worked out correctly, the rate quoted by the contractor shall be taken as correct and not the amount.

iv) In case of lumpsum price, if there is any difference between the amount in figures and in words, the amount quoted by the bidder in words shall be taken as correct.

v) In case of omission in quoting any rate for one or more items, the evaluation shall be done considering the highest quoted rate obtained against the respective items by other tenderers for the subject tender. If the tenderer becomes L-1, the notional rates for the omission items shall be the lowest rates quoted for the respective items by the other tenderers against the respective omission items for the subject job and the 'Total quoted price (loaded for omissions)' shall be arrived at. However the overall price remaining the same as quoted originally, the rates for all the items in the 'Total quoted price (loaded for omissions)' shall be reduced item wise in proportion to the ratio of 'Original' total price and the 'Total quoted price (loaded for omissions)''.

vi) The 'Final Total Amount' shall be arrived at after considering the amounts worked out in line with 'i' to 'iv' above.

1.4.2 Reverse Auction: In case of Reverse Auction, the successful bidder shall undertake to execute

the work as per overall price offered by him during the Reverse Auction process. In case of omission of rates, the procedure shall be as per 'Guidelines for Reverse Auction' enclosed.

1.5. QUALIFICATION OF TENDERERS

i) Only tenderers who have previous experience in the work of the nature and description detailed in the Notice Inviting Tender and/or tender specification are expected to quote for this work duly detailing their experience along with offer.

ii) Offers from tenderers who do not have proven and established experience in the field shall not be considered

iii) .Offers from tenderers who are under suspension (banned) by any Unit/Region/Division of BHEL shall not be considered.

iv) Offers from tenderers who do not comply with the latest guidelines of Ministry/Commissions of Govt of India shall not be considered.

1.6. EVALUATION OF BIDS

i) Technical Bids submitted by the tenderer will be opened first and evaluated for fulfilling the Pre Qualification criteria and other conditions in NIT/Tender documents, based on documentary evidences submitted along with the offer

ii) In case the same qualifying experience is claimed by more than one agency, then the agency who has executed the work as per documentary evidence submitted shall only be qualified. Scope of qualifying work should be totally with the agency who has executed and in case it is only labour+consumables without T&P, then the responsibility of execution is assigned to the first agency and not to the agency who has executed only as labour supply contractor. Further, BHEL reserves the right to ask for further proofs including submission of TDS certificates for the said job

iii) In case the qualifying experience is claimed by private organizations based on Work Order and completion certificates from another private organization, BHEL reserves the right to ask for further proofs including submission of TDS certificates for the said job

iv) Assessing Bidder Capacity for executing the current tender shall be as per Notice Inviting Tender

v) Price Bids of shortlisted bidders shall only be opened either through the conventional price bid opening or through electronic Reverse Auction, at the discretion of BHEL

vi) Price Bids of unqualified bidders shall not be opened. Reasons for rejection shall be intimated in due course after issue of LOI/LOA to successful bidder and receipt of unqualified acceptance from the successful bidder

vii) Bidders are advised to also refer to clause no 2.9.4 regarding evaluation of their performance in ongoing projects for the current tender

1.7. DATA TO BE ENCLOSED

Full information shall be given by the tenderer in respect of the following. Non-submission of this information may lead to rejection of the offer.

i) INCOME TAX PERMANENT ACCOUNT NUMBER

Certified copies of Permanent Account Numbers as allotted by Income Tax Department for the Company/Firm/Individual Partners, etc. shall be furnished along with tender.

ii) ORGANIZATION CHART

The organization chart of the tenderer's organization, including the names, addresses and contact

information of the Directors/Partners shall be furnished along with the offer.

iii) An attested copy of the Power of Attorney, in case the tender is signed by an individual other than the sole proprietor

iv) IN CASE OF INDIVIDUAL TENDERER:
His / her full name, address and place & nature of business.

v) IN CASE OF PARTNERSHIP FIRM
The names of all the partners and their addresses, A copy of the partnership deed/instrument of partnership dully certified by the Notary Public shall be enclosed.

vi) IN CASE OF COMPANIES:

a. Date and place of registration including date of commencement certificate in case of Public Companies (certified copies of Memorandum and articles of Association are also to be furnished).
b. Nature of business carried on by the Company and the provisions of the Memorandum relating thereof.

1.8 AUTHORISATION AND ATTESTATION
Tenders shall be signed by a person duly authorized/empowered to do so. An attested copy of the Power of Attorney, in case the tender is signed by an individual other than the sole proprietor shall be submitted along with the tenders

1.9 EARNEST MONEY DEPOSIT

1.9.1 Every tender must be accompanied by the prescribed amount of Earnest Money Deposit (EMD) in the manner described herein.

i) EMD shall be furnished along with the offer in full as per the amount indicated in the Special Conditions of Contract / NIT
ii) EMD is to be paid in cash (as permissible under Income Tax Act), Pay order or Demand Draft in favour of 'Bharat Heavy Electricals Limited' and payable at Regional HQ issuing the tender.
iii) No other form of EMD remittance shall be acceptable to BHEL
iv) Bidder may opt to deposit "One Time EMD" of Rs. 2.0 lakhs (Rupees Two lakhs only) with BHEL:Power Sector Region HQ issuing the tender, which will enable them to participate in all the future tender enquiries in respect of Erection and Commissioning services issued from the respective office. Interested bidders may clearly send their consent for converting the present EMD into a "One Time EMD" in their offer.
   - Note : The 'One Time EMD' cannot be withdrawn by the tenderers within 3 years from the date of deposit, under any circumstances. The Tenderer who wishes to withdraw after three years will not be allowed to submit 'One Time EMD' again.
v) Bidders who have already deposited such "One Time EMD" of Rs. 2.00 lakh are exempted from submission of EMD for this tender. However a copy of 'One Time EMD' certificate issued by BHEL Regional HQ issuing the tender shall be enclosed along with the offer.

1.9.2 EMD by the bidder will be forfeited as per Tender Documents if

i) After opening the tender, the bidder revokes his tender within the validity period or increases his

earlier quoted rates.

ii) The bidder does not commence the work within the period as per LOI/Contract. In case the LOI / contract is silent in this regard then within 15 days after award of contract.

1.9.3 EMD shall not carry any interest.

1.9.4 In the case of unsuccessful bidders, the Earnest Money will be refunded to them within a reasonable time after acceptance of award by successful tenderer.

1.10 SECURITY DEPOSIT

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

SN	Contract Value	Security Deposit Amount
1	Up to Rs. 10 lakhs	10% of Contract Value
2	Above Rs. 10 lakhs upto Rs.50 lakhs	1 lakh + 7.5% of the Contract Value exceeding Rs. 10 lakhs.
3	Above Rs. 50 lakhs	Rs 4 lakhs + 5% of the Contract Value exceeding Rs. 50 lakhs.

1.10.2 The security Deposit should be furnished before start of the work by the contractor.

1.10.3 Security Deposit may be furnished in any one of the following forms

i) Cash (as permissible under the Income Tax Act)
ii) Pay Order / Demand Draft in favour of BHEL.
iii) Local cheques of scheduled banks, subject to realization.
iv) Securities available from Post Offices such as National Savings Certificates, Kisan Vikas Patras etc. (Certificates should be held in the name of Contractor furnishing the security and duly pledged in favour of BHEL and discharged on the back).
v) Bank Guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format for Security Deposit shall be in the prescribed formats
vi) Fixed Deposit Receipt issued by Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The FDR should be in the name of the contractor, A/C BHEL, duly discharged on the back.
vii) Security deposit can also be recovered at the rate of 10% from the running bills. However in such cases at least 50% of the Security Deposit should be deposited in any form as prescribed before start of the work and the balance 50% may be recovered from the running bills.
viii) EMD of the successful bidder can be converted and adjusted against the cash portion of Security Deposit excepting for such bidders who have remitted One Time EMD.

NOTE: Acceptance of Security Deposit against Sl. No. (iv) and (vi) above will be subject to hypothecation or endorsement on the documents in favour of BHEL. However, BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith.

1.10.4 The Security Deposit shall not carry any interest.

1.10.5 In case the value of work exceeds / reduces from the awarded / accepted value, the Security Deposit shall be correspondingly enhanced / reduced as given below:

i) The enhanced part of the Security Deposit shall be immediately deposited by the Contractor or adjusted against payments due to the Contractor.

ii) There will be no reduction in Security Deposit value in case of variation in contract value upto the lower limit specified in Quantity variation clause. In case of reduction of contract value beyond the lower limit specified in Quantity Variation clause, then the Security Deposit shall be re adjusted in proportion.

iii) In case of reduction, the reduced Contract value shall be certified by BHEL Construction Manager after ascertaining / freezing of BOQ / Drawings from the Design / Engineering Centre. The reduced Security Deposit value can only be considered after taking into account the adequacy of the securities held by BHEL to meet the liabilities of the contractor for the contract, and the performance of the contract in general. In such cases, the revised value of Security Deposit shall be worked out only after execution of not less than the lower limit of the revised scope of work/contract value as per quantity variation clause, and as certified by Construction Manager. This reduction in value of Security Deposit shall not entitle the contractor to any amendment of Contract and shall be operated at the discretion of BHEL

iv) Contract value for the purpose of operating the reduced/increased value of Security Deposit due to Quantity Variation, shall be exclusive of Price Variation Clause, Over Run Compensation and Extra works done on manday rates.

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

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

1.11 RETURN OF SECURITY DEPOSIT

Security Deposit shall be refunded/Bank Guarantee(s) released to the Contractor along with the 'Final Bill' after deducting all expenses / other amounts due to BHEL under the contract / other contracts entered into with them by BHEL.

1.12 BANK GUARANTEES

Where ever Bank Guarantees are to be furnished/submitted by the contractor, the following shall be complied with

i) Bank Guarantees shall be from Scheduled Banks / Public Financial Institutions as defined in the Companies Act.

ii) The Bank Guarantees shall be as per prescribed formats.

iii) It is the responsibility of the bidder to get the Bank Guarantees revalidated/extended for the required period (subject to a minimum period of six months), as per the advice of BHEL Site Engineer / Construction Manager. BHEL shall not be liable for issue of any reminders regarding expiry of the

Bank Guarantees.

iv) In case extension/further extensions of any Bank Guarantees are not required, the bidders shall ensure that the same is explicitly endorsed by the Construction Manager and submitted to the Regional HQ issuing the LOI/LOA.

v) In case the Bank Guarantees are not extended before the expiry date, BHEL reserves the right to invoke the same by informing the concerned Bank in writing, without any advance notice/communication to the concerned bidder.

vi) Bidders to note that any corrections to Bank Guarantees shall be done by the issuing Bank, only through an amendment in an appropriate non judicial stamp paper.

vii) The Original Bank Guarantee shall be sent directly by the Bank to BHEL under Registered Post (Acknowledgement Due), addressed to the Subcontracting Department of the respective Region.

1.13 VALIDITY OF OFFER

The rates in the Tender shall be kept open for acceptance for a minimum period of SIX MONTHS from latest due date of offer submission (including extension, if any) . In case BHEL (Bharat Heavy Electricals Ltd) calls for negotiations, such negotiations shall not amount to cancellation or withdrawal of the original offer which shall be binding on the tenderers.

1.14 EXECUTION OF CONTRACT AGREEMENT

The successful tenderer's responsibility under this contract commences from the date of issue of the Letter of Intent by Bharat Heavy Electricals Limited. The Tenderer shall submit an unqualified acceptance to the Letter of Intent/Award within the period stipulated therein.

The successful tenderer shall be required to execute an agreement in the prescribed form, with BHEL, within a reasonable time after the acceptance of the Letter of Intent/Award, and in any case before releasing the first running bill. The contract agreement shall be signed by a person duly authorized/empowered by the tenderer. The expenses for preparation of agreement document shall be borne by BHEL

1.15 REJECTION OF TENDER AND OTHER CONDITIONS

1.15.1 The acceptance of tender will rest with BHEL which does not bind itself to accept the lowest tender or any tender and reserves to itself full rights for the following without assigning any reasons whatsoever:-

a. To reject any or all of the tenders.

b. To split up the work amongst two or more tenderers as per NIT

c. To award the work in part if specified in NIT

d. In case of either of the contingencies stated in (b) and (c) above, the time for completion as stipulated in the tender shall be applicable.

1.15.2 Conditional tenders, unsolicited tenders, tenders which are incomplete or not in the form specified or defective or have been materially altered or not in accordance with the tender

conditions, specifications etc., are liable to be rejected.

1.15.3 Tenders are liable to be rejected in case of unsatisfactory performance of the tenderer with BHEL, or tenderer under suspension (hold/banning /delisted) by any unit / region / division of BHEL or tenderers who do not comply with the latest guidelines of Ministry/Commissions of Govt of India. BHEL reserves the right to reject a bidder in case it is observed that they are overloaded and may not be in a position to execute this job as per the required schedule in line with clause no. 9.0 of the 'NIT'. The decision of BHEL will be final in this regard.

1.15.4 If a tenderer who is a proprietor expires after the submission of his tender or after the acceptance of his tender, BHEL may at their discretion, cancel such tender. If a partner of a firm expires after the submission of tender or after the acceptance of the tender, BHEL may then cancel such tender at their discretion, unless the firm retains its character.

1.15.5 BHEL will not be bound by any Power of Attorney granted by changes in the composition of the firm made subsequent to the execution of the contract. They may, however, recognise such power of Attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the contractor concerned.

1.15.6 If the tenderer deliberately gives wrong information in his tender, BHEL reserves the right to reject such tender at any stage or to cancel the contract if awarded and forfeit the Earnest Money/Security Deposit/any other money due.

1.15.7 Canvassing in any form in connection with the tenders submitted by the Tenderer shall make his offer liable to rejection.

1.15.8 In case the Proprietor, Partner or Director of the Company/Firm submitting the Tender, has any relative or relation employed in BHEL, the authority inviting the Tender shall be informed of the fact as per specified format, along with the Offer. Failing to do so, BHEL may, at its sole discretion, reject the tender or cancel the contract and forfeit the Earnest Money/Security Deposit.

1.15.9 The successful tenderer should not sub-contract part or complete work detailed in the tender specification undertaken by him without written permission of BHEL's Construction Manager/Site Incharge. The tenderer is solely responsible to BHEL for the work awarded to him.

1.15.10 The Tender submitted by a techno commercially qualified tenderer shall become the property of BHEL who shall be under no obligation to return the same to the bidder. However unopened price bids and late tenders shall be returned to the bidders

1.15.11 Unsolicited discount received after the due date and time of Bid Submission shall not be considered for evaluation. However, if the party who has submitted the unsolicited discount/rebate becomes the L-I party, then the awarded price i.e contract value shall be worked out after considering the discount so offered.

1.15.12 BHEL shall not be liable for any expenses incurred by the bidder in the preparation of the tender irrespective of whether the tender is accepted or not.

CHAPTER-2

2.1 DEFINITION: The following terms shall have the meaning hereby assigned to them except where the context otherwise requires

i) BHEL shall mean Bharat Heavy Electricals Limited (of the respective Power Sector Region inviting the Tender), a company registered under Indian Companies Act 1956, with its Registered Office at BHEL HOUSE, SIRI FORT, NEW DELHI – 110 049, or its Power Sector Regional Offices or its Authorised Officers or its Site Engineers or other employees authorised to deal with any matters with which these persons are concerned on its behalf.

ii) "EXECUTIVE DIRECTOR" or 'GROUP GENERAL MANAGER' or "GENERAL MANAGER (Incharge)" or "GENERAL MANAGER" shall mean the Officer in Administrative charge of the respective Power Sector Region.

iii) "COMPETENT AUTHORITY" shall mean Executive Director or Group General Manager or General Manager (Incharge) or General Manager or BHEL Officers who are empowered to act on behalf of the Executive Director or General Manager (Incharge) or General Manager of BHEL.

iv) "ENGINEER" or "ENGINEER IN CHARGE" shall mean an Officer of BHEL as may be duly appointed and authorized by BHEL to act as "Engineer" on his behalf for the purpose of the Contract, to perform the duty set forth in this General Conditions of Contract and other Contract documents. The term also includes 'CONSTRUCTION MANAGER' or 'SITE INCHARGE' as well as Officers at Site or at the Headquarters of the respective Power Sector Regions.

v) "SITE" shall mean the places or place at which the plants/equipments are to be erected and services are to be performed as per the specification of this Tender.

vi) "CLIENT OF BHEL" or "CUSTOMER" shall mean the project authorities with whom BHEL has entered into a contract for supply of equipments or provision of services.

vii) "CONTRACTOR" shall mean the successful Bidder/Tenderer who is awarded the Contract and shall include the Contractor's successors, heirs, executors, administrators and permitted assigns.

viii) "CONTRACT" or "CONTRACT DOCUMENT" shall mean and include the Agreement of Work Order, the accepted appendices of Rates, Schedules, Quantities if any, General Conditions of Contract, Special Conditions of Contract, Instructions to the Tenderers, Drawings, Technical Specifications, the Special Specifications if any, the Tender documents, subsequent amendments mutually agreed upon and the Letter of Intent/Acceptance issued by BHEL. Any conditions or terms stipulated by the contractor in the tender documents or subsequent letters shall not form part of the contract unless, specifically accepted in writing by BHEL in the Letter of Intent/Award and incorporated in the agreement.

ix) "GENERAL CONDITIONS OF CONTRACT" shall mean the 'Instructions to Tenderers' and 'General Conditions of Contract' pertaining to the work for which above tenders have been called for.

x)	"TENDER SPECIFICATION" or "TENDER" or "TENDER DOCUMENTS" shall mean General Conditions, Common Conditions, Special Conditions, Price Bid, Rate Schedule, Technical Specifications, Appendices, Annexures, Corrigendums, Amendments, Forms, procedures, Site information, etc and drawings/documents pertaining to the work for which the tenderers are required to submit their offers. Individual specification number will be assigned to each Tender Specification.
xi)	"LETTER OF INTENT" shall mean the intimation by a Letter/Fax/email to the tenderer that the tender has been accepted in accordance with provisions contained in the letter. The responsibility of the contractor commences from the date of issue of this letter and all terms and conditions of the contract are applicable from this date.
xii)	"COMPLETION TIME" shall mean the period by 'date/month' specified in the 'Letter of Intent/Award' or date mutually agreed upon for handing over of the intended scope of work, the erected equipment/plant which are found acceptable by the Engineer, being of required standard and conforming to the specifications of the Contract.
xiii)	"PLANT" shall mean and connote the entire assembly of the plant and equipments covered by the contract.
xiv)	"EQUIPMENT" shall mean equipment, machineries, materials, structural, electricals and other components of the plant covered by the contract.
xv)	"TESTS" shall mean and include such test or tests to be carried out on the part of the contractor as are prescribed in the contract or considered necessary by BHEL, in order to ascertain the quality, workmanship, performance and efficiency of the contractor or part thereof.
xvi)	"APPROVED", "DIRECTED" or "INSTRUCTED" shall mean approved, directed or instructed by BHEL.
xvii)	"WORK or CONTRACT WORK" shall mean and include supply of all categories of labour, specified consumables, tools and tackles and Plants required for complete and satisfactory site transportation, handling, stacking, storing, erecting, testing and commissioning of the equipments to the entire satisfaction of BHEL.
xviii)	"SINGULAR AND PLURALS ETC" words carrying singular number shall also include plural and vice versa, where the context so requires. Words imparting the masculine Gender shall be taken to include the feminine Gender and words imparting persons shall include any Company or Associations or Body of Individuals, whether incorporated or not.
xix)	"HEADING" – The heading in these General Conditions are solely for the purpose of facilitating reference and shall not be deemed to be part thereof or be taken as instructions thereof or of the contract.
xx)	"MONTH" shall mean calendar month unless otherwise specified in the Tender.

xxi) Day' or 'Days' unless herein otherwise expressly defined shall mean calendar day or days of twenty four (24) hours each. A week shall mean continuous period of seven (7) days.

xxii) "COMMISSIONING" shall mean the synchronisation testing and achieving functional operation of the Equipment with associated system after all initial adjustments, trials, cleaning, re-assembly required at site if any, have been completed and Equipment with associated system is ready for taking into service.

xxiii) "WRITING" shall include any manuscript type written or hand written or printed statement or electronically transmitted messages, under the signature or seal or transmittal of BHEL.

xxiv) "TEMPORARY WORK" shall mean all temporary works for every kind required in or for the execution, completion, maintenance of the work.

xxv) 'CONTRACT PRICE' or 'CONTRACT VALUE' shall mean the sum mentioned in the LOI/LOA/Contract Agreement subject to such additions thereto or deductions there from as may be made under provisions hereinafter contained

xxvi) "COMMENCEMENT DATE" or "START DATE" shall mean the commencement/start of work at Site as per terms defined in the Tenderl

xxvii) "SHORT CLOSING" or "FORE CLOSING" of Contract shall mean the premature closing of Contract, for reasons not attributable to the contractor and mutually agreed between BHEL and the contractor

xxviii) "TERMINATION" of Contract shall mean the pre mature closing of contract due to reasons as mentioned in the contract

xxix) "DE MOBILISATION" shall mean the temporary winding up of Site establishment by Contractor leading to suspension of works temporarily for reasons not attributable to the contractor

xxx) "RE MOBILISATION" shall mean the resumption of work with all resources required for the work after demobilization.

2.2 LAW GOVERNING THE CONTRACT AND COURT JURISDICTION

The contract shall be governed by the Law for the time being in force in the Republic of India. The Civil Court having original Civil Jurisdiction at Delhi for PSNR, at Kolkata for PSER, at Nagpur for PSWR and at Chennai for PSSR, shall alone have exclusive jurisdiction in regard to all claims in respect of the Contract. No other Civil Court shall have jurisdiction in case of any dispute, under this contract

2.3 ISSUE OF NOTICE

2.3.1 Service of notice on contractor

Any notice to be given to the Contractor under the terms of the contract shall be served by sending the same by Registered Post / Speed Post to or leaving the same at the Contractor's last known address of the principal place of business (or in the event of the contractor being a company, to or at its Registered Office). In case of change of address, the notice shall be served at changed address as notified in writing by the Contractor to BHEL. Such posting or leaving of the notice shall be deemed to be good service of such notice and the time mentioned to the condition for doing any act after notice shall be reckoned from the date so mentioned in such notice.

2.3.2 Service of notice on BHEL

Any notice to be given to BHEL in-charge/Region under the terms of the Contract shall be served by sending the same by post to or leaving the same at BHEL address or changed address as notified in writing by BHEL to the Contractor.

2.4 USE OF LAND

No land belonging to BHEL or their Customer under temporary possession of BHEL shall be occupied by the contractor without written permission of BHEL.

2.5 COMMENCEMENT OF WORK

2.5.1 The contractor shall commence the work as per the time indicated in the Letter of Intent from BHEL and shall proceed with the same with due expedition without delay.

2.5.2 If the contractor fails to start the work within stipulated time as per LOI or as intimated by BHEL, then BHEL at its sole discretion will have the right to cancel the contract. The Earnest Money and/or Security Deposit with BHEL will stand forfeited without any further reference to him without prejudice to any and all of BHEL's other rights and remedies in this regard.

2.5.3 All the work shall be carried out under the direction and to the satisfaction of BHEL.

2.6 MEASUREMENT OF WORK AND MODE OF PAYMENT:

2.6.1 All payments due to the contractors shall be made by e mode only, unless otherwise found operationally difficult for reasons to be recorded in writing
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2.6.2 For progress running bill payments: - The Contractor shall present detailed measurement sheets in triplicate, duly indicating all relevant details based on technical documents and connected drawings for work done during the month/period under various categories in line with terms of payment as per contract. The basis of arriving at the quantities, weights shall be relevant documents and drawings released by BHEL. These measurement sheets shall be prepared jointly with BHEL Engineers and signed by both the parties.

2.6.3 These measurement sheets will be checked by BHEL Engineer and quantities and percentage eligible for payment under various groups shall be decided by BHEL Engineer. The abstract of quantities and percentage so arrived at based on the terms of payment shall be entered in Measurement Book and signed by both the parties.

2.6.4 Based on the above quantities, contractor shall prepare the bills in prescribed format and work out the financial value. These will be entered in Measurement Book and signed by both the parties. Payment shall be made by BHEL after effecting the recoveries due from the contractor.

2.6.5 All recoveries due from the contractor for the month/period shall be effected in full from the corresponding running bills unless specific approval from the competent authorities is obtained to the contrary.

2.6.6 Measurement shall be restricted to that portion of work for which it is required to ascertain the financial liability of BHEL under this contract.

2.6.7 The measurement shall be taken jointly by persons duly authorized on the part of BHEL and by the Contractor.

2.6.8 The Contractor shall bear the expenditure involved if any, in making the measurements and testing of materials to be used/used in the work. The contractor shall, without extra charges, provide all the assistance with appliances and other things necessary for measurement.

2.6.9 If at any time due to any reason whatsoever, it becomes necessary to re-measure the work done in full or in part, the expenses towards such re measurements shall be borne by the contractor unless such re measurements are warranted solely for reasons not attributable to contractor.

2.6.10 Passing of bills covered by such measurements does not amount to acceptance of the completion of the work measured. Any left out work has to be completed, if pointed out at a later date by BHEL.

2.6.11 Final measurement bill shall be prepared in the final bill format prescribed for the purpose based on the certificate issued by BHEL Engineer that entire works as stipulated in tender specification has been completed in all respects to the entire satisfaction of BHEL. Contractor shall give unqualified "No Claim" Certificate. All the tools and tackles loaned to him should be returned in satisfactory condition to BHEL. The abstract of final quantities and financial values shall also be entered in the Measurement Books and signed by both parties to the contract. The Final Bill shall be prepared and paid within a reasonable time after completion of work.

2.7 RIGHTS OF BHEL

BHEL reserves the following rights in respect of this contract during the original contract period or its extensions if any, as per the provisions of the contract, without entitling the contractor for any compensation.

2.7.1 To withdraw any portion of work and/or to restrict/alter quantum of work as indicated in the contract during the progress of work and get it done through other agencies to suit BHEL's commitment to its customer or in case BHEL decides to advance the date of completion due to other emergent reasons/ BHEL's obligation to its customer.

2.7.2 To terminate the contract or get any part of the work done through other agency or deploy BHEL's own/hired/otherwise arranged resources , at the risk and cost of the contractor after due notice <u>of a period of two weeks by BHEL,</u> in the event of:-

i) Contractor's continued poor progress
ii) Withdrawal from or abandonment of the work before completion of the work
iii) Contractor's inability to progress the work for completion as stipulated in the contract
iv) Poor quality of work
v) Corrupt act of Contractor
vi) Insolvency of the Contractor
vii) Persistent disregard to the instructions of BHEL
viii) Assignment, transfer, sub-letting of contract without BHEL's written permission
ix) Non fulfillment of any contractual obligations
x) In the opinion of BHEL, the contractor is overloaded and is not in a position to execute the job as per required schedule

2.7.3 To meet the expenses including BHEL overheads on the differential cost at 5%, over and above the Liquidated damages/penalties arising out of "Risk & Cost" as explained above under Sl.No. 2.7.2. BHEL shall recover the amount from any money due from Contractor, or from any money due to the Contractor including Security Deposit, or by forfeiting any T&P or material of the contractor under this contract or any other contract of BHEL or by any other means or any combination thereof

2.7.4 To terminate the contract or to restrict the quantum of work and pay for the portion of work executed in case BHEL's contract with their customer are terminated for any reason, as per mutual agreement.

2.7.5 To effect recovery from any amounts due to the contractor under this or any other contract or in any other form, the moneys BHEL is statutorily forced to pay to anybody, due to contractor's failure to fulfill any of his obligations. BHEL shall levy overheads of 5% on all such payments along with interest as defined elsewhere in the GCC.

2.7.6 While every endeavour will be made by BHEL to this end, they cannot guarantee uninterrupted work due to conditions beyond their control. The Contractor will not be normally entitled for any compensation/extra payment on this account unless otherwise specified elsewhere in the contract.

2.7.7 In case the execution of works comes to a complete halt or reaches a stage wherein worthwhile works cannot be executed and there is no possibility of commencement of work for a period of not less than two months, due to reasons not attributable to the contractor and other than Force Majeure conditions, BHEL may consider permitting the contractor to de mobilize forthwith and re mobilize at an agreed future date. Cost of such demobilization/remobilization shall be mutually agreed. ORC in such cases shall not be applicable for the period between the period of demobilization and re mobilisation. The duration of contract/time extension shall accordingly get modified suitably. In case of any conflict, BHEL decision in this regard shall be final and binding on the contractor.

2.7.8 In the unforeseen event of inordinate delay in receipt of materials, drawings, fronts, etc, due to which inordinate discontinuity of work is anticipated, BHEL at its discretion may consider contractor's request to short close the contract in following cases:

a) The balance works (including but not limited to Trial Operation, PG Test, etc) are minor vis a vis the scope of work envisaged as per the contract.
b) There has been no significant work in past 6 months OR no significant work is expected in next 6 months (example in Hydro projects or in projects where work has stopped due to reasons beyond the control of BHEL)
c) The balance works cannot be done within a reasonable period of time as they are dependent on unit shutdown or on other facilities of customer or any other reasons not attributable to the contractor

At the point of requesting for short closure, contractor shall establish that he has completed all works possible of completion and he is not able to proceed with the balance works due to constraints beyond his control. In such a case, the estimated value of the unexecuted portion of work (or estimated value of services to be provided for carrying out milestone/stage payments like

Trial Operation/PG Test, etc) as mutually agreed, shall however be reduced from the final contract value.

2.7.9 LIQUIDATED DAMAGES/PENALTY

If the contractor fails to maintain the required progress of work which results in delay in the completion of the work as per the contractual completion period, BHEL shall have the right to impose Liquidated Damage/Penalty at the rate of 0. 5% of the contract value, per week of delay or part thereof subject to a maximum of 10% of the contract value. For this purpose, the period of delay shall be the delay attributable to the Contractor for the completion of work as per contract. Contract Value for this purpose, shall be the final executed value exclusive of ORC, Extra Works executed on Manday rate basis, Supplementary/Additional Items and PVC.

2.8 RESPONSIBILITIES OF THE CONTRACTOR IN RESPECT OF LOCAL LAWS, EMPLOYMENT OF WORKERS ETC.

The following are the responsibilities of the contractor in respect of observance of local laws, employment of personnel, payment of taxes etc. The subcontractor shall fully indemnify BHEL against any claims of whatsoever nature arising due to the failure of the contractor in discharging any of his responsibilities hereunder:

2.8.1 As far as possible, Unskilled Workers shall be engaged from the local areas in which the work is being executed.

2.8.2 The contractor at all times during the continuance of this contract shall, in all his dealings with local labour for the time being employed on or in connection with the work, have due regard to all local festivals and religious and other customs.

2.8.3 The contractor shall comply with all applicable State and Central Laws, Statutory Rules, Regulations etc. such as Payment of Wages Act, Minimum Wages Act, Workmen Compensation Act, Employer's Liability Act, Industrial Disputes Act, Employers Provident Act, Employees State Insurance Scheme, Contract Labour (Regulation and Abolition) Act 1970, Payment of Bonus & Gratuity Act and other Acts, Rules and Regulations for labour as may be enacted by the Government during the tenure of the Contract and having force or jurisdiction at Site. The Contractor shall also give to the local Governing Body, Police and other relevant Authorities all such notices as may be required by the Law.

2.8.4 The contractor shall obtain independent License under the Contract Labour (Regulations and Abolition Act, 1970)as required from the concerned Authorities based on the certificate (Form-V) issued by the Principal Employer/Customer

2.8.5 The contractor shall pay all taxes, fees, license charges, deposits, duties, tolls, royalties, commission or other charges which may be leviable on account of his operations in executing the contract.

2.8.6 While BHEL would pay the inspection fees and Registration fees of Boiler/Electrical Inspectorate,

all other arrangements for site visits periodically by the Inspectorate to site, Inspection certificate etc. will have to be made by contractor. However, BHEL will not make any payment to the Inspectorate in connection with contractor's Welders/Electricians qualification tests etc.

2.8.7 Contractor shall be responsible for provision of Health and Sanitary arrangements (more particularly described in Contract Labour Regulation & Abolition Act), Safety precautions etc. as may be required for safe and satisfactory execution of contract.

2.8.8 The contractor shall be responsible for proper accommodation including adequate medical facilities for personnel employed by him.

2.8.9 The contractor shall be responsible for the proper behavior and observance of all regulations by the staff employed by him.

2.8.10 The contractor shall ensure that no damage is caused to any person/property of other parties working at site. If any such damage is caused, it is responsibility of the contractor to make good the losses or compensate for the same.

2.8.11 All the properties/equipments/components of BHEL/their Client loaned with or without deposit to the contractor in connection with the contract shall remain properties of BHEL/their Client.

2.8.12 The contractor shall use such properties for the purpose of execution of this contract. All such properties/equipments/components shall be deemed to be in good condition when received by the contractor unless he notifies within 48 hours to the contrary. The contractor shall return them in good condition as and when required by BHEL/their Client. In case of non-return, loss, damage, repairs etc, the cost thereof as may be fixed by BHEL Engineer will be recovered from the contractor

2.8.13 In case the contractor is required to undertake any work outside the scope of this contract, the rates payable shall be those mutually agreed upon if the item rates are not mentioned in existing contract

2.8.14 Any delay in completion of works/or non achievement of periodical targets due to the reasons attributable to the contractor, the same may have to be compensated by the contractor either by increasing manpower and resources or by working extra hours and/or by working more than one shift. All these are to be carried out by the contractor at no extra cost.

2.8.15 The contractor shall arrange, coordinate his work in such a manner as to cause no hindrance to other agencies working in the same premises.

2.8.16 All safety rules and codes applied by the Client/BHEL at site shall be observed by the contractor without exception. The contractor shall be responsible for the safety of the equipment/material and works to be performed by him and shall maintain all light, fencing guards, slings etc. or other protection necessary for the purpose. Contractor shall also take such additional precautions as may be indicated from time to time by the Engineer with a view to prevent pilferage, accidents, fire hazards. Due precautions shall be taken against fire hazards and atmospheric conditions. Suitable number of Clerical staff, watch and ward, store keepers to take care of equipment/materials and construction tools and tackles shall be posted at site by the contractor till the completion of work

under this contract.

The contractor shall arrange for such safety devices as are necessary for such type of work and carry out the requisite site tests of handling equipment, lifting tools, tackles etc. as per prescribed standards and practices.

Contractor has to ensure the implementation of Health, Safety and Environment (HSE) requirements as per directions given by BHEL/Customer. The contractor has to assist in HSE audit by BHEL/Customer and submit compliance Report. The contractor has to generate and submit record/reports as per HSE plan/activities as per instruction of BHEL/Customer

2.8.17 The contractor will be directly responsible for payment of wages to his workmen. A pay roll sheet giving all the payments given to the workers and duly signed by the contractor's representative should be furnished to BHEL site for record purpose, if so called for.

2.8.18 In case of any class of work for which there is no such specification as laid down in the contract, such work shall be carried out in accordance with the instructions and requirements of the Engineer.

2.8.19 Also, no idle charges will be admissible in the event of any stoppage caused in the work resulting in contractor's labour and Tools & Plants being rendered idle due to any reason at any time.

2.8.20 The contractor shall take all reasonable care to protect the materials and work till such time the plant/equipment has been taken over by BHEL or their Client whichever is earlier.

2.8.21 The contractor shall not stop the work or abandon the site for whatsoever reason of dispute, excepting force majeure conditions. All such problems/disputes shall be separately discussed and settled without affecting the progress of work. Such stoppage or abandonment shall be treated as breach of contract and dealt with accordingly

2.8.22 The contractor shall keep the area of work clean and shall remove the debris etc. while executing day-to-day work. Upon completion of work, the contractor shall remove from the vicinity of work, all scrap, packing materials, rubbish, unused and other materials and deposit them in places specified by the Engineer. The contractor will also demolish all the hutments, sheds, offices, etc. constructed and used by him and shall clean the debris. In the event of his failure to do so, the same will be arranged to be done by the Engineer and the expenses recovered from the contractor.

2.8.23 The contractor shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work and timely execution shall be the essence of this contract. The contractor shall be responsible to ensure that the quality, assembly and workmanship conform to the dimensions and clearance given in the drawings and/ or as per the instructions of the Engineer.

2.8.24 The Contractor to note that some of BHEL's T&Ps/MMDs may not be insured. The Contractor will take necessary precautions and due care to protect the same while in his custody from any damage/ loss till the same is handed over back to BHEL. In case the damage / loss is due to carelessness/ negligence on the part of the contractor, the Contractor is liable to get them repair/

replaced immediately and in case of his failure to do so within a reasonable time, BHEL will reserve the right to recover the loss from the contractor.

2.9 PROGRESS MONITORING, MONTHLY REVIEW AND PERFORMANCE EVALUATION

2.9.1 A detailed plan/programme for completion of the contractual scope of work as per the time schedule given in the contract shall be jointly agreed between BHEL and Contractor, before commencement of work . The above programme shall be supported by monthwise deployment of resources viz Manpower, T&P, Consumables, etc. Progress will be reviewed periodically (Daily/Weekly/Monthly) vis a vis this jointly agreed programme. The Contractor shall submit periodical progress reports (Daily/Weekly/Monthly) and other reports/information including manpower, consumables, T&P mobilization etc as desired by BHEL.

2.9.2 Monthly progress review between BHEL and Contractor shall be based on the agreed programme as above, availability of inputs/fronts etc, and constraints if any, as per prescribed formats. Manpower, T&P and consumable reports as per prescribed formats shall be submitted by contractor every month. Release of RA Bills shall be contingent upon certification by BHEL Site Engineer of the availability of the above prescribed formats duly filled in and signed.

2.9.3 The burden of proof that the causes leading to any shortfall is not due to any reasons attributable to the contractor is on the contractor himself. The monthly progress review shall record shortfalls attributable to (i) Contractor, (ii) Force Majeure Conditions, and (iii) BHEL

2.9.4 Performance of the Contractor shall be assessed as per prescribed formats and shall form the basis for 'Annual/Overall Performance Evaluation' of the Contractor and also for 'Assessment of Capacity of Bidder' for Tenders where the Contractor is a bidder. BHEL reserves the right to revise the evaluation formats during the course of execution of the works

2.10 TIME OF COMPLETION

2.10.1 The time schedule shall be as prescribed in the Contract. The time for completion shall be reckoned from the date of commencement of work at Site as certified by BHEL Engineers

2.10.2 The entire work shall be completed by the contractor within the time schedule or within such extended periods of time as may be allowed by BHEL under clause 2.11

2.11 EXTENSION OF TIME FOR COMPLETION

2.11.1 If the completion of work as detailed in the scope of work gets delayed beyond the contract period, the contractor shall request for an extension of the contract and BHEL at its discretion may extend the Contract.

2.11.2 Based on the monthly reviews jointly signed, the works balance at the end of original contract period less the backlog attributable to the contractor shall be quantified, and the number of months of 'Time extension' required for completion of the same shall be jointly worked out. Within this period of 'Time extension', the contractor is bound to complete the portion of backlog attributable to the contractor. Any further 'Time extension' or 'Time extensions' at the end of the previous extension shall be worked out similarly.

2.11.3 However if any 'Time extension' is granted to the contractor to facilitate continuation of work and completion of contract, due to backlog attributable to the contractor alone, then it shall be without prejudice to the rights of BHEL to impose penalty/LD for the delays attributable to the contractor, in addition to any other actions BHEL may wish to take at the risk and cost of contractor.

2.11.4 A joint programme shall be drawn for the balance amount of work to be completed during the period of 'Time Extension', along with matching resources (with weightages) to be deployed by the contractor as per specified format. Review of the programme and record of shortfall shall be done

every month of the 'Time extension' period in the same manner as is done for the regular contract period.

2.11.5 During the period of 'Time extension', contractor shall maintain their resources as per mutually agreed program

2.11.6 At the end of total work completion as certified by BHEL Engineer, and upon analysis of the total delay, the portion of time extensions attributable to (i) Contractor, (ii) Force majeure conditions, and (iii) BHEL, shall be worked out and shall be considered to be exhausted in the same order. The total period of time extensions shall be the sum of (i), (ii) and (iii) above and shall be equal to period between the scheduled date of completion and the actual date of completion of contract. LD shall be imposed/levied for the portion of time extensions attributable to contractor and recoverable from the dues payable to the contractor.

2.12 OVERRUN COMPENSATION

2.12.1 Over Run Compensation (ORC) is payable for works done during the extension period, by way of rate revisions for periods beyond original contract period subject to the following terms and conditions.

2.12.2 Rates shall be increased by 10% for the first twelve months of one or more extensions beyond original contract period. For the next twelve months of further extensions if any, rates shall be increased as above by 10% over the previous twelve months, and similarly for each subsequent twelve months extension.

2.12.3 The amount of increase payable per month due to rate revisions is subject to a minimum of Rs 1,00,000/- per month and a maximum of Rs 10,00,000/- per month.

2.12.4 Should there be any 'Time extension' for reasons attributable only to the contractor, then the work shall be executed by the contractor at the rates applicable for the period the work was planned

2.12.5 Payment of ORC shall be regulated as follows:

i) Contractor is entitled to Over Run Compensation (ORC) only for the portion of backlog attributable to BHEL.

ii) 50% of the compensation as per clause 2.12.3 is allocated for deployment of resources agreed as per the joint programme drawn vide 2.11.4. Payment shall however be based on the actual deployment of resources for the month as certified by BHEL, as per weightages assigned therein

iii) 50% of the compensation as per clause 2.12.3, is allocated for achieving of planned progress agreed as per the joint programme drawn vide 2.11.4. Payment shall be on pro rata basis for actual achieved quantities

iv) Total Over Run Compensation shall be limited to 10% of the executed contract value as certified in Final Bill. For this purpose executed contract value excludes PVC, ORC, Supplementary/Additional Items and Extra Works done on Manday rate basis

2.12.6 Contractor shall not be entitled for any Over Run Compensation (ORC) for the portion of backlog attributable to the contractor. Such works shall be executed at the rates applicable for the period the work was planned

2.13 INTEREST BEARING RECOVERABLE ADVANCES

2.13.1 Normally no advance is payable to the contractor. However, advance payment in exceptional circumstances shall be interest bearing and secured through a Bank Guarantee and shall be limited to a maximum of 5% of contract value. This 'Interest Bearing Recoverable Advance' shall be

payable in not less than two installments with any of the installment not exceeding 60% of the total eligible advance.

2.13.2 In exceptional circumstances, with due justification, Competent Authority of BHEL is empowered to approve proposals for payment of additional interim interest bearing advance against Bank Guarantee, for resource augmentation towards expediting work for project implementation.

2.13.3 Bank Guarantee towards 'Interest Bearing Recoverable Advance' shall be atleast 110% of the advance so as to enable recovery of not only principle amount but also the interest portion, if so required.

2.13.4 Contractor shall establish the utilization of advance drawn before the release of next installment.

2.13.5 Payment and recovery of Interest Bearing Recoverable advance shall be at the sole discretion of BHEL and shall not be a subject matter of arbitration.

2.13.6 The rate of interest applicable for the above advances shall be the prime lending rate of State Bank of India prevailing at the time of disbursement of the advance + 2%, and such rate will remain fixed till the total advance amount is recovered

2.13.7 Unadjusted amount of advances paid shall not exceed 5% of the total contract value at any point of time. Recovery of advances shall be made progressively from each Running Bill such that the advance amounts paid along with the interest is fully recovered by the time the contractor's billing reaches 80% of contract value.

2.13.8 Recovery rate per month shall be the sum of:
a. Not less than 10% of Running Bill amount
b. Simple interest up to the date of RA Bill on the outstanding Principle amount/amounts

2.13.9 Contractor to submit Bank Guarantee as per prescribed formats for each of the advance and shall be valid for at least one year or the recovery duration or the balance contract period which ever is later. In case the recovery of dues does not get completed within the aforesaid BG period, the contractor shall renew the BG or submit fresh BG for the outstanding amount and the remaining recovery period.

2.13.10 BHEL is entitled to make recovery of the entire outstanding amount in case the contractor fails to comply with the BG requirement

2.14 QUANTITY VARIATION

2.14.1 The quoted rates shall remain firm irrespective of any variations in the individual quantities. No compensation becomes payable in case the variation of the final executed contract value is within the limits of Plus (+) or Minus (-) 15% of awarded contract value

2.14.2 Compensation due to variation of final executed value in excess of the limits defined in clause above, shall be as follows:

i) In case the finally executed contract value reduces below the lower limit of Contract Value due to quantity variation specified above, the contractor will be eligible for compensation @ 15% of the difference between the lower limit of the contract value and the actual executed value.

ii) In case the finally executed contract value increases above the upper limit of Contract Value

due to quantity variation specified above, there will be no revision in the rates within the contract period.

2.15 EXTRA WORKS

2.15.1 All rectifications/modifications, revamping, and reworks required for any reasons not due to the fault of the contractor, or needed due to any change in deviation from drawings and design of equipments, operation/maintenance requirements, mismatching, or due to damages in transit, storage and erection/commissioning, and other allied works which are not very specifically indicated in the drawings, but are found essential for satisfactory completion of the work, will be considered as extra works.

2.15.2 Extra works arising on account of the contractor's fault, irrespective of time consumed in rectification of the damage/loss, will have to be carried out by the contractor free of cost. Under such circumstances, any material and consumable required for this purpose will also have to be arranged by the contractor at his cost.

2.15.3 All the extra work should be carried out by a separately identifiable gang, without affecting routine activities. Daily log sheets in the pro-forma prescribed by BHEL should be maintained and shall be signed by the contractor's representative and BHEL engineer. No claim for extra work will be considered/entertained in the absence of the said supporting documents i.e. daily log sheets. Signing of log sheets by BHEL engineer does not necessarily mean the acceptance of such works as extra works.

2.15.4 BHEL retains the right to award or not to award any of the major repair/ rework/modification/rectification/fabrication works to the contractor, at their discretion without assigning any reason for the same

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

MAN-HOUR RATE FOR ELIGIBLE EXTRA WORKS: Single composite average labour man-hour rate, including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals, consumables for carrying out any major rework/ repairs/ rectification/ modification/ fabrication as certified by site as may arise during the course of erection, testing, commissioning or extra works arising out of transit, storage and erection damages, payment, if found due will be at Rs 60/- per man hour.

2.15.6 The above composite labour man hour rate towards extra works shall remain firm and not subject to any variation during execution of the work. PVC will not be applicable for extra works. Rate revision, Over Run Charges/compensation etc will not be applicable due to extra works.

2.15.7 Extra Works for Civil Packages shall be regulated as follows

i) Rates for Extra Works arising due to (1) non availability of BOQ (Rate Schedule), OR (2) change in Specifications of materials/works (3) rectification/modification/dismantling & re erecting etc due to no fault of Contractor, shall be in the order of the following:

a) Item rates are to be derived from similar nature of items in the BOQ (Rate Schedule) with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities.
b) As per CPWD-DSR-2007 (or latest edition) with applicable escalation derived from All India Consumer price Index for Whole Sale Commodities, OR, Notification issued by the office of CPWD for 'Cost Index' in that Region where the project is being executed, whichever is less
c) Item rates are to be worked out on the basis of prevailing market rates mutually agreed between BHEL and Contractor, plus 15% towards Contractor's overheads and profit.

ii) PVC and ORC will not applicable be for (i) above.

2.16 SUPPLEMENTARY ITEMS

2.16.1 For NON Civil Works

Supplementary items are items/works required for completion of entire work but not specified in the scope of work. Subject to certification of such items/works as supplementary items by BHEL Engineer, rates shall be derived on the basis of any one of the following on mutual agreement:

i) Based on percentage breakup/rates indicated for similar/nearby items

ii) In case (i) above does not exist, then BHEL/site may derive the percentage breakup/rates to suit the type of work

2.16.2 For Civil Works

i) Rates for Supplementary Works/Additional Works arising out due to additions/alterations in the original scope of works as per contract subject to certification of BHEL Engineer shall be worked out as under:

a) Item rates which are available in existing BOQ (Rate Schedule) shall be operated with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities
b) Items of works which are not available in existing BOQ shall be operated as an 'Extra Works' and rate shall be derived as per clause no 2.15.7

ii) Execution of Supplementary Works/Additional Works through the Contractor shall be at the sole discretion of BHEL, and shall be considered as part of executed contract value for the purpose of Quantity Variation as per clause 2.14

iii) BHEL Engineer's decision regarding fixing the rate as above is final and binding on the contractor.

iv) PVC and ORC will not be applicable for (i) above.

2.17 **PRICE VARIATION COMPENSATION**

2.17.1 In order to take care of variation in cost of execution of work on either side, due to variation in the index of LABOUR, HIGH SPEED DIESEL OIL, WELDING ROD, CEMENT, STEEL, MATERIALS, Price Variation Formula as described herein shall be applicable

2.17.2 85% component of Contract Value shall be permitted to be adjusted for variation in various relevant indices during execution of work. The remaining 15% shall be treated as fixed component

2.17.3 The basis for calculation of price variation in each category, their component, Base Index, shall be as under:

SL NO.	CATEGORY	BASE INDEX	COMPONENT ('K')		
			CIVIL PACKAGES (See Note A/B/C)	MECHANICAL PACKAGES	LABOUR ORIENTED

			A	B**	C		PACKAGES (See Note D)
i)	LABOUR (ALL CATEGORIES)	'MONTHLY ALL-INDIA AVERAGE CONSUMER PRICE INDEX NUMBERS FOR INDUSTRIAL WORKERS' published by Labour Bureau, Ministry of Labour and Employment, Government of India. (Website: labourbureau.nic.in)	40	25	30	65	80
ii)	HIGH SPEED DIESEL OIL	Name of Commodity : HSD OIL. Type : INDIVIDUAL COMMODITY (See Note F)	5	3	5	5	5
iii)	WELDING ROD	Name of Commodity : WELDING ROD Type: INDIVIDUAL COMMODITY (See Note F)				15	
iv)	CEMENT	Name of Commodity : GREY CEMENT Type: INDIVIDUAL COMMODITY (See Note F)		20	30		
v)	STEEL (Structural and Reinforcement Steel)	Name of Commodity : a1. IRON & SEMIS Type: GROUP ITEM (See Note F)		25			
vi)	MATERIALS (Other than Cement & Steel)	Name of Commodity: ALL COMMODITIES Type: GROUP ITEM (See Note F)	40	12	20		

Note: A) Cement & Steel : Free Issue (BHEL Scope)
B) Cement & Steel : In Contractor Scope {**: unless otherwise specified in Special Conditions of Contract (SCC) }
C) Cement in Contractor Scope, and Steel is Free Issue (BHEL Scope)
D) Predominantly 'Labour Oriented' packages including Material Handling & Management, Insulation, Painting, Electrical and CI or a combination thereof, which are separately tendered and awarded
E) For Composite packages (i.e. Civil+Mechanical+Electrical/CI or Civil+Mechanical or Mechanical+Electrical/CI), the components for various categories shall be as per respective packages
F) As per the 'MONTHLY WHOLE SALE PRICE INDEX' for the respective Commodity and Type, published by Office of Economic Adviser, Ministry of Commerce and Industry, Government of India. (Website : www.eaindustry.nic.in). Revisions in the index or commodity will be re adjusted accordingly.

2.17.4 Payment/recovery due to variation in index shall be determined on the basis of the following notional formula without any initial absorption, in respect of the identified components viz LABOUR, HIGH SPEED DIESEL OIL, WELDING ROD, CEMENT, STEEL, MATERIALS

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

Where

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

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

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

XN = Revised Index No for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials for the billing month under consideration

Xo = Index no for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials as on the Base date.

2.17.5 Base date shall be calendar month of the latest date of submission of Tender.

2.17.6 PVC shall not be payable for the ORC amount, Supplementary/Additional Items, Extra works.

2.17.7 The contractor shall furnish necessary monthly bulletins for the necessary indices from the relevant websites along with his Bills.

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

2.17.9 PVC shall be applicable for the entire original contract period plus the extended period. However the Total Quantum of Price Variation amount payable/recoverable shall be regulated as follows:

i) For the portion of backlog attributable to the contractor, the PVC will be based on the average of the indices for the period of the original contract period.

ii) For the period of Force Majeure, the PVC will be limited to the indices applicable at the beginning of the force majeure period.

iii) For the portion of backlog attributable to BHEL, the PVC will be as per the indices applicable for the respective months

iv) The total amount of PVC shall not exceed 20% of the cumulatively executed contract value. Executed contract value for this purpose is exclusive of PVC, ORC, Supplementary/Additional Items and Extra works.

2.18 INSURANCE

2.18.1 BHEL/their customer shall arrange for insuring the materials/properties of BHEL/customer covering the risks during transit, storage, erection and commissioning.

2.18.2 It is the sole responsibility of the contractor to insure his materials, equipments, workmen, etc. against accidents and injury while at work and to pay compensation, if any, to workmen as per Workmen's compensation Act. The work will be carried out in a protected area and all the rules and regulations of the client /BHEL in the area of project which are in force from time to time will have to be followed by the contractor.

2.18.3 If due to negligence and or non-observation of safety and other precautions by the contractors, any accident/injury occurs to the property / manpower belong to third party, the contractor shall have to pay necessary compensation and other expense, if so decided by the appropriate authorities.

2.18.4 The contractor will take necessary precautions and due care to protect the material, while in his custody from any damage/ loss due to theft or otherwise till the same is taken over by BHEL or customer. For lodging / processing of insurance claim the contractor will submit necessary documents. BHEL will recover the loss including the deductible franchise from the contractor, in case the damage / loss is due to carelessness / negligence on the part of the contractor. In case of any theft of material under contractor's custody , matter shall be reported to police by the contractor immediately and copy of FIR and subsequently police investigation report shall be submitted to BHEL for taking up with insurance. However this will not relieve the contractor of his

contractual obligation for the material in his custody.

2.19 STRIKES & LOCKOUT

2.19.1 The contractor will be fully responsible for all disputes and other issues connected with his labour. In the event of the contractor's labour resorting to strike or the Contractor resorting to lockout and if the strike or lockout declared is not settled within a period of one month, BHEL shall have the right to get the work executed through any other agencies and the cost so incurred by BHEL shall be deducted from the Contractor's bills.

2.19.2 For all purposes whatsoever, the employees of the contractor shall not be deemed to be in the employment of BHEL

2.20 FORCE MAJEURE

The following shall amount to Force Majeure:-

2.20.1 Acts of God, act of any Government, War, Sabotage, Riots, Civil commotion, Police action, Revolution, Flood, Fire, Cyclones, Earth quake and Epidemic and other similar causes over which the contractor has no control.

2.20.2 If the contractor suffers delay in the due execution of the contractual obligation due to delays caused by force majeure as defined above, the agreed time of completion of the job covered by this contract or the obligations of the contractor shall be extended by a period of time equal to period of delay, provided that on the occurrence of any such contingency, the contractor immediately reports to BHEL in writing the causes of delay and the contractor shall not be eligible for any compensation.

2.21 ARBITRATION & RECONCILIATION

2.21.1 In case amicable settlement is not reached in the event of any dispute or difference arising out of the execution of the Contract or the respective rights and liabilities of the parties or in relation to interpretation of any provision by the Contractor in any manner touching upon the Contract, such dispute or difference shall (except as to any matters, the decision of which is specifically provided for therein) be referred to the sole arbitration of the arbitrator appointed by BHEL/In charge(Region).

The award of the Arbitrator shall be binding upon the parties to the dispute

Subject as aforesaid, the provisions of Arbitration and Reconciliation Act 1996 (India) or statutory modifications or re enactments thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause. The venue of the arbitration shall be the place from which the contract is issued or such other place as the Arbitrator at his discretion may determine

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

In the event of any dispute or difference relating to the interpretation and application of the provisions of the Contract, such dispute or difference shall be referred to by either party to the arbitration of one of the arbitrators in the department of public enterprises. The award of the arbitrator shall be binding upon the parties to the dispute, provided, however, any party aggrieved by such award may make further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law and Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary or Additional Secretary when so authorized by the Law Secretary, whose decision shall bind the parties hereto finally and conclusively.

2.21.3 The cost of arbitration shall be borne equally by the parties.

2.21.4 Work under the contract shall be continued during the arbitration proceedings

2.22 RETENTION AMOUNT

2.22.1 Retention Amount shall be 5% of executed contract value and shall be recovered at the rate of 5% from each Running Bill admitted, including PVC Bills.

2.22.2 Refund of Retention Amount shall be as follows:

i) 50% of retention amount along with 'Final Bill'

ii) Balance 50% of retention amount shall be retained towards 'Performance Guarantee for Workmanship' and shall become refundable after expiry of Guarantee period, provided all the defects noticed during the guarantee period have been rectified to the satisfaction of BHEL Site Engineer/BHEL Construction Manager, and after deducting all expenses/other amounts due to BHEL under the contract/other contracts entered into by BHEL with them. This portion of the retention amount can be released on commencement of the Guarantee period, on submission of equivalent Bank Guarantee.

2.23 PAYMENTS

Payments to Contractors are made in any one of the following forms

2.23.1 Running Account Bills (RA Bills)

i) These are for interim payments when the contracts are in progress. The bills for such interim payments are to be prepared by Contractor in prescribed formats (RA Bill forms).

ii) Payments shall be made according to the extent of work done as per measurements taken up to the end of the calendar month and in line with the terms of payments described in the Tender documents

iii) Recoveries on account of electricity, water, statutory deductions, etc are made as per terms of contract

iv) Full rates for the work done shall be allowed only if the quantum of work has been done as per the specifications stipulated in the contract. If the work is not executed as per the stipulated specifications, BHEL may ask the contractor to re do the work according to the required specifications, without any extra cost. However, where this is not considered necessary 'OR' where the part work is done due to factors like non-availability of material to be supplied by BHEL 'OR' non availability of fronts 'OR' non availability of drawings, fraction payment against full rate, as is considered reasonable, may be allowed with due regard for the work remaining to be done. BHEL decision in this regard will be final and

binding on the contractor.

v) In order to facilitate part payment, BHEL Site Engineer at his discretion may further split the contracted rates/percentages to suit site conditions, cash flow requirements according to the progress of work

2.23.2 Final Bill

Final Bill' is used for final payment on closing of Running Account for works or for single payment after completion of works. 'Final Bill' shall be submitted as per prescribed format after completion of works as per scope and upon material reconciliation, along with the following.

i) 'No Claim Certificate' by contractor
ii) Clearance certificates where ever applicable viz Clearance Certificates from Customer, various Statutory Authorities like Labour department, PF Authorities, Commercial Tax Department, etc
iii) Indemnity bond as per prescribed format

BHEL shall settle the final bills after deducting all liabilities of Contractor to BHEL

2.24 PERFORMANCE GUARANTEE FOR WORKMANSHIP

2.24.1 Even though the work will be carried out under the supervision of BHEL Engineers the Contractor will be responsible for the quality of the workmanship and shall guarantee the work done for a period of twelve months from the date of commencement of guarantee period as defined in Special Conditions of Contract, for good workmanship and shall rectify free of cost all defects due to faulty erection detected during the guarantee period. In the event of the Contractor failing to repair the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs of such defective works at the Contractor's risk and cost, without prejudice to any other rights and recover the same from the Guarantee money.

2.24.2 BHEL shall release the guarantee money subject to the following

i) Contractor has submitted 'Final Bill'
ii) Guarantee period as per contract has expired
iii) Contractor has furnished 'No Claim Certificate' in specified format
iv) BHEL Site Engineer/Construction Manager has furnished the 'No Demand Certificate' in specified format
v) Contractor has carried out the works required to be carried out by him during the period of Guarantee and all expenses incurred by BHEL on carrying out such works is included for adjustment from the Guarantee money refundable.

2.25 CLOSING OF CONTRACTS

The Contract shall be considered completed and closed upon completion of all contractual obligations and settlement of Final Bill or completion of Guarantee period whichever is later. Upon closing of Contract, BHEL shall issue a completion certificate as per standard format, based on specific request of Contractor.

2.26 REVERSE AUCTION:

BHEL reserves the right to go for Reverse Auction for Price Bid Opening by BHEL appointed service provider, instead of opening the submitted sealed price bid in the conventional way. The Business Rules for Reverse Auction shall be as per BHEL guidelines issued from time to time.

2.27 SUSPENSION OF BUSINESS DEALINGS

BHEL reserves the right to take action against Contractors who either fail to perform or Tenderers/Contractor who indulge in malpractices, by suspending business dealings with them in

	line with BHEL guidelines issued from time to time.
2.28	OTHER ISSUES
2.28.1	Value of Non judicial Stamp Paper for Bank Guarantees and for Contract Agreement shall be not less than Rs 100/- unless otherwise required under relevant statutes.
2.28.2	In case of any conflict between the General Conditions of Contract and Special Conditions of Contract, provisions contained in the Special Conditions of Contract shall prevail.
2.28.3	Unless otherwise specified in NIT, offers from consortium/JVs shall not be considered.
2.28.4	BHEL may not insist for signing of Contract Agreements in respect of low value and short time period contracts like providing services for Hot water flushing, Chemical Cleaning, Transportation, etc

TENDER NO: PSER:SCT:KLN-E2060:20

VOLUME -ID

SPECIAL CONDITIONS OF CONTRACT

FOR

Erection, Testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears, HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1, FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP, Rampal, Bangladesh.

BHARAT HEAVY ELECTRICALS LIMITED

(A GOVT. OF INDIA UNDERTAKING)
POWER SECTOR – EASTERN REGION
PLOT NO. – 9 / 1, DJ – BLOCK,
SECTOR – II, KARUNAMOYEE,
SALT LAKE CITY,
KOLKATA – 700091.

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1.0	INTENT OF THE SPECIFICATION
1.1	The intent of this erection specification is to provide services for execution of the project according to most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for the proper and efficient services towards installation of the plant shall not relieve the contractor of the responsibility of providing such services / facilities to complete the work or portion of work awarded to him. The quoted / accepted rates / price shall deem to be inclusive of all such contingencies.
1.2	The work shall conform to dimensions and tolerances given in various drawings and documents that will be provided during erection. If any portion of works is found to be defective in workmanship and not conforming to drawings / documents or other stipulations, the contractor shall dismantle and re-do the work duly replacing the defective materials at their own cost, failing which recoveries, as determined by BHEL, shall be effected from contractor's bills.
1.3	It is not the intent of this specification to specify herein all the details of erection and commissioning. However, the system shall conform in all respects to high standards of quality and workmanship for performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgments is not in full accordance herewith.
1.4	The omission of specific reference to any fabrication / erection or other method, equipment or material necessary for proper and efficient working of the plant shall not relieve the tenderer of the responsibility of providing such facilities to complete the work at quoted rates. Any mismatch/ defect found due to mistake in fabrication / erection shall have to be rectified by the vendor free of cost. Inspection by BHEL/Customer does not relieve vendor of his responsibility of executing quality erection.
1.5	The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management. The contractor should ensure proper planning and successful and timely completion of the work to meet the overall project schedule. The contractor must deploy adequate quantity of tools & plants, modern / latest construction aids etc. He must also deploy adequate trained, qualified and experienced supervisory staff and skilled personnel.

1.6	Contractor shall erect and commission all the equipments and auxiliaries as per the sequence & methodology prescribed by BHEL depending upon the technical requirements. Availability of materials and fronts will decide this. BHEL Engineer's decision regarding correctness of the work and method of working shall be final and binding on the contractor. No claims for extra payment from the contractor will be entertained on the ground of deviation from the methods / sequence adopted in erection of similar sets elsewhere.
1.7	Following shall be the minimum responsibility of contractor and have to be provided within finally accepted rates / prices:
1.7.1	Provision as required of all types of labour, supervisors, engineers, watch and ward, tools & tackles, calibrated MMEs (Monitoring and Measuring Equipment) as specified and otherwise required for the work, consumables for erection, testing and commissioning including material handling
1.7.2	Achieving Proper out-turn / Turn-over as per BHEL plan and commitment.
1.7.3	Completion of work as per BHEL Schedule
1.7.4	Good quality and accurate workmanship for proper performance of the equipment
1.7.5	Repair and rectification
1.7.6	Preservation / Re-conservation of all components during storage / erection / commissioning till handing over.

2.0	GENERAL SERVICES TO BE RENDERED BY THE BIDDER
2.1	Services for construction, fabrication, equipment erection testing as well as trial run & commissioning of various equipment and accessories under the contract shall include but not be limited to the following:
2.2	Issuing materials from store/open yard from time to time for erection as per the construction programme. The Contractor shall be the custodian of all the materials issued till the plant/equipment is officially taken over by the owner / BHEL after complete erection any successful trial run & commissioning.
2.3	Transport of material to their respective places of erection and erection of the complete plant & equipment as supplied under this specification.
2.4	Trial run and commissioning of individual equipment / sub-systems to the satisfaction of Owner/BHEL.
2.5	Deployment of all skilled and unskilled manpower required for erection, supervision of erection, watch & ward, commissioning and other services to the rendered under this specification.
2.6	Deployment of all erection tools & tackle, construction machinery, transportation vehicles and all other implements in adequate number and size, appropriate for the erection work to be handled under scope of this specification except otherwise specified.
2.7	Supply of all consumables, eg welding electrodes, cleaning agents, diesel oil, lubricant etc as well as materials required for temporary supports, scaffolding etc as necessary for such erection work, unless specified other wise.
2.8	Providing support services for the contractor's erection staff eg construction of site offices, temporary stores, residential accommodation and transport to work site for erection personnel, watch and ward for security and safety of the materials under the Contractor's custody etc. as required.
2.9	Maintaining proper documentation of all the site activities undertaken by the Contractor as per the proforma mutually agreed with BHEL, Submission of monthly progress reports and any such document as and when desired by BHEL/owner, taking approval of all statutory authorities i.e Boiler Inspector, Factory Inspector, Inspector of Explosives etc , as applicable for respective portions of work fall under the jurisdiction of such statutes of laws.
2.10	Any other service, although not specifically called for but required for a contract of the size and nature indicated in the specification.

3.0	GENERAL TECHNICAL REQUIREMENTS (CODES AND STANDARDS)
3.1	Except where otherwise specified, the plant/equipment shall comply with the appropriate Indian Standard or an agreed internationally accepted Standard Specification as mentioned elsewhere in contract specifications, each incorporating the latest revisions at the time of tendering. Where no internationally accepted standard is applicable, the Bidder shall give all particulars and details as necessary, to enable BHEL to identify all of the plant/equipment in the same detail as would be possible had there been a Standard Specification.
3.2	Where the Bidder proposes alternative codes or standards he shall include in his tender one copy (in English) of each Standard Specification to which materials offered shall comply. In such case, the adopted alternative standard shall be equivalent or superior to the standards mentioned in the specification.
3.3	In the event of any conflict between the codes and standards referred above, and the requirements of this specification, the requirements which are more stringent shall govern.
3.4	Tools used during erection and commissioning shall not be accepted except with the specific approval of the Engineer.

4.0	OBLIGATIONS OF CONTRACTOR
4.1	CONSUMABLES & OTHER ITEMS
4.1.1	The contractor shall provide within finally accepted price / rates, all consumables (excepting those indicated in BHEL scope) like welding electrodes (including alloy steel and stainless steel), filler wires, TIG filler wires (over & above as supplied by the unit along with the plant materials, which will be given free of cost to bidder), gases (inert, welding, cutting), soldering material, dye penetrants, radiography films, etc. Other erection consumables such as tapes, jointing compound, grease, mobile oil, M-seal, Araldite, petrol, CTC / other cleaning agents, grinding and cutting wheels are to be provided by the contractor. Steel, packers, shims, wooden planks, scaffolding materials hardware items etc required for temporary works such as supports, scaffoldings are to be arranged by the contractor. Sealing compounds, gaskets, gland packing, wooden/concrete sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by the contractor.
4.1.2	All the shims, gaskets and packing, which go finally as part of plant equipment, shall be supplied by BHEL free of cost.
4.1.3	It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of consumables. Non-availability of any consumable materials or equivalent suggested by BHEL cannot be considered as reason for not attaining the required progress or for additional claim.
4.1.4	<u>TIG Filler wire for Boiler and Filler wires for Electrodes for P91/T91 piping:</u> These shall be supplied by BHEL free of cost as supplied by BHEL Manufacturing Units as part of regular supply. Required quantity as arrived at by calculation / standards will only be supplied. It would be the contractors' responsibility to account for the consumption of these filler wires. Additional consumption beyond standard / calculated quantity will be at cost recovery basis only unless and otherwise accounted for. Surplus quantity of TIG filler wire, if any, shall be properly stored and returned to BHEL stores.
4.1.5	It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of electrodes etc before procurement of welding electrodes. On receipt of electrodes at site these shall be subjected to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number, date of expiry etc and produce test certificate for each lot / batch with correlation of batch / lot number with respective test certificate. No

	electrode without a valid test certificate will to be used.
4.1.6	BHEL reserves the right to reject the use of any consumable including electrodes, gases, lubricants / special consumables if it is not found to be of the required standard / make / purity or when shelf life has expired. Contractor shall ensure display of shelf life on consumable wherever required and records maintained.
4.1.7	Storage of all consumables including welding electrodes shall be done as per requirement / instruction of the Engineer by the contractor at his cost.
4.1.8	In case of improper arrangement for procurement of any consumable, BHEL reserves the right to procure the same from any source and recover the cost from the Contractor's first subsequent bill at market value plus the departmental charges of BHEL from time to time. Postponement of such recovery is normally not permitted. The decision of Engineer in this regard shall be final and binding on the Contractor.
4.1.9	All lubricants and chemicals required for pre-commissioning, commissioning, testing, preservation and lubricants for trial runs of the equipment shall be supplied by BHEL / BHEL's client. All services including labour and T&P will be provided by the contractor for handling, filling, emptying, refilling etc. The consumption of lubricants / chemicals shall be properly accounted for. Surplus material if any shall be properly stacked/tagged and returned to BHEL/ CUSTOMER stores at no extra cost to BHEL. BHEL reserves the right to recover costs for wastage by the contractor.
4.1.10	Transportation of oil drums, from stores, filling of oil for flushing, first filling, subsequent changeover if any, topping/making up till the unit is fully commissioned and handed over to customer is included in scope of this contract. The contractor shall have to return all the empty drums to BHEL / BHEL's client store at no extra cost. Any loss / damage to above drums shall be to contractor's account.
4.1.11	All charges on account of Octroi, terminal or sales tax and other duties on materials obtained from any source for carrying out the works in the scope of the contractor shall be borne by the contractor.
4.2	TOOLS AND PLANTS / MONITORING AND MEASURING EQUIPMENT (MMEs)
4.2.1	T&Ps and MMEs to be provided by Contractor
4.2.1.1	All T&Ps and MMEs excepting those specifically indicated in BHEL scope are to be provided by the Contractor. Contractor has to make his own arrangement at his cost for completing the formalities (including arrangement of Road permits, if any) if required with Sales Tax/VAT authorities, for bringing their materials, plants and

	equipments at site for the execution of work under this contract.
4.2.1.2	All suitable cranes, lifting and transport equipments for material handling at stores/yard/siding of BHEL/Customer are included in scope. BHEL's cranes will not be available for this purpose unless otherwise specifically permitted as per contract conditions
4.2.1.3	All T&Ps to be deployed by the contractor shall have the approval of BHEL Engineer with regard to brand, quality and specification.
4.2.1.4	Indicative list of Major T&Ps in the scope of Contractor are given in the Technical Conditions of Contract. Bidders to note that these are only indicative and as such all other T&P necessary for timely and satisfactory completion of work in scope shall be mobilized by Contractor
4.2.1.5	Timely deployment of adequate T&Ps is the responsibility of the contractor. The contractor shall be prepared to augment the T&P at short notice to match the planned programme and to achieve the milestones.
4.2.1.6	Contractor shall maintain and operate his tools and plants in such a way that major breakdowns are avoided. In the event of major breakdown, contractor shall make alternative arrangements expeditiously so that the progress of work is not hampered.
4.2.1.7	In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make alternative arrangement at the risk and cost of the contractor. Decision of BHEL shall be final and binding on the contractor
4.2.1.8	The T&P to be arranged by the contractor shall be in proper working condition and their operation shall not lead to unsafe condition. The movements of cranes, and other equipment should be such that no damage / breakage occurs to foundations, other equipments, material, property and men. All arrangements for the movement of the T&P etc shall be the contractor's responsibility.
4.2.1.9	Use of welding generators/ rectifiers only shall be permitted for welding. Use of welding transformers will be subject to specific approval of BHEL engineer.
4.2.1.10	The contractor at his cost shall carry out periodical testing of his construction equipments. Test certificates shall be furnished to BHEL.
4.2.1.11	Contractor shall ensure deployment of serviced and healthy T&Ps including cranes, lifting tackles, wire ropes, manila ropes, winches and slings etc. History card and maintenance records for major T&Ps will be maintained by the contractor and will be made available to BHEL Engineer for inspection as and when required.

	Fitness certificate / Test Certificates of T&P shall have to be submitted before it is put in use. Identification for such T&Ps will be done as per BHEL Engineer's advice. BHEL reserves the right to permit only new slings up to 20 mm and lifting tackles up to 3 MT capacities.
4.2.1.12	Contractor shall ensure deployment of reliable and calibrated MMEs (Inspection measuring and Monitoring equipment). The MMEs shall have test / calibration certificates from authorized / Government approved / accredited agencies traceable to National / International standards. Each MME shall have a label indicating calibration status i.e. date of calibration, calibration agency and due date for calibration. A list of such instruments deployed by contractor at site with its calibration status is to be submitted to BHEL Engineer for control.
4.2.1.13	Re-testing / re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such MME so that work does not suffer when the particular instrument is sent for calibration. If any MMEs not found fit for use, BHEL shall have the right to stop the use of such item. It will be necessary for the contractor to deploy proper item. Any readings taken by the defective instrument will be recalled and repeat the readings taken by that instrument with a proper one. In case he fails to do so, BHEL may deploy MMEs and retake the readings at contractor's cost.
4.2.1.14	BHEL shall have lien on all T&P, MMEs and other equipment of the contractor brought to the site for the purpose of erection, testing and commissioning. BHEL shall continue to hold the lien on all such items throughout the period of contract / extended period. The contractor and / or his sub-contractors, without the prior written approval of the Engineer, shall remove no material brought to the site.
4.2.1.15	The month wise T&P deployment plan to execute the work is to be submitted as per relevant format as per the instruction of BHEL. It shall be the contractor's responsibility to deploy the required T&P, for timely and successful completion of the job, to any extent.
4.2.2	Obligations in respect of T&Ps and MMEs provided by BHEL
4.2.2.1	T&P / MMEs being provided by BHEL to sub-contractor free of hire charges shall be shared by other subcontractors working for BHEL at site and the allotment done by BHEL Engineer shall be final and binding.
4.2.2.2	BHEL T&P will be issued in basic assembled condition. Additional loose components / sub-assemblies / attachments as and when necessary, will be

	issued by BHEL. Assembly of such additional loose components/sub-assemblies/ attachments is in contractor's scope.
4.2.2.3	In case of non-availability of the T&Ps to be provided by BHEL due to breakdown, major overhauls, distribution pattern or any other reason, the contractor shall plan / amend / alter his activities to meet erection / commissioning targets in consultation with BHEL.
4.2.2.4	void
4.2.2.5	The contractor shall engage trained and experienced operators for the operation of BHEL's T&Ps. Their skill / performance will be checked by BHEL Engineer before they are allowed to operate the same. However checking of skills by BHEL does not absolve the contractor of his responsibilities for proper and safe handling of equipment, consistent good performance of operators and regular performance evaluation of operators.
4.2.2.6	The day to day operation and maintenance of BHEL's T&Ps (Other than cranes) shall be carried out by contractor as per manufacturer's / BHEL's maintenance schedule at his cost. The contractor shall arrange, at his own cost, trained operators, fuel and other consumables for their operation.BHEL shall arrange all spares needed for upkeep of major T&Ps provided like Huck Bolting Machine*, DG Set, Induction Machine and Hydraulic Test pumps. The contractor has to arrange for fixing of the spares; supervision in specialized cases will be provided by BHEL. For upkeep of all other T&Ps supplied by BHEL, spares shall be arranged by the Contractor. BHEL supplied T&Ps shall be maintained in good working condition during the entire period of use. T&Ps in defective / damaged condition shall be rectified promptly to the full satisfaction of BHEL engineer. Contractor shall maintain records for maintenance of major T&Ps. These shall be made available for Inspection whenever required. In case of any lapses on the part of the contractor, BHEL at its own discretion shall get the servicing / repair of equipment done at the risk and cost of the contractor along with BHEL overheads. Further, if there are breakdowns / damages due to negligence of the contractor, the complete service / repair charges and cost of all the spares damaged with BHEL overheads shall be recovered from contractor's RA bills. *: for operation and maintenance of ESP Huck bolting machine, BHEL shall provide the basic power rig and hose. Balance toolingsie Guns, chuck jaws etc are to be arranged by contractor.
4.2.2.7	void

4.2.2.8	Increasing / shortening of the crane boom to suit work requirements shall have to be arranged by the indenting contractor at his cost including restoration to a state as directed by BHEL. All necessary manpower tools, support, consumables, illumination etc. will have to be arranged by contractor at his cost. If required, contractor has to return the crane with original boom.
4.2.2.9	The area and infrastructure development of the area to be carried out by the customer. However in construction projects of this magnitude it is possible that all the areas / approaches may not be ready. In such cases backfilling of approaches where ever necessary, consolidation of ground and arrangement of sleepers / sand bag filling etc for safe operation / movement of equipment including cranes / trailers etc shall be the responsibility of the contractor at his cost. No compensation on this account shall be payable.
4.2.2.10	In the event of contractor not using and maintaining BHEL T&Ps according to BHEL's instructions. BHEL will have the right to withdraw such item without any notice and no claim in this regard shall be entertained and contractor shall be responsible for delay in execution on this account.
4.2.2.11	The contractor shall furnish regular utilization report of the BHEL T&Ps, as per requirement of BHEL.
4.2.2.12	Any loss / damage to any part of BHEL T&Ps and MMEs shall be to the contractor's account and any expenditure on these accounts by BHEL will be recovered from the contractor's bill in case the contractor fails to make good the loss.
4.2.2.13	It shall be responsibility of the contractor to take delivery of T&Ps and MMEs from stores or place of use by other contractor at project site, transport the same to site and return the same to BHEL store / place as intimated by Engineer in project site in good working conditions after use.
4.2.2.14	The contractor shall return BHEL T&Ps and MMEs issued to him in good working condition as and when desired by BHEL (on completion or reduction of workload). If contractor delays return of T&P and MME, hire charges as applicable shall be levied by BHEL from time, it was requisitioned till the time of actual return. T&Ps and MMEs returned in damaged / unserviceable condition shall be got repaired by BHEL at its own discretion and entire cost of repair with BHEL overheads shall be recovered from the contractor.
4.2.2.15	Replacement cost including BHEL overheads in respect of irreparable / completely damaged / non return of T&Ps and MMEs shall be recovered from the

	contractor's running / final bills
4.2.2.16	Obligations in respect of Cranes provided by BHEL
a)	BHEL will make available the cranes (as per Technical Conditions of Contract) free of charge to the contractor on sharing basis mainly for the purposes enumerated/indicated therein. BHEL cranes have to be shared with other agencies / contractors of BHEL. The allocation of cranes shall be the discretion of BHEL engineer, which shall be binding on the contractor.
b)	BHEL Cranes may be initially issued in basic assembled condition. Any alteration/addition like boom reduction / extension, assembly of components/sub-assemblies needed for modulating the capacity/reach/other features of cranes and restoration to the state as directed by BHEL shall be the contractor's responsibility.
c)	In case the BHEL cranes are not covered under AMC of BHEL, then the day-to-day upkeep and running maintenance like filling / topping up of lubricants, changing filters, etc including repair of self starter and dynamo of these cranes shall be the responsibility of the contractor.If on checking it is found that the same is not followed, BHEL will exercise its right to get the job/works done at the risk and cost of contactor. In case BHEL cranes are covered under AMC awarded by BHEL, then the day-to-day upkeep and running maintenance as described above are excluded from scope. However any additional helpers if any required during Preventive/Breakdown Maintenance, Assembly/disassembly shall be provided by contractor at no extra cost. BHEL may also provide cranes through crane hiring agencies in which case the day-to-day upkeep and running maintenance shall be excluded from scope of contractor.
d)	Minor consumables like cotton cloth, cotton waste, etc is to be supplied by Contractor. All spares and lubricants/grease is excluded from scope. Contractor to give the requirements of these items well in advance in case the cranes provided by BHEL are BHEL owned cranes.
e)	Unless otherwise specified, trained operators for BHEL owned cranes shall be provided by the contractor. These operators should possess valid license for heavy vehicle.
f)	BHEL cranes will be withdrawn for regular and capital maintenance as per the respective schedule of maintenance. As far as possible such schedules will be intimated to the contractor in advance and may be adjusted depending on the work

	requirements at site. However no claim whatsoever will be entertained on account of non-availability of cranes.
g)	Where the services of the cranes provided by BHEL are to be shared by other agencies/ contractors of BHEL, the contractor's responsibilities defined above will also be apportioned accordingly to the beneficiary agency. Working arrangements in this regard will be done at site by BHEL engineer and in any case his decision shall be final and binding.
h)	Major breakdowns will be attended to by BHEL. However, in case of breakdowns or damages due to negligence of the contractor, the complete service/repair charges including cost of spares shall be to the account of the contractor, along with BHEL overheads.
4.2.2.17	Obligations in respect of Construction Lift/Elevators provided by BHEL
a)	The total erection including commissioning, maintenance, statutory clearances shall be in included in scope of work. Supervision by the original equipment supplier or their authorized agency shall be arranged for by BHEL, in case found necessary.
b)	All day to day and routine maintenance and checking is to be carried out by the contractor as per the recommendations of the supplier. He should periodically check the brakes and carry out the all works to ensure the safety of all those using the lift/elevator. BHEL shall arrange spares required for upkeep of Construction lift/elevator
c)	The construction lift/elevator should never be overloaded as this can lead to serious accidents. Ensuring all safety aspects in operation of the lift shall be the responsibility of the contractor. Erection of all the required number of landing platforms is included in scope. Landing platforms are to be provided with proper barricades and hand railings.
d)	After completion of contractual scope of work or as per BHEL advice, the temporary elevator/lift shall be dismantled and handed over to BHEL neatly identified/tagged. Temporary structures/platforms etc erected for the elevators/lifts are also to be dismantled and materials to be returned to stores as applicable. The construction and dismantling of the foundations required for the construction/elevator lifts is includedin the scope of the contractor.

5.0	RESPONSIBILITIES OF CONTRACTOR IN RESPECT OF LABOUR, SUPERVISORY STAFF, ETC.
5.1	Refer relevant clauses of General Conditions of Contract (GCC) also in this regard
5.2	The contractor shall deploy all the necessary skilled/semiskilled/ unskilled labour including highly skilled workmen etc. These workmen should have previous experience on similar job. They shall hold valid certificates wherever necessary. BHEL reserves the right to insist on removal of any employee of the contractor at any time if he is found to be unsuitable and the contractor shall forthwith remove him.
5.3	Contractor shall also comply with the requirements of local authorities/ project authorities calling for police verification of antecedents of the workmen, staff etc.
5.4	It is the responsibility of the contractor to engage his workmen in shifts and or on overtime basis for achieving the targets set by BHEL. This target may be set to suit BHEL's commitments to its customer or to advance date of completion of events or due to other reasons. The decision of BHEL in regard to setting the erection and commissioning targets will be final and binding on the contractor.
5.5	Contractor shall provide at different elevation suitable arrangement for urinal and drinking water facility with necessary plumbing & disposal arrangement including construction of septic tank. These installations shall be maintained in hygienic condition at all times.
5.6	The Contractor in the event of engaging 20 or more workmen, shall obtain Independent license under the Contract labour (Regulation and Abolition) Act 1970 from the concerned authorities based on Form-V issued by the Principal Employer/Customer. In order to issue Form-V by Customer, Contractor shall fulfill all Statutory requirements like Insurance Policy, PF Code/PF Account number etc as per the requirement of BHEL/Customer
5.7	Contractor shall deduct the necessary amount towards Provident Fund and contribute equal amount as per Government of India laws. This amount will be deposited regularly to the provident Fund Commissioner. BHEL/Customer may insist for submission of the account code duly certified by PF Commissioner
5.8	Contractor may also be required to comply with provisions of ESI Act in vogue if applicable and submit evidence to BHEL.
5.9	BHEL / customer may insist for witnessing the regular payment to the labour. They may also like to verify the relevant records for compliance with statutory

	requirements. Contractor shall enable such facilities to BHEL / Customer.
5.10	Contractor shall deploy only qualified and experienced engineers/ supervisors. They shall have professional approach in executing the work.
5.11	The contractor's supervisory staff shall execute the work in the most professional manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that the assembly and workmanship conform to dimensions and tolerances given in the drawings/instructions given by BHEL engineer from time to time.
5.12	The supervisory staff employed by the contractor shall ensure proper outturn of work and discipline on the part of the labour put on the job by the contractor. Also in general they should see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL or BHEL's client.
5.13	It is the responsibility of the contractor to arrange gate pass for all his employees, T&P etc for entering the project premises. Necessary coordination with customer officials is the responsibility of the contractor. Contractor to follow all the procedures laid down by the customer for making gate passes. Where permitted, by customer / BHEL, to work beyond normal working hours, the contractor shall arrange necessary work permits for working beyond normal working hours.
5.14	The actual deployment will of Labour and Engineer/supervision staff shall be so as to satisfy the erection and commissioning targets set by BHEL. If at any time, it is found that the contractor is not in a position to deploy the required engineers/supervisors/workmen due to any reason, BHEL shall have the option to make alternate arrangements at the contractor's risk and cost.The expenditure incurred along with BHEL overheads thereon shall be recovered from the contractor
5.15	Contractor shall not deploy women labour at night.

6.0	MATERIAL HANDLING, STORAGE AND PRESERVATION ETC
6.1	MATERIAL HANDLING AND STORAGE
6.1.1	All the equipments/materials furnished under this contract shall be received from the project stores, sheds / storage yards and transported to pre assembly area / erection site and stored in the storage spaces in a manner so that they are easily retrievable till the contractor erects them. While drawing/lifting material from BHEL / customer stores, the contractor shall ensure that the balance / other materials are stacked back immediately. No claim is admissible on this account
6.1.2	While BHEL will endeavor to store / stack / identify materials properly in their open / close / semi closed / tarpaulins covered storage yard / shed, it shall be contractor's responsibility to assist BHEL in identifying materials well in time for erection. They should take the delivery of the same, following the procedure indicated by BHEL, and transport the material safely to pre-assembly yard / erection site in time, according to program.
6.1.3	The contractor shall take delivery of components, equipment / consumables from storage area after getting the approval of BHEL Engineer on standard indent forms.
6.1.4	The contractor shall identify and deploy necessary Engineers / supervisors / workmen for the above work in sufficient number as may be needed by BHEL, for areas covering their scope.
6.1.5	All the equipment shall be handled very carefully to prevent any damage or loss. No untested wire ropes / slings etc. shall be used for unloading / handling. The equipment shall be properly protected to prevent damage either to the equipment or to the floor where they are stored. The equipment from the stores shall be moved to the actual location at the appropriate time so as to avoid damage of such equipment at site.
6.1.6	Contractor shall ensure that while lifting slings shall be put over the points indicated on the equipment or as indicated in the manufacturer's drawings. Slings / shackles of proper size shall be used for all lifting and rigging purposes. All care shall be taken to safe guard the equipment against any damage. Dragging of piping / valves should be avoided. In case of any damage the cost shall be covered from the contractor.
6.1.7	Approach road conditions from the stores / yards to the erection site may not

	be equipped and ideal for smooth transportation of the equipment. Contractor may have to be adequately prepared to transport the materials under the above circumstances without any extra cost. . The contractor may familiar himself with soil conditions at site.
6.1.8	Contractor shall be responsible for examining all the plant and materials issued to him and notify the Engineer immediately of any damage, shortage, discrepancy etc before they are moved out of the stores / storage area. The contractor shall be solely responsible for any shortages or damages in transit, handling, storage and erection of the equipment once received by him. As the erection work will be spread in different areas / locations of the project, contractor has to arrange sufficient number of watch / ward personal to avoid any pilferage of material
6.1.9	The contractor shall maintain an accurate and exhaustive record-detailing out the list of all equipment received by him for the purpose of erection and keep such record open for the inspection of the engineer at any time.
6.1.10	All the material in the custody of contractor and stored in the open or dusty locations must be covered with suitable weather proof / fire retardant covering material wherever applicable and shall be blocked up on raised level above ground. All covering materials including blocks and sleeper shall be arranged by the contractor at his cost.
6.1.11	If the material belonging to the contractor are stored in area other than those earmarked for his operation the engineer will have the right to get it moved to the area earmarked for the contractor at the contractors risk and cost.
6.1.12	The contractor shall be responsible for making suitable indoor storage facilities to store all equipment (drawn by the contractor from BHEL / customer stores), which require indoor storage till the time of their installation. The Engineer will direct the contractor in this regard, which item in his opinion will require indoor storage, and the contractor shall comply with Engineer's decision.
6.1.13	The contractor shall ensure that all surplus / damaged / scrap / unused material, packing wood / containers/ special transporting frames etc are returned to BHEL at a place in project area identified by the Engineer. The contractor will maintain an account for all items received and returned to BHEL. Any shortage in returning such items shall be chargeable to the contractor except allowable wastage for packing wood only.
6.1.14	The contractor shall hand over all parts / materials remaining extra over the normal requirement with proper identification tags to the stores as directed by

	the concerned BHEL engineer.
6.1.15	The contractor shall ensure that all the packing materials and protective devices installed on equipment during transit and storage are removed before installation.
6.1.16	It shall be the responsibility of the contractor to keep the work / storage areas in neat, tidy and working conditions. All surplus/unusable packing and other materials shall be removed and deposited at location(s) specified by BHEL within the project premises. If required weighing of the same within the project premises will have to be carried out.
6.2	PRESERVATION OF COMPONENTS
6.2.1	After taking delivery from BHEL / customer's stores, plant materials storage shall be subjected to the following protection besides other provisions indicated in these specifications elsewhere.
6.2.1.1	Items stored outdoors shall be stacked up at least six inches (6") off the ground.Items should not be stored in a low lying area where water logging is a possibility. Contractor should have sufficient numbers of wooden / concrete / steel sleepers for the job.
6.2.1.2	Motors, valves, electrical equipment, control equipment and instruments, and special or precision items requiring special care,etc shall be stored indoors. Motor windings shall be kept dry by use of external heat or space heaters.
6.2.1.3	Bearings and other wearing surfaces of plant materials shall be protected against corrosion and kept clean and should be regularly monitored.
6.2.1.4	Insulation materials shall be stored indoors or otherwise protected against getting wet/ damaged, using suitable measures and should be protected from direct rain.
6.2.2	It shall be the responsibility of the contractor to apply preservatives / touch up paints (primer) on equipment handled and erected by him till such time of final painting. It shall be contractor's responsibility to arrange for required paints (primer), thinners, labour, scaffolding materials, cleaning materials like wire brush, emery sheets, etc, cleaning of surface and provide one coat of preservatives / paints (primer) from time to time as decided by BHEL engineer. The accepted rate shall include this work also. It is to be noted that such painting may have to be done as and when required till such time the final painting is carried out.
6.2.3	The contractor shall effectively protect the finished work from action of weather

	and from damage or defacement and shall cover the finished parts then and there for their protection.
6.2.4	Any failure on the part of contractor to carry out works according to above clauses will entail BHEL to carry out the job from any other party and recover the cost from contractor.

7.0	DRAWINGS AND DOCUMENTS
7.1	The detailed drawings, specifications available with BHEL engineers will be made available to the contractor during execution of work at site. The contractor will also ensure availability of all drawings / documents at work place.
7.2	Necessary drawings to carry out the erection work will be furnished to the contractor by BHEL on loan, which shall be returned to BHEL Engineer at site after completion of work. Contractor shall ensure safe storage and quick retrieval of these documents.
7.3	The contractor shall maintain a record of all drawings and documents available with him in a register as per format given by BHEL Engineer. Contractor shall ensure use of pertinent drawings / data / documents and removal of obsolete ones from work place and returning to BHEL.
7.4	The data furnished in various annexure enclosed with this tender specification are only approximate and for guidance. However, the change in the design and in the quantity may occur as is usual in any such large scale of work. The contractors quoted rates shall be inclusive of the above factor
7.5	Should any error or ambiguity be discovered in the specification or information the contractor shall forthwith bring the same to the notice of BHEL before commencement of work. BHEL's interpretation in such cases shall be final and binding on the contractor.
7.6	Deviation from design dimensions should not exceed permissible limit. The contractor shall not correct or alter any dimension / details, without specific approval of BHEL.

8.0	INSPECTION AND QUALITY
8.1	Inspection, Quality Assurance, Quality Control
8.1.1	Preparation of quality assurance log sheets and protocols with customer/ consultants/statutory authority, welding logs, NDE records, testing & calibration records and other quality control and quality assurance documentation as per BHEL engineer's instructions, is within the scope of work/specification. These records shall be submitted to BHEL/customer for approval from time to time.
8.1.2	The protocols between contractor and customer/ BHEL shall be made prior to installation for correctness of foundations, materials, procedures, at each stage of installation, generally as per the requirement of customer/ BHEL. This is necessary to ensure elimination of errors or keeping them within tolerable limits and to avoid accumulation and multiplication of errors.
8.1.3	A daily log book should be maintained by every supervisor/engineer of contractor on the job in duplicate (one for BHEL and one for contractor) for detailing and incorporating alignment/clearance / centering / leveling readings and inspection details of various equipments etc. High pressure welding details like serial number of weld joints, welders name, date of welding, details of repair, heat treatment etc. will be documented in welding log as per BHEL Engineer's instructions. Record of radiography containing details like serial number of weld joints, date of radiography, repairs, if any, re-shots etc shall also be maintained as per BHEL Engineer's instructions. Record of heat treatments performed shall be maintained as prescribed by BHEL
8.1.4	The performance of welders will be reviewed from time to time as per the BHEL standards. Welders' performance record shall be furnished periodically furnished for scrutiny of BHEL's Engineer. Corrective action as informed by BHEL shall be taken in respect of those welders not conforming to these standards. This may include removal/ discontinuance of concerned welder(s). Contractor shall arrange for the alternate welders immediately
8.1.5	All the welders shall carry identity cards as per the proforma prescribed by BHEL/Customer/Consultant. Only welders duly authorized by

	BHEL/customer/consultant shall be engaged on the work.
8.1.6	Contractor shall provide all the Measuring Monitoring Equipments (MMEs) required for completion of the work satisfactorily. These MMEs shall be of brand, quality and accuracy specified by BHEL Engineer and should have necessary calibration and other certificates as per the requirement of BHEL Engineer. Decision of BHEL Engineer regarding acceptance or otherwise of the measuring instruments/gauges/tools for the work under this specification, is final and binding on the contractor. BHEL may give an indicative list of MMEs required for this work and to be made available by the contractor. The list will be reviewed by BHEL and the contractor shall meet any augmentation needed wherever required.
8.1.7	It is the responsibility of the contractor to prove the accuracy of the testing/measuring/calibrating equipments brought by him based on the periodicity of calibration as called for in the BHEL's quality assurance standards/BHEL Engineer's instructions.
8.1.8	Any re-laying or re-termination of cables/re-erection of instruments/ recalibration of instruments etc. required due to contractor's mistake or design requirement and found at any stage inspection, shall be carried out by the contractor at no extra cost.
8.1.9	BHEL, Power Sector Regions (PSNR/PSER/PSWR/PSSR) have already been accredited with ISO 9001 certification and as such this work is subject to various audits to meet ISO 9001 requirements. One particular aspect which needs special mention is about arrangement of calibration of instruments by the contractor. Contractor shallensure deployment of reliable andcalibratedMMEs (Measuring and Monitoring Equipments). The MMEs shall have test / calibration certificates from authorised / Government approved / Accredited agencies traceable to National / International Standards. Re-testing / re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such MMEs so that work does not suffer when the particular equipment / instrument is sent for calibration. Also if any MMEs not found fit for use, BHEL shall have the right to stop the use of such item and instruct the contractor to deploy proper item and recall ie repeat the readings taken by that instrument, failing which BHEL may deploy MME and retake the readings at Contractor's cost.
8.1.10	Re-work necessitated on account of use of invalid MMEs shall be entirely to the

	contractor's account. He shall be responsible to take all corrective actions, including resource augmentation if any, as specified by BHEL to make-up for the loss of time.
8.1.11	In the courses of erection, it may become necessary to carry repeated checks of the work with instruments recently calibrated, re-calibrated. BHEL may counter/ finally check the measurements with their own MMEs. Contractor shall render all assistance in conduct of such counter/final measurements.
8.1.12	Total Quality is the watchword of the work and Contractor shall strive to achieve the Quality Standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and Quality Standards.
8.2	Stage Inspection By FES/QA Engineers
8.2.1	Apart from day-to-day inspection by BHEL Engineers stationed at Site and Customer's Engineers, stage inspection of equipments under erection and commissioning at various stages shall also be conducted by teams of Engineers from Field Engineering Services of BHEL's Manufacturing Units, Quality Assurance teams from Field Quality Assurance, Unit/Factory Quality Assurance and Commissioning Engineers from Technical Services etc. Contractor shall arrange all labour, tools and tackles etcalong with proper access for such stage inspections free of cost.
8.2.2	Any modifications suggested by BHEL FES and QA Engineers' team shall be carried out. Claims of contractor, if any, shall be dealt as per Section 13, and provided such modifications have not arisen for reasons attributable tothe contractor.
8.3	Statutory Inspection of Work
8.3.1	The work to be executed under these specifications has to be offered for inspection, at appropriate stages of work completion, to various statutory authorities for compliance with applicable regulations. The work related statutory inspections, though not limited to, are as under: 1) Inspectorate of Steam Boilers and Smoke Nuisance 2) Electrical Inspector 3) Factory Inspector, Labour Commissioner, PF Commissioner and other authoritiy connected to this project work

	The scope includes getting the approvals from the statutory authorities, which includes arranging for inspection visits of statutory authority periodically as per BHEL Engineer's instructions, arranging materials for ground inspection, taking rub outs for the pressure parts to be offered for inspection, submitting co-related inspection reports, documents, radiographs etc and following up the matter with them. Contractor shall also make all arrangements for offering the Products / Systems for inspection at location, as applicable, to the concerned authority.
8.3.2	Contractor should be qualified to execute pressure parts & piping work coming under the purview of IBR, for which he should register himself with CIB of state concerned. contractor also should be aware of the latest IBR regulations and Electricity Act, including the amendments thereof.
8.3.3	Contractor shall comply with 'Qualification Tests for welders engaged in welding of Boilers and Steam Pipes under Construction, Erection and Fabrication at Site in India and in repairing Boilers and steam pipes by welding' in line with Chapter XIII of Indian Boiler Regulations-1950, for testing his welders / men / workers, including all associated fees, procedures, required instruments and equipments and their calibration there of. It shall be contractor's responsibility to obtain approval of Statutory Authorities, wherever applicable, for the conducting of any work which comes under the purview of these authorities, at his cost.
8.3.4	The following fees shall be excluded from scope of Contractor: 1. Registration Fee as per Regulation 385 of Chapter IX of Indian Boiler Regulations-1950 2. Fees for inspection of Boiler at the site of Construction as per Regulation 395 A, sl no 4 of Chapter IX of Indian Boiler Regulations-1950 However all other fees like visit fees charged by the Boiler Inspector and other arrangements for his visit or visits till satisfactory completion of work, shall be included in scope of Contractor
8.4	The Quality Management System of BHEL, Power Sector Regions (PSNR/PSER/PSWR/PSSR) have already been certified and accredited under ISO 9002 standards in this regard. The basic philosophy of the Quality Management System is to define the organizational responsibility, work as per

	documented procedures, verify the output with respect to acceptance norms, identify the non-conforming product/ procedure and take corrective action for removal of non-conformance specifying the steps for avoiding recurrence of such non-conformities, & maintain the relevant quality records. The nonconformities are to be identified through the conduct of periodical audit of implementation of quality systems at various locations/stages of work. Suppliers/vendors of various products/services contributing in the work are also considered as part of the quality management system. .as such the contractor is expected not only to conform to the quality management system of BHEL but also it is desirable that they themselves are accredited under any quality management system standard.
8.5	Field Quality Assurance
8.5.1	Contractor shall carry out all activities conforming to the approved Field Quality Plan (FQP) as revised from time to time. Total quality shall be the watchword of the work and contractor shall strive to achieve the quality standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and quality standards. Contractor shall provide the services of quality assurance engineer as per the relevant clauses.

9.0	OCCUPATIONAL HEALTH, SAFETY & ENVIRONMENT MANAGEMENT/ QUALITY ASSURANCE PROGRAMME: BHEL, Power Sector Regions (PSNR/ER/WR/SR) are each certified for ISO 9001. Quality of work to customer's satisfaction and fulfillment of system requirements are the essence of ISO 9001 certification. BHEL, PS Regions have HSE certification (ISO 14001 & OHSAS 18001) and therefore Contractor also shall organise/ plan/ perform all their activities to meet with the applicable requirements of these standards.
9.1	HSE (Health, safety & Environment): Contractor will comply with HSE (Health, safety & Environment) requirements of BHEL. HSE requirements in brief, are given below :-
9.1.1	Contractor will nominate one of their qualified and experienced employees as Safety Officer, who will be responsible for all HSE related issues of contractors work area. Safety Officer will have authority to stop any activity, in case he observes that the activity is not being carried out in safe manner. He will conduct surprise inspection as well as periodic inspection/drill (at least once in a month) and submit such reports to BHEL. He will conduct periodic meetings with supervisors of different working groups and explain HSE issues and use of PPEs to them. Reports of such meetings will be submitted to BHEL. Contractor will develop suitable work procedures based upon HSE guidelines and OCPs and implement it. Such work procedures will consist of Area of work, T&P Details, Work Procedure, PPE requirements etc. Please refer Schedule VIII of BOCW Rules for number of safety officers, qualification, duties etc. Contractor should highlight the requirement of safety to staff and labour through daily tool box meeting before start of the days job. Contractor to also submit monthly safety reports as per the format/procedure of BHEL.
9.1.2	The contractor shall arrange induction and regular health check of their employees as per schedule VII of BOCW rules by aregistered medical practitioner. The contractor shall take special care of the employees affected with occupational diseases under rule 230 and schedule II of BOCW Rules. The employees not meeting the fitness requirement should not be engaged for such job
9.1.3	Following personnel protective equipments (PPEs), in adequate numbers, will

	be made available at site & their regular use by all concerned will be ensured :-
	- HELMET
	- SAFETY GOGGLES & WELDING FACE SHIELDS
	- SAFETY BELTS AND PROTECTIVE NET FOR WORKING AT HEIGHT
	- SAFETY SHOES
	- EAR PLUG
	- ANY OTHER SAFETY EQUIPMENT REQUIRED FOR SAFE COMPLETION OF THE WORK
	Contractor to also submit monthly reports on above as per the format/procedure of BHEL.
9.1.4	Providing appropriate First Aid facilities for prompt treatment of injuries and illness at work place. Arranging training to contractor workmen/ employees for giving first aid.
9.1.5	Arranging ambulance in case of any emergency situation .
9.1.6	Identification of nearest hospital and health check-up of workmen/employees
9.1.7	Providing filtered drinking water at work place in cool container.
9.1.8	Providing Canteen, Rest Room, Washing facilities to the contracted employees as per provisions of Contract Labour Regulation Act 1970 (Chapter V).
9.1.9	Providing appropriate fire fighting equipment at designated work place and nominate a fire officer/warden adequately trained for his job.
9.1.10	Identification of nearest fire station and display contact telephone nos. / person's name around work places for cases of emergencies .
9.1.11	Providing adequate no. of 24 V sources and ensure that no hand lamps are operating at voltage level above 24 Volts.
9.1.12	Fulfilling safety requirements at all power tapping points.
9.1.13	Red & White caution tape of proper width(1.5 to 2 inch) to be used for cordoning unsafe area such as open trench, excavation area etc.
9.1.14	Providing contractors company logo on cloths /uniform/ proper identity cards with photographs, for correct identification of people working at project site .
9.1.15	High/ Low pressure welders to be identified with separate colourclothings. No welders will be deployed without passing appropriate tests and holding valid welding certificates. Approved welding procedure should be displayed at work place.
9.1.16	Displaying safe handling procedures for all chemicals such as lube oil, acid, alkali, sealing compounds etc , at work place .

9.1.17	All scaffolding/ platforms should be made from materials of appropriate quality/grade so that these are safe for use. It should be certified/declared safe for use by an experienced contractor person, before any scaffolding/platform is used. Please refer IS:3696 part 1&2 and 4014 part 1 & 2
9.1.18	All T&Ps/ MMEs should be of reputed brand/appropriate quality & must have valid test/calibration certificates bearing endorsement from competent authority of BHEL.. Contractor to also submit monthly reports of T&Ps deployed and validity test certificates to BHEL safety Officer as per the format/procedure of BHEL.
9.1.19	Ensure that the regulatory requirement of excessive weight limit (to carry/lift/ move weights beyond prescribed limits) for male and female workers are complied with.
9.1.20	Safety slogan, Safety/ Caution boards , wherever required to be displayed in consultation with BHEL.
9.1.21	Take suitable measures for waste management and environment related laws/legislation as a part of normal construction activities. Compliance with the legal requirements on storage/ disposal of paint drums (including the empty ones), Lubricant containers, Chemical Containers, and transportation and storage of hazardous chemicals will be strictly maintained. Ensure proper cleanliness of work place, housekeeping and waste management (including proper waste disposal) on daily basis.
9.1.22	It is imperative on the part of the contractor to join and effectively contribute in joint measures such as tree plantation, environment protection, contributing towards social upliftment, conversion of packing woods to school furniture, keeping good relation with local populace etc.
9.1.23	The contractor shall carry out periodic air and water quality check and illumination level checking in his area of work place and take suitable control measure.
9.1.24	The Contractor is required to provide proper safety net systems (IS-11057) where ever the hazard of fall from height is present as per instruction of BHEL Engineer. The safety nets shall be fire resistant, duly tested and shall be of ISI Mark and the nets shall be located as per site requirements to arrest or to reduce the consequences of a possible fall of persons working at different heights.
9.1.25	All applicable OCPs (Operational control procedures) will be followed by contractor as per BHEL instructions. This will be done as part of normal scope of work. List of such OCPs is given below . In case any other OCP is found to

	be applicable during the execution of work at site, then contractor will follow this as well, within quoted rate. These OCPs (applicable ones) will be made available to contractor during work execution at site. However for reference purpose, these are kept with Safety Officer of BHEL at the Power Sector Regional HQ, or available in downloadable format in the website, which may be refereed by contractor, if they so desire.
	■ OCP for safe handling of chemicals
	■ OCP for Electrical safety
	■ OCP for energy conservation
	■ OCP for safe welding and gas cutting operation
	■ OCP for fire safety
	■ OCP for safety in use of hand tools
	■ OCP for first aid
	■ OCP for food safety at canteen
	■ OCP for safety in use of cranes
	■ OCP for storage and handing of gas cylinders
	■ OCP for manual arc welding
	■ OCP for safe use of helmets
	■ OCP for good house keeping
	■ OCP for working at height
	■ OCP for safe excavation
	■ OCP for safe filling of Hydrogen in cylinder
	■ OCP for illumination
	■ OCP for handling and erection of heavy metals
	■ OCP for safe acid cleaning
	■ OCP for safe alkali boil out
	■ OCP for safe oil flushing
	■ OCP for steam blowing
	■ OCP for safe working in confined area
	■ OCP for safe operation of passenger lift, material hoists & cages
	■ OCP for Vehicle maintenance
	■ OCP for safe radiography
	■ OCP for waste disposal
	■ OCP for working at night
	■ OCP for blasting
	■ OCP for DG Set
	■ OCP for handling & storage of mineral wool

	■ OCP for drilling, reaming and grinding(machining) etc.
	■ OCP for hydraulic test
	■ OCP for spray insulation
	■ OCP for trial run of rotary equipment
	■ OCP for stress relieving
	■ OCP for material preservation
	■ OCP for cable laying/tray work
	■ OCP for electrical maintenance
	■ OCP for transformer charging
	■ OCP for safe handling of battery system
	■ OCP for computer operation
	■ OCP for storage in open yard
	■ OCP for sanitary maintenance
	■ OCP for batching
	■ OCP for piling rig operation
	■ OCP for gas distribution test
	■ OCP for cleaning of hotwell / deaerator
	■ OCP for electro-resistance heating
	■ OCP for compressor operation
	■ OCP for O&M of control of AC plant & system
	■ OCP for air compressor
	■ OCP for passivation
	■ OCP for Safe EDTA Cleaning
	■ OCP for Safe Chemical cleaning of Pre boiler system
	■ OCP for Safe Boiler Light up
	■ OCP for Safe Rolling and Synchronisation
	■ OCP for Safe Loading of Unit
9.2	SAFETY AND CLEANLINESS : The contractor shall take all necessary safety precautions and arrange for appropriate appliances as per discretion of BHEL or its authorised officials (Site Construction Manager) to prevent loss of human lives, injuries, to personnel engaged and damage to property. Before commencing the work, the contractor shall submit a "Safety Plan" to the above authorised BHEL official and obtain approval on the same. The safety plan shall indicate in detail the measures that would be taken by the contractor to ensure safety of men, equipment, materials and environment during execution of the work. This will also include an organization structure, role and responsibilities of the concerned key

	personnel, the safety practices that will be followed, PPEs deployed, plan for handling critical activities and emergencies.
9.3	If the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instructions issued by the authorised BHEL official, BHEL shall have the right to take corrective steps at the risk and cost of the contractor.
9.4	During the course of construction, alternation or repairs, scrap with protruding nail, sharp edge etc and all other debris shall be kept clean from working areas, passage, ways and stairs in and around site.
9.5	Combustible scrap and debris shall be removed at regular intervals during the course of execution. Safe means shall be provided to facilitate such removal. The combustible scrap should be stored in safe place away from the plant materials to avoid fire accidents. The area shall be chosen in consultation with the Engineer and to be cordoned off.
9.6	Rigging equipment for materials handling shall be inspected prior to use in each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment will be removed from service.
9.7	Rigging equipment shall not be loaded in excess of its recommended safe working load. Rigging equipment, when not in use, shall be removed from the original work area so as not to present a hazard to employees.
9.8	Contractor shall notify the engineer, of his intention to bring on to site any equipment or any container, with liquid or gaseous fuel or other substance which may create a hazard. The Engineer shall have the right to prescribe the condition under which such equipment or container may be handled and used during the performance of the works and the contractor shall strictly adhere to such instructions. The Engineer shall have the right to inspect any construction tool and to forbid its use, if in his opinion it is unsafe. No claim due to such prohibition will be entertained.
9.9	Where it is necessary to provide and/or store petroleum products or petroleum mixture & explosives, the contractor shall be responsible for carrying out such provision / storage in accordance with the rules & regulations laid down in the relevant petroleum act, explosive act and petroleum and carbide of calcium manual, published by the chief inspector of explosives of India. All such storage shall have prior approval if necessary from the chief inspector of explosives or any other statutory authority. The contractor shall be responsible for obtaining

	the same.
9.10	Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dragged, struck or permitted to strike each other violently.
9.11	When cylinders are transported by powered vehicle they shall be secured in a vertical position.
9.12	All workmen of the contractor working on construction area shall wear safety shoes, hand gloves, safety helmets and safety belt as applicable. The contractor shall provide to its workforce and ensure the use of following personnel protective equipment as found necessary and as directed by BHEL.
9.12.1	Safety Helmets conforming to IS-2925 : 1984
9.12.2	Safety Belts conforming to IS-3521:1983
9.12.3	Safety Shoes conforming to IS-1989 : 1978
9.12.4	Eye and face protection devices conforming to IS – 1179:1967, IS 5983:1980, IS 8521 Part 1:1977, IS 8521 Part 2: 1994.
9.12.5	Hand and body protection devices conforming to IS 4770:1991 and IS- 6994 : Part 1: 1973, IS – 8619 : 1977
9.12.6	Ear protection IS-9167:1979
9.12.7	Respiratory Protective Devices as per IS-9473:2002, i4746:1999 and 14166:1994
9.13	The contractor shall insure his workmen against all accidents and the policy shall be presented to BHEL Engineer on demand. Other wise, BHEL will arrange the same and the expenditure towards this will be debited to the contractor. In case of a fatal or disabling injury accident to any person at construction site due to lapses by the contractor, the victim and/or his/her dependants shall be compensated by the contractor as per statutory requirements. However, if considered necessary BHEL shall have the right to impose appropriate financial penalty on contractor and recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependence before imposing any such penalty. Appropriate enquiry shall be held by BHEL giving opportunity to the contractor for presenting his case. Above safety conditions are not exhaustive but gives an idea for the contractor and contractor shall adhere to all safety precaution given by the

	Engineer at site.
9.14	The contractor shall arrange at his cost adequate lighting facilities e.g. flood lighting, hand lamps, area lighting etc. at various levels for safe and proper working operations during night hours at the work spot as well as at the pre-assembly area.
9.15	The contractor shall be responsible for provision of all the safety notices and safety equipment as enjoined on him by the application of relevant statutory regulation / provisions and/or as called upon by BHEL from time to time. He shall be held responsible for any violation of statutory regulations (local, state or central) and BHEL instruction that may endanger safety of men, equipment and material.
9.16	The contractor shall provide temporary fencing wherever required as a safety measure against accident and damage to properties. Suitable caution notices shall be displayed where access to any part is found to be unsafe and hazardous.
9.17	Contractor shall ensure safety of all the workmen, material and equipment either belonging to him or to others working at site. He shall observe safety rules and codes applied by BHEL without exception.
9.18	It will be the responsibility of the contractor to ensure safe lifting of the equipment, taking due precaution to avoid any accident and damage to other equipment and personnel. All requisite tests and inspection of handling equipment, tools & tackle shall be periodically done by the contractor by engaging only the COMPETENT PERSONS as per law. Defective equipment or uncertifiedshall be removed from service. Any equipment shall not be loaded in excess of its recommended safe working load.
9.19	The contractor shall provide necessary first aid facilities as per schedule III. In addition, ambulance facilities, OHC and CMO as per schedule IV, V, X and XI of BOCW Rules as applicable for all his employees, representatives and workmen at site and BHEL shall have no obligation in this regard. The first aid boxes should be placed at various elevations so as to make them available within the reach and at the quickest possible time. The contractor should conduct periodical first –aid classes to keep his supervisor and Engineers properly trained for attending to any emergency.
9.20	Training

9.20.1	The contractor shall arrange induction safety training for all employees before assigning work. In addition, awareness programme, mock drill at regular intervals and daily tool box meetings shall be arranged. Monthly report of the above to be given to BHEL safety Officer as per prescribed BHEL formats
9.20.2	All the contractor's supervisory personnel and sufficient number of workers shall be trained for fire protection systems. Enough number of such trained personnel must be available during the tenure of contract. Contractor should nominate his supervisor to coordinate and implement the safety measures.
9.21	Contractor shall provide enough fire protecting equipment of the types and numbers at his office, stores, temporary structure in labour colony etc. Such fire protection equipment shall be easy and kept open at all times. The fire extinguishers shall be properly refilled and kept ready which should be certified at periodic intervals. The date of changing should be marked on the Cylinders. All other fire safety measures as laid down in the "codes for fire safety at construction site" issued by safety coordinator of BHEL shall be followed. Non-compliance of the above requirement under fire protection shall in no way relieve the contractor of any of his responsibility and liabilities to fire accident occurring either to his materials or equipment or those of others. Emergency contacts nos must be displayed at prominent locations
9.22	The contractor shall at his cost, remove from vicinity of work at least once each day all combustible waste, scrap, panting materials, rubbish, unused or other materials and deposit them in places specified by BHEL to keep the work site clear and tidy. Use of undercoated canvas paper, corrugated paper, fabricated carton, plastic or other flammable materials shall be restricted to the minimum and promptly removed.
9.23	The contractor shall not use any hand lamp energized by Electric power with supply voltage of more than 24 volts in confined spaces like inside water boxes, turbine casings, condensers etc.
9.24	All portable electric tools used by the contractor shall have safe plugging system to source of power and be appropriately earthed. Only electricians licensed by appropriate statutory authority shall be employed by the contractor to carry out all types of electrical works. Details of earth resource ad their test date to be given to BHEL safety officer as per the prescribed formats of BHEL
9.25	In case of any delay in completion of a job due to mishaps attributable to lapses by the contractor, BHEL shall have the right to recover cost of such delay from

	the payments due to the contractor, after notifying the contractor suitably.
9.26	Valve protection caps shall be kept in place and secured.
9.27	The contractor shall be responsible for the safe storage and handling of his radio-active sources as per BARC rules and regulations.
9.28	Tarpaulin being inflammable should not be used (instead, only non infusible covering materials shall be used) as protective cover while preheating, welding, stress relieving etc. at site.
9.29	If the contractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given reasonable opportunity to do so and/or if the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instruction regarding safety issued by BHEL, BHEL shall have the right to take corrective steps at the risk and cost of the contractor after giving a notice of not less than 7 days indicating the steps that would be taken by BHEL.
9.30	If the contractor succeeds in carrying out its job in time with out any fatal or disabling injury accident and without any damage to property BHEL may, at its sole discretion, favorably consider to reward the contractor suitably for the performance.
9.31	The contractor shall carefully follow the safety requirement of BHEL/ the purchaser with the regard to voltages used in critical areas.
9.32	The contractor shall use only properly insulated and armored cables which conform to the requirement of Indian Electricity Act and Rules for all wiring, electrical applications at site. BHEL reserves the right to replace any unsafe electrical installations, wiring, cabling etc. at the cost of the contractor. All electrical appliances used in the work shall be in good working condition and shall be properly earthed. No maintenance work shall be carried out on live equipment. The contractor shall maintain adequate number of qualified electricians to maintain his temporary electrical installations. Area wise Electrical safety inspection is to be carried out on monthly basis as per “Electrical Safety Inspection checklist’ and the report is to be submitted to BHEL safety officer
9.33	The contractor shall arrange adequate number of persons specifically for clearing any debris and for house keeping of the erection area including restacking of components in the erection areas. Housekeeping to be carried out

	as per BHEL's checklistand report is to be submitted to BHEL safety officer
9.34	In case of any damage to property due to lapses by the contractor, BHEL shall have the right to recover the cost of such damages from the contractor after holding an appropriate enquiry.
9.35	The contractor shall submit report of all accidents, fires and property damage etc to the Engineer immediately after such occurrence, but in any case not later then 24 hours of the occurrence. Such reports shall be furnished in the manner prescribed by BHEL. In addition periodic reports on safety shall also be submitted by the contractor to BHEL from time to time as prescribed by the Engineer.Compiled monthly reports of all kinds of accidents, fires and property damage to be submitted to BHEL safety officer as per prescribed formats
9.36	Before commencing the work, the contractor shall appoint/nominate a responsible person to supervise implementation of all safety measures and liaison with his counterpart of BHEL.
9.37	Suitable scaffolds shall be provided for workman for all works that cannot safely be done from the ground, or from solid construction except in the case of short duration of work which can be done safely from ladders. When a ladder is used, it shall be of rigid construction made of steel. The steps shall have a minimum width of 45 cm and a maximum rise of 30 cm. Suitable handholds of good quality wood or steel shall be provided and the ladder shall be given an inclination not steeper then ¼ horizontal and 1 vertical.
9.38	Scaffolding or staging more than 3.6 m above the ground floor, swung or suspended from an overhead support or erected with stationery support shall have a guard rail properly bolted, braced or otherwise secured, at least 90 cm above the floor or platform of such scaffolding or staging and extending along the entire length of the out side and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it form saver, from swaying, from the building or structure.
9.39	Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform gangways provided is more than 3.6 m above ground level or floor level, they shall be closely boarded and shall have adequate width which shall not be less than 750 mm and be suitably fenced as described above.

9.40	Every opening in the floor or a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 90 cm.
9.41	Wherever there are open excavation in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping into the excavations.
9.42	Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 m in the length while the width between side rails in rung ladder shall in no case be less than app. 29.2 cm for ladder upto and including 3 m in length. For longer ladders this width shall be increased at least ¼'' for each additional foot of length.
9.43	A sketch of the ladders and scaffolds proposed to be used shall be prepared and approval of the Engineer obtained prior to Construction.
9.44	All personnel of the Contactor working within the plant site shall be provided with safety helmets. All welders shall wear welding goggles while doing welding work and all metal worker shall be provided with safety gloves. Persons employed on metal cutting and grinding shall wear safety glasses.
9.45	Adequate precautions shall be taken to prevent danger for electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.
9.46	All trenches, four feet or more in depth, shall at all times be supplied with at least one ladder for each 30 m in length or fraction thereof. The ladder shall be extended from bottom of the trench to at least 90 cm above the surface of the ground. Sides of the trenches which are 1.50 m or more in depth shall be stepped back to give suitable slope or securely held by timer bracing, so as to avoid the danger of sides collapsing. The excavated materials shall not be placed within 1.5 m of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.
9.47.1	The contractor shall take permission of BHEL prior to risky jobs such as working at height, hot work, liftig activities, etc through permits. No job should be started without permits.
9.47.2	The Contactor shall take all measures at the sites of the work to protect all persons from accidents and shall be bound to bear the expenses of defense of

	every suit, action or other proceeding at law that may be brought by any persons for injury sustained or death owing to neglect of the above precautions and to pay any such persons such compensation or which may with the consent of the Contractor be paid to compromise any claim by any such person should such claim proceeding be filed against BHEL, the Contractor hereby agrees to indemnify BHEL against the same.
9.48	Before any demolition work is commenced and also during the process of the work the following shall be ensured:
9.48.1	All roads and open areas adjacent to the work site shall either be closed or suitably protected.
9.48.2	No electric cable or apparatus which is liable to be a source of danger nor a cable or an apparatus used by the operator shall remain electrically charged.
9.48.3	All practical steps shall be taken to prevent danger to persons employed from the risks of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render them unsafe.
9.49	All necessary personnel safety equipment as considered adequate by the Engineer should be kept available for the use of the persons employed in the Site and maintained in a condition suitable for immediate use and the Contactor should take adequate steps to ensure proper use of equipment by those concerned.
9.49.1	Workers employed on mixing asphalted materials, cement and lime mortars shall be provided with protective foot wear and protective goggles.
9.49.2	Those engaged in white washing and mixing or stacking of cement bags or any materials which is injurious to the eyes shall be provided with protective goggles.
9.49.3	Those engaged in welding works shall be provided with welder's protective eyesight lids.
9.49.4	Stone breakers shall be provided with protective goggles and protective clothing and seated sufficient to safe intervals.
9.49.5	Where workers are employed in sewers and manholes, which are in use, the Contractor shall ensure that the manhole covers are opened and ventilated at least for an hour before the workers are allowed to get into manhole, and the manholes so opened shall be cordoned off with suitable railing and provided

	with warning signals or boards to prevent accident to the public.
9.49.6	The Contractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, the following precautions should be taken.
9.49.6.1	No paint containing lead or lead products shall be used except in the form of paste or ready made paint.
9.49.6.2	Suitably face masks should be supplied for use by the workers where paints are applied in the form of spray or a surface having lead paint dry rubbed and scrapped.
9.49.6.3	Overalls shall be supplied by the Contractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.
9.50	When the work is being done near any place where there is risk of drowning all necessary equipment should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.
9.51	Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safe guards. Hoisting appliance should be provided with such means as will reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers employed on electrical installations which are already energized, insulting mats, wearing apparel, such as gloves, sleeves and boots as may be necessary should be provided. The worker should not wear any rings, watches and carry keys or other materials which are good conductor of electricity.
9.52	All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near the places of work.
9.53	The contractor shall maintain and ensure necessary safety measures as required for inspection and tests HV test, Pneumatic test, Hydraulic test, Spring test, Bend test etc as applicable, to enable inspection Agency for performing Inspection. If any test equipment is found not complying with proper safety

	requirements then the Inspection Agency may withhold inspection, till such time the desired safety requirements are met.
9.54	The Contractor shall notify BHEL of his intention to bring to site any equipment or material which may create hazard. BHEL shall have the right to prescribe the conditions under which such equipment or materials may be handled and the contractor shall adhere to such instructions. BHEL may prohibit the use of any construction machinery, which according to him is unsafe. No claim for compensation due to such prohibition will be entertained by BHEL.
9.55	All safety precautions shall be taken for welding and cutting operations as per IS-818. All safety precautions shall be taken for foundation and other excavation marks as per IS-3764.
9.56	.All gas cylinders shall be stored in upright position. Suitable trolley shall be used. There shall be flash-back arrestors conforming to IS-11006 at both cylinder and burner ends. Damaged tube and regulators must be immediately replaced. No of cylinders shall not exceed the specified quantity as per OCP
9.57	These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent, place at work spot. The persons responsible for compliance of the safety code shall be named therein by the Contractor
9.58	To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangement made by the contract shall be open to inspection by the Engineer of the Engineer's Representative.
9.59	Keeping the work area clean/ free from debris, removed scaffoldings, scraps, insulation/sheeting wastage /cut pieces, temporary structures, packing woods etc. will be in the scope of the contractor. Such cleanings has to be done by contractor within quoted rate, on daily basis by an identified group. If such activity is not carried out by contractor / BHEL is not satisfied, then BHEL may get it done by other agency and actual cost alongwith BHEL overheads will be deducted from contractor's bill. Such decisions of BHEL shall be binding on the contractor.
9.60	Notwithstanding the above clauses there is nothing to exit the Contractor from the operations of any other Act or Rule in force in area of work in this respect. Provided always that all safety measures apart from those specifically provided in this agreement which are brought to the notice of the Contractor from time to time by the Engineer shall be complied by the Contractor. Provided further that

all consequences, damages, or losses arising by reason of any safety code shall be met with by the Contractor.

9.61 NON COMPLIANCE:-

NONCONFORMITY OF SAFETY RULES AND SAFETY APPLIANCES WILL BE VIEWED SERIOUSLY AND BHEL HAS RIGHT TO IMPOSE FINES ON THE CONTRACTOR AS UNDER for every instance of violation noticed:

SN	Violation of Safety Norms	Fine (in Rs)
01	Not Wearing Safety Helmet	50/- *
02.	Not wearing Safety Belt or not anchoring life line	100/-*
03	Not wearing safety shoe	100/-*
04	Not keeping gas cylinders vertically	100/-
05	Not using flash back arrestors	50/-
06	Not wearing gloves	50/- *
07.	Grinding Without Goggles	50/- *
08.	Not using 24 V Supply For Internal Work	500/-
09.	Electrical Plugs Not used for hand Machine	100/-
10.	Not Slinging property	200/-
11.	Using Damaged Sling	200/-
12.	Lifting Cylinders Without Cage	500/-
13.	Not Using Proper Welding Cable With Lot of Joints And Not Insulated Property.	200/-
14.	Not Removing Small Scrap From Platforms	200/-
15.	Gas Cutting Without Taking Proper Precaution or Not Using Sheet Below Gas Cutting	200/-
16.	Not Maintaining Electric Winches Which are Operated Dangerously	500/-
17.	Improper Earthing Of Electrical T&P	500/-
18	No or improper barricading	500/-
19.	Activity carried out without Safety work permit (Height work, Lifting activity, Hot work-each person/case)	1000/-
20.	Accident Resulting in Partial Loss in Earning Capacity	25,000/- per victim

	21.	Fatal Accident/Accidents Resulting in total loss in Earning Capacity	1,00,000/- per victim #

Legend:-*: per head,
#: or as deducted by Customer whichever is higher

Any other non-conformity noticed not listed above will also be fined as deemed fit by BHEL. The decision of BHEL engineer is final on the above. The amount will be deducted from running bills of the contractor. The amount collected above will be utilized for giving award to the employees who could avoid accident by following safety rules. Also the amount will be spent for purchasing the safety appliances and supporting the safety activity at site.

9.61 CITATION:-If safety record of the contractor in execution of the awarded job is to the satisfaction of safety department of BHEL, issue of an appropriate certificate to recognize the safety performance of the contractor may be considered by BHEL after completion of the job

9.62 MEMORANDUM OF UNDERSTANDING

After Award Of Work, Contractors Are Required To Enter Into A Memorandum Of Understanding As Given Below:

Memorandum of Understanding

- BHEL, Power Sector _____ Region is committed to Health, Safety and Environment Policy (EHS Policy).
- M/s _____ do hereby also commit to the same EHS Policy while executing the Contract Number _____
- M/s _____ shall ensure that safe work practices not limited to the above are followed by all construction workers and supervisors. Spirit and content therein shall be reached to all workers and supervisors for compliance.
- BHEL will be carrying out EHS audits twice a year and M/s _____ shall ensure to close any non-conformity observed/reported within fifteen days.

Signed by authorized representative of M/s ----------

	Name : Place & Date:

10.0	RA Bill Payments
10.1	The contractor shall submit his monthly RA bills with all the details required by BHEL on specified date every month covering progress of work in all respects and areas for the previous calendar month.
10.2	Mode of payment and measurement of work completed shall be as per relevant clauses of General Conditions of Contract
10.3	Release of payment in each running bill including PVC Bills where ever applicable will be restricted to 95% of the value of work admitted as per stages of progressive pro rata payments.
10.4	The 5% thus remaining shall be treated as 'Retention Amount' and shall be released as per terms specified in the General Conditions of Contract.
10.5	The payment for running bills will normally be released within 30 days of submission of running bill complete in all respects with all documents. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc and other dues in the meanwhile. In case of Civil works, 60% of RA Bills complete and correct in all respects and certified by BHEL Engineer, shall be paid within 15 days of receipt. Balance payment shall be within 30 days.
10.6	BHEL shall release payment through Electronic Fund Transfer (EFT)/RTGS. In order to implement this system, Contractor to furnish details pertaining to his Bank Accounts where proceeds will be transferred through BHEL's banker, as per prescribed formats: Note: BHEL may also choose to release payment by other alternative modes as applicable
10.7	Paying Authority shall be the Construction Manager of the Site. Any change in the paying Authority shall be intimated to the Contactor accordingly.

11.0	Performance Monitoring
11.1	Performance of the contractor is monitored through various reports/reviews and shall be jointly evaluated every month for unit wise identified packages as per prescribed formats. Based on the net weighted scores obtained, Contractors shall be rated 'Good' or 'Satisfactory' or 'Unsatisfactory'
11.2	In case of any dispute on performance rating and the contractor refuses to sign on the performance rating given by BHEL package Incharge, the same shall be reviewed by BHEL site Incharge/Construction Manager and his decision shall be final.
11.3	Release of RA Bills will be contingent upon joint evaluation of performance
11.4	Performance of the contractor will be taken into consideration for assessing the capacity of the bidder to execute future jobs under tender, as detailed in the Notice Inviting Tender. Risk of non evaluation or non availability of the Monthly performance evaluation reports is to be borne by the Bidder.
11.5	In case of 'Unsatisfactory performance' for a continuous period of three or more months for a package or packages, BHEL has the right to get the balance works executed at the risk and cost of the contractor.
11.6	In case of 'Unsatisfactory performance' in a financial year, BHEL reserves the right to put on hold such Contractors for a period of six months for similar package or similar packages

12.0	Suspension of Business dealings
12.1	BHEL reserves the right to take action against contractors who fail to perform or indulge in malpractices, by suspending business dealings with them.
12.2	Suspension could be in the form of 'Hold', 'De-listing' or 'Banning' a contractor.
12.3	A bidder may be put on HOLD for a period of 6 months, for future tenders for specific works on the basis of one or more of the following reasons: a) Bidder does not honour his own offer or any of its conditions within the validity period. b) Bidder fails to respond against three consecutive enquires of BHEL. c) After placement of order, Bidder fails to execute a contract. d) Bidder fails to settle sundry debt account, for which he is legitimately liable, within one year of its occurrence. e) Bidder's performance rating falls below 60% in specific category (more fully described in chapter 'Performance Monitoring') f) Bidder works are under strike/ lockout for a long period.
12.4	A Bidder may be de-listed from the list of registered Bidders of the region for a period of 1 year on the basis of one or more of the following reasons:- a) Bidder tampers with tendering procedure affecting ordering process or commits any misconduct which is contrary to business ethics. b) Bidder has substituted, damaged, failed to return, short returned or unauthorizedly disposedoff materials/ documents/ drawings/ tools etc of BHEL. c) Bidder no longer has the technical staff, equipment, financial resources etc. required to execute the orders/ contracts.
12.5	A Bidder can be banned from doing any business with all Units of BHEL for a period of 3 years on the basis of one or more of the following reasons: a) Bidder is found to be responsible for submitting fake/ false/ forged documents, certificates, or information prejudicial to BHEL's interest. b) In spite of warnings, the Bidder persistently violates or circumvents the provisions of labour laws/ regulations/ rules and other statutory requirements. c) Bidder is found to be involved in cartel formation

	d) The Bidder has indulged in malpractices or misconduct such as bribery, corruption and fraud, pilferage etc which are contrary to business ethics. e) The Bidder is found guilty by any court of law for criminal activity/ offences involving moral turpitude in relation to business dealings. f) The Bidder is declared bankrupt, insolvent, has wound up or been dissolved; i.e ceases to exist for all practical purposes. g) Bidder is found to have obtained Official Company information/ documentation by questionable means. h) Communication is received from the administrative Ministry of BHEL to ban the Bidder from business dealings.
12.6	Contracts already entered with a contractor before the date of issue of order of 'HOLD' or 'DE-LISTING' shall not be affected.
12.7	All existing contracts with a 'BANNED' contractor shall normally be short closed
12.8	Once the order for suspension is passed, existing offers/new offers of the contractor shall not be entertained
12.9	The above guidelines are not exhaustive but enunciate broad principles governing action against contractors

भारत हेवी इलेक्ट्रिकल्स लिमिटेड

(भारत सरकार का उपक्रम)

BHARAT HEAVY ELECTRICALS LIMITED

(A Govt. of India Undertaking)

HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SUB-CONTRACTORS FOR 2X660MW MAITREE SUPER THERMAL POWER PROJECT

DOCUMENT NO; HSEP:14-MAITREE: VENDOR DATE:05.05.16

HSE DEPARTMENT
Plot No. 9/1, Block-DJ,Sector-II, Salt Lake, Kolkata – 700 091
Phone no. 033-23398049, Web : www.jantermanter.com

SPECIAL NOTES

- **This document supersedes section-IX of SCC or any such HSE related document in the tender**

- This document is a living document and subject to changes as many times as desired by BHEL and customer, BIFCL and project consultant Fichtner GmbH. Any cost implication shall be absorbed by the contractor.
- This project is a highly eco-sensitive project. There will be regular assessment of impact of the site activities on ecology. The contractors shall be obligated to take corrective actions, if any, as advised by BHEL/ Customer/ any Statutory body.
- The contractor shall ensure that only persons with required competence and sound health are engaged at the site. No deviation shall be allowed. The person and the contractor shall be in possession of relevant documents in support of competence and health condition for producing before BHEL for verification, whenever demanded.
- It may take minimum 2 days for finishing health check-up and induction training before a gate-pass/ ID is issued. In a day, maximum 30 persons can be given induction training. Mobilization shall be planned accordingly
- Method statement and Job Safety Analysis shall be carried out for all hazardous jobs and critical lifts
- As the site is located in an area which is prone to adverse weather condition, the contractors shall have infrastructure for fast evacuation of people
- Contractor for Boiler-1, Chimney-1 and Cooling Tower-1 shall provide one double-mounted siren at a height covering a dia of about 2KM for alerting site workers in case of emergency.
- The following basic instruments shall be available with contractors HSE team if their job involves:
  - Height work: Binoculars
  - Confined space work: Oxy-meter
  - Night work: Lux meter, Torch light
  - Checking of ELCBs: ELCB tester
  - Checking of earthing: Megger

  Apart from these, DB meter, Alcohol Breath analyzer, and other HSE promotional items shall be made available by the contractors as and when demanded by BHEL.

- Well-equipped sick room shall be set up and ambulance shall be made available by specific contractors as provided for in the work order of certain packages. However, the operational expenses can be shared by those contractors who will avail services of these facilities.

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1.0 PURPOSE

1.1 The purpose of this HSE Plan is to provide for the systematic identification, evaluation, prevention and control of general workplace hazards, specific job hazards, potential hazards and environmental impacts that may arise from foreseeable conditions during installation and servicing of industrial projects and power plants.

1.2 This document shall be followed by BHEL's subcontractors at all installation and servicing sites. In case customer specific documents are to be implemented, this document will be followed in conjunction with customer specific documents.

1.3 Although every effort has been made to make the procedures and guidelines in line with statutory requirements, in case of any discrepancy relevant statutory guidelines or EHSS contract requirements must be followed of which the most stringent shall apply

1.4 In case the customer has any specific requirement, the same is to be fulfilled.

1.5 We will promote and maintain a safe, healthy and environmentally compliant workplace for all employees, contractors, visitors and any others that may be affected by construction activities, and strive for a "GOAL of ZERO REPORTABLE INCIDENTS" on the project.

2.0 SCOPE

The document is applicable for installation and commissioning of 2x660MW SETS as per the relevant contractual obligations, and provides the minimum HSE requirements to be followed at the project site and labour colony. As an item of note, this HSE Plan is considered a living document and will be revised as/if necessary to ensure that contractual and regulatory compliance requirements are met during the performance of work on the project

3.0 OBJECTIVES

The HSE Plan reflects that BHEL places high priority upon the Occupational Health, Safety and Environment at workplaces.

- Ensure the Health and Safety of all persons at work site is not adversely affected by the work.
- Ensure protection of environment of the work site.
- Comply at all times with the relevant statutory and contractual HSE requirements.
- Provide trained, experienced and competent personnel. Ensure medically fit personnel only are engaged at work.
- Provide and maintain plant, places and systems of work that are safe and without risk to health and the environment.
- Provide all personnel with adequate information, instruction, training and supervision.
- Effectively control, co-ordinate and monitor the activities of all personnel on the Project sites including subcontractors in respects of HSE.
- Establish effective communication on HSE matters with all relevant parties involved in the Project works.
- Ensure that all work planning takes into account all persons that may be affected by the work.
- Ensure fitness testing of all T&Ps/Lifting appliances like cranes, chain pulley blocks etc. are to be certified by competent authority.
- Ensure timely provision of resources to facilitate effective implementation of HSE requirements.
- Ensure continual improvements in HSE performance
- Ensure conservation of resources and reduction of wastage.

- Capture the data of all incidents including near misses, process deviation etc. Investigate and analyze the same to find out the root cause.
- Ensure timely implementation of correction, corrective action and preventive action.

3.1 Goals and Targets -

- To achieve “Zero Fatal Incident at Site”
- 100% compliance of all legal/statutory requirements related to EHS.
- 100% Health, Safety and Environmental Induction training attendance for all employees and sub-contractors.
- 100% High Risk activities to be carried out only after approved Method Satement, HIRA/JSA and Permit to Work are implemented.
- 100% PPEs compliance in high & medium risk activities.
- 100% incident reporting, recording and reviewing for corrective & preventive actions.
- A monthly review shall be scheduled and conducted to assess HSE program compliance and to close any recognized gaps to improve safety management and incident prevention.

4.0 BHEL POWER SECTORHEALTH, SAFETY & ENVIRONMENT POLICY

In BHEL,Health,Safety and Environment (HSE) responsibilities are driven by our commitment to protect our employees and people we work with,community and environment. BHEL believes in zero tolerance for unsafe work/non-conformance to safety and in minimizing environmental footprint associated with all its business activities. We commit to continually improve our HSE performance by:

- Developing safety and sustainability culture through active leadership and by ensuring availability of required resources.
- Ensuring compliance with applicable legislation, regulations and BHEL systems.
- Taking up activities for conservation of resources and adopting sound waste management by following Reduce/Recycle/Reuse approach.
- Continually identifying, assessing and managing environmental impacts and Occupational Health & Safety risks of all activities,

products and services adopting approach based on elimination/substitution/reduction/control.

- Incorporating appropriate Occupational Health, Safety and Environment criteria into business decisions, design of products & systems and for selection of plants, technologies and services.

- Imparting appropriate structured training to all persons at workplace and promoting awareness amongst customers, contractors and suppliers on HSE issues.

- Reviewing periodically this policy and HSE Management Systems to ensure its relevance, appropriateness and effectiveness.

- Communicating this policy within BHEL and making it available to interested parties.



June 5, 2018

Atul Sobti
Chairman & Managing Director

5.0 TERMS AND DEFINITIONS

5.1 **DEFINITIONS**

5.1.1 **INCIDENT**

Work- related event(s) in which an injury or ill health (regardless of severity) or fatality occurred, or could have occurred.

5.1.2 **NEAR MISS**

An incident where no ill health, injury, damage or other loss occurs, but it had a potential to cause, is referred to as "Near-Miss".

5.1.3 **MAN-HOUR WORKED**

The total number of employee hours worked by all employees including subcontractors working in the premises. It includes managerial, supervisory, professional, technical, clerical and other workers including contract labours. Man-hours worked shall be calculated from the payroll or time clock recorded including overtime. When this is not feasible, the same shall be estimated by multiplying the total man-days worked for the period covered by the number of hours worked per day. The total number of workday for a period is the sum of the number of men at work on each day of period. If the daily hours vary from department to department separate estimate shall be made for each department and the result added together.

5.1.4 **FIRST AID CASES**

First Aid includes:

- Visit to a physician or a licensed health care professional solely for observation or counselling
- Conduct of diagnostic procedures like X rays, blood test including the prescription medications used solely for diagnostic purposes (e.g. eye drops to dilate eyes)
- Using a non-prescription medicine at non-prescription strength (for medication available in both prescription and non-prescription form as recommendation by a physician or other licensed health care professional to use a non-prescription medication at prescription strength is considered medical treatment for record keeping purposes};
- Administering tetanus immunizations (other immunizations, such as Hepatitis B vaccine or rabies vaccine, are considered medical treatment);
- Cleaning, flushing or soaking wounds on the surface of the skin;
- Using wound coverings such as bandages, Band-Aids TM, gauze pads, etc.;or using butterfly bandages or Steri-StripsTM (other wound closing devices such as sutures, staples, etc., are considered medical treatment);
- Using hot or cold therapy;
- Using any non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc. (devices with rigid stays or other systems designed to immobilize parts of the body are considered medical treatment for record-keeping purposes);
- Using temporary immobilization devices while transporting an accident victim (e.g., splints, slings, neck collars, back boards, etc.).
- Drilling of a fingernail or toenail to relieve pressure, or draining fluid from a blister;
- Using eye patches;
- Removing foreign bodies from the eye using only irrigation or a cotton swab;
- Removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs or other simple means;
- Using finger guards;
- Using massages (physical therapy or chiropractic treatment are considered medical treatment for recordkeeping purposes); or
- Drinking fluids for relief of heat stress.

No other treatments are considered first aid.

5.1.5 **INJURY OTHER THAN FIRST-AID: (As per Chapter VII, Rule 69 of Bangladesh Labour Rules, 2015)**

Notice to be given of any accident. When any accident occurs in an establishment causing loss of life or bodily injury, or an accidental explosion, ignition, outbreak of fire or irruption of water or fumes occurs, the employer shall give notice of the occurrence to the Inspector within following 3 (three) working days [:]
Provided that the factory authority shall, immediately after the occurrence of such incident, inform the matter to the Government, Fire Service, Directorate of Inspection of Factories and Establishments, Police Station, and if required, the nearby hospital or government-private medical service establishment, through telephone, mobile phone, SMS or fax, in order to take immediate necessary action to minimize potential damages or bring the situation under control.]

Fatal incident and Serious Incident:
If the victim dies in the incident, it will be treated as a fatal incident.
In this case the injured person is likely to be disable for more than 20 days to perform his duty, it will be treated as Serious Incident. In these cases, the intimation will be made as described above.

Minor Incident: (As per Chapter VII , Rule 70 of Bangladesh Labour Rules, 2015)
Where an accident mentioned above causes bodily injury resulting the compulsory absence from work of the person injured for a period exceeding 48 (forty-eight) hours, but not exceeding 20days. The management will inform the concerned statutory authority within 7 days in form-27 under rule 69/1/(A), (B) and (C) of Bangladesh Labour Rules, 2015.

6.0 HSE ORGANISATION

Number of HSE officers:

The subcontractor must deploy one HSE officer for every 500 workers or part thereof in each package. If there are more than one HSE officer, one shall be designated as head/HSE. No Of HSE stewards shall be one for every 100 workers deployed

Deployment: The subcontractor should deploy sufficient HSE officers and HSE-steward/supervisor, as per requirement given above, since initial stage and add more in proportion to the added strength in work force. Any delay in deployment of HSE Officer will attract a penalty of BNR.40,000/- per man month for the delayed period.

6.1 QUALIFICATION FOR HSE PERSONNEL

Sl.no	Designation	Minimum Qualification	Experience
1	Safety officer (Construction Agency)	Degree or Diploma in Engineering with diploma in Industrial Safety with construction safety as one of the subjects. If Degree/Diploma in safety is from India, it must be recognized by AICTE/SCTE&VT. NEBOSH IGC /IOSH diploma also acceptable	Minimum two years for degree holder and five years for diploma holder in the field of Construction of power plant/ major industries

6.2 RESPONSIBILITIES

6.2.1 SITE IN -CHARGE OF SUBCONTRACTOR

- Shall engage qualified safety officer(s) as per clause 6.1

- Shall adhere to the rules and regulations mentioned in this code, practice very strictly in his area of work in consultation with his concerned engineer and the safety coordinator.
- Shall screen all workmen for health and competence requirement before engaging for the job and periodically thereafter as required.
- Shall not engage any employee below 18 years.
- Shall arrange for all necessary PPEs like safety helmets, belts, full body harness, shoes, face shield, hand gloves etc. before starting the job. Shall ensure that no working men/women carry excessive weight more than stipulated in Factory Rule Regulation R57.
- Shall ensure that all T&Ps engaged are tested for fitness and have valid certificates from competent authorities.
- Shall ensure that provisions stipulated in contract Labour Regulation Act 1970, Chapter V C.9, canteen, rest rooms/washing facilities to contracted employees at site.
- Shall adhere to the instructions laid down in Operation Control Procedures (OCPs) available with the site management.
- Shall ensure that person working above 2.0 meter should use Safety Harness tied to a life line/stable structure.
- Shall ensure that materials are not thrown from height. Cautions to be exercised to prevent fall of material from height.
- Shall report all incidents (Fatal/Major/Minor/Near Miss) to the Site engineer /HSE officer of BHEL.
- Shall ensure that Horseplay is strictly forbidden.
- Shall ensure that adequate illumination is arranged during night work.
- Shall ensure that all personnel working under subcontractor are working safely and do not create any Hazard to self and to others.
- Shall ensure display of adequate signage/posters on HSE.
- Shall ensure that mobile phone is not used by workers while working.
- Shall ensure conductance of HSE audit, mock drill, medical camps, induction training and training on HSE at site.
- Shall ensure full co-operation during HQ/External /Customer HSE audits.
- Shall ensure submission of look-ahead plan for procurement of HSE equipment's and PPEs as per work schedule.
- Shall ensure good housekeeping.
- Shall ensure adequate valid fire extinguishers are provided at the work site.
- Shall ensure availability of sufficient number of toilets /restrooms and adequate drinking water at work site and labour colony.
- Shall ensure adequate emergency preparedness.
- Shall be member of site HSE committee and attend all meetings of the committee

6.2.2 **HEALTH, SAFETY AND ENVIRONMENT OFFICER OF SUBCONTRACTOR**

- Carry out safety inspection of Work Area, Work Method, Men, Machine & Material, P&M and other tools and tackles.

- Facilitate inclusion of safety elements into Work Method Statement.
- Highlight the requirements of safety through Tool-box / other meetings.
- Help concerned HOS to prepare Job Specific instructions for critical jobs.
- Conduct investigation of all incident/dangerous occurrences & recommend appropriate safety measures.
- Advice & co-ordinate for implementation of HSE permit systems, OCPs & MPs.
- Convene HSE meeting & minute the proceeding for circulation & follow-up action.
- Plan procurement of PPE & Safety devices and inspect their healthiness.
- Report to PS Region/HQ on all matters pertaining to status of safety and promotional program at site level.
- Facilitate administration of First Aid
- Facilitate screening of workmen and safety induction.
- Conduct fire Drill and facilitate emergency preparedness
- Design campaigns, competitions & other special emphasis programs to promote safety in the workplace.
- Apprise PS– Region on safety related problems.
- Notify site personnel non-conformance to safety norms observed during site visits / site inspections.
- Recommend to Site In charge, immediate discontinuance of work until rectification, of such situations warranting immediate action in view of imminent danger to life or property or environment.
- To decline acceptance of such PPE / safety equipment that do not conform to specified requirements.
- Encourage raising Near Miss Report on safety along with, improvement initiatives on safety.
- Shall work as interface between various agencies such customer, package-in-charges, subcontractors on HSE matters

7.0 PLANNING BY SUBCONTRACTOR

7.1 MOBILISATION OF MACHINERY/EQUIPMENT/TOOLS BY SUBCONTRACTOR

- As a measure to ensure that machinery, equipment and tools being mobilized to the construction site are fit for purpose and are maintained in safe operating condition and complies with legislative and owner requirement. A documented daily prior to use inspection checklist shall be completed by the end user and periodic inspection shall be arranged by in-house competent authority for acceptance as applicable. All Tools & Plants shall be certified by a third party COMPETENT person before these are put to use as per Rule 60, 75 and schedule 3 of Bangladesh Labor Rules. As far as possible, this certification shall be made available to site HSE function by the contractor before entry into the site. The certification shall be renewed annually, otherwise, the item shall be withdrawn from the work area. The fitness of T&Ps shall be monitored by site HSE quarterly and alert/ reminder issued to the concerned agency and BHEL package in-charge.

- The machinery and equipment to be embraced for this purpose shall include but not limited to the following:

  - Mobile cranes.
  - Side Booms.
  - Grinding machine.
  - Drilling machine.
  - Air compressors.

- Welding machine.
- Generator sets.
- Dump Trucks.
- Excavators.
- Dozers
- Grit Blasting Equipment.
- Hand and power tools.

- Subcontractor shall notify the engineer, of his intention to bring on to site any equipment or any container, with liquid or gaseous fuel or other substance which may create a hazard. The Engineer shall have the right to prescribe the condition under which such equipment or container may be handled and used during the performance of the works and the subcontractor shall strictly adhere to such instructions. The Engineer shall have the right to inspect any construction tool and to forbid its use, if in his opinion it is unsafe. No claim due to such prohibition will be entertained.

7.2 MOBILISATION OF MANPOWER BY SUBCONTRACTOR

- As a measure to ensure that manpower being mobilized to the construction site is fit and competent for safe working, screening arrangement shall be made by the sub-contractors to fulfill contractual as well as legislative requirement.
- Examination of medical fitness shall be conducted through qualified medical professional for all workers to be deployed (pre-employment). Post-employment medical check-up shall be done for persons engaged in hazardous jobs at a regular interval as per legislations.
- Ensure that the regulatory requirements of excessive weight limit (to carry/lift/ move weights beyond prescribed limits) for male and female workers are complied with.
- Appropriate accommodation to be arranged for all workmen in hygienic condition.
- Addiction and substance abuse shall also be checked at pre-employment stage and later at random

7.3 PROVISION OF PPEs

- Personnel Protective Equipment (PPEs), in adequate numbers, will be made available at site & their regular use by all concerned will be ensured. PPE details shall be maintained as per Form-23
- The following matrix recommends usage of minimum PPEs against the respective job.

Sl. No	Type of work	PPEs
1	Concrete and asphalt mixing	Nose mask, hand glove, apron and gum boot
2	Welders/Grinders/ Gas cutters	Welding/face screen, apron, hand gloves, nose mask and ear muffs if noise level exceeds 90dB. Helmet fitted with welding shield is preferred for welders
3	Stone/ concrete breakers	Ear muffs, safety goggles, hand gloves
4	Electrical Work	Rubber hand glove, Electrical Resistance shoes,Apron
5	Insulation Work	Respiratory mask, Hand gloves, safety goggles
6	Work at height	Double lanyard full body harness, Fall arrestor (specific cases)
7	Grit/Sand blasting	Blast suit, blast helmet, respirator, leather gloves
8	Painting	Plastic gloves, Respirators (particularly for spray painting)
9	Radiography	As per BARC guidelines

The PPEs and other related safety equipments shall conform to the relevant indian or equivalent Europeon or American standards as below:

BS EN 397-2012	Industrial Safety Helmets.
BS EN 60903:2003	Insulating material gloves for electrical purposes.
BS EN 374-3: 2003	Protective Gloves- Chemical Penetration
BS EN 388:2003	Protective Gloves- Mechanical Risks
BS EN 407: 2004	Protective Gloves- heat and fire
BS EN 420:2003	Gloves- general requirement
BS EN-20345	Industrial safety footwear
BS EN 166:2002	Eye protectors.
BS EN 352-1 & 2:2002	Ear Muff & Ear Plug
BS EN 175:1997	Eye & Face protection during welding
BS EN 361:2002	Fall Arrest Full Body Harness
BS EN 360:2002	Retractable type fall arresters
BS EN 795:2012	Lifeline System
BS EN 358;1999	Work Resistant Harness
BS EN 813:2008	Seat harness
BS EN 1498+ others	Rescue Harness+ other items of a rescue kit
BS EN 353:2002	Detachable fall arrester
BS EN 149: 2001	Filtering Half masks tp protect against particles
BS EN 471:2003	High Visibility Clothing

The list is not exhaustive. The safety officer may demand additional PPEs based on specific requirement.

- Where workers are employed in sewers and manholes, which are in use, the subcontractor shall ensure that the manhole covers are opened and ventilated at least for an hour before the workers are allowed to get into manhole, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent incident to the public
- . The visitors shall also use Reflective Vests, Helmet and any other PPEs as deemed appropriate for the area of work.

Colour scheme for Helmets:

1. Workmen: Yellow
2. Safety staff: Green or white with green band
3. Electrician: Red
4. Others including visitors: White

- All the PPEs shall be checked for its quality before issue and the same shall be periodically checked. The users shall be advised to check the PPEs themselves for any defect before putting on. The defective ones shall be repaired/ replaced.
- The issuing agency shall maintain register for issue and receipt of PPEs.
- The Helmets shall have logo or name (abbreviation of agency name permitted) affixed or printed on the front.
- The body harnesses shall be serial numbered.
  In case, contractor fails to provide PPEs in time, BHEL/Customer may provide the same and the cost as deemed appropriate by BHEL/Customer shall be debited

7.4 ARRANGEMENT OF INFRASTRUCTURE

7.4.1 DRINKING WATER

- Adequate drinking water shall be provided and maintained at suitable places at different elevations.
- Chilled water shall be made available from 1st April to 30th Sep of the year
- Container should be labeled as " Drinking Water"
- Cleaning of the storage tank shall be ensured at least once in 1 month indicating date of cleaning and next due date. Mild cleaning detergents as used for cleaning vessels shall be applied and scrubbers (3M or equivalent) shall be used for removing scales and deposits on the inside surface. The tank shall be thoroughly cleaned with potable water only before it is refilled.
- Employees should use their own cup for collecting water-no cup shall be shared
- Potability of water should be tested as per standard at least once in every quarter as per Rule 50(5) of Bangladesh Labour Rules, 2015.
- Apart from above, those who are engaged in work producing significant heat , shall be served saline water or Sarbat at the rate of 2litres perday
- Storage of drinking water shall be min 6M away from any toilet and washroom

7.4.2 WASHING FACILITIES (As per Chapter VIII, Rule 86 of Bangladesh Labour Rules, 2015)

- In every workplace, adequate and suitable facilities for washing shall be provided and maintained.
- Separate and adequate cleaning facilities shall be provided for the use of male and female workers. Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition and dully illuminated for night use.
- Overalls shall be supplied by the subcontractor to the workmen and adequate facilities shall be provided to enable the painters and other workers to wash during the cessation of work.
- If water used for washing is not potable, it shall be marked "Do Not Drink" in English and Bangla

7.4.3 LATRINES AND URINALS (As per Chapter V, Rule 51, Schedule II of Bangladesh Labour Rules, 2015)

- Latrines and urinals shall be provided in every work place based on strength of workmen at the rate of one toilet seat and one urinal for every 50 female workmen and that for every 60 male workmen
- Urinals shall also be provided at different elevations.
- They shall be adequately illuminated and shall be maintained in a clean and hygienic condition at all times, by appointing designated person.
- Separate facilities shall be provided for the use of male and female worker if any.
- Hand-wash facility shall be provided

7.4.4 **PROVISION OF SHELTER DURING REST**

Proper Shed & Shelter shall be provided for rest during break::

7.4.5 **MEDICAL FACILITIES (Sharing with other sub-contractors at site is permitted)**

7.4.5.1 **Sick Room (As per rule 77) (As stipulated in the contract)**

- A Sick room shall be ensured/identified at site with basic facilities as per subrule 77(5) for handling medical emergencies. The sick room can be run independently or jointly developed on proportionate sharing basis with permission from BHEL. It shall be equipped with one rigid stretcher, one foldable stretcher, one rescue basket stretcher, a wheel chair, at least 2 beds with separator and all basic facilities that a doctor needs for basic health check-up and quick referral including those listed in sub-rule 77(5) of Bangladesh Labour Rules,2015
- A qualified medical professional, not less than a Degree in Medical Science (Allopathy) as recognized in Bangladesh , shall be deployed at the sick room along with sufficient support staff
- Medical waste shall be disposed as per prevailing legislation
- Ambulance, **as stipulated in the contract**, shall be made available at the site along with a trained driver and shall be equipped with at least an Oxygen cylinder along with dispensation system, first-aid box, a portable ABC type fire extinguisher.

7.4.5.2 **FIRST AIDER**

- Must have a competence certificate in First-aid issued by Bangladesh Red Cross Society/ Bangladesh St Johns Ambulance/ any other agency which is recognised by the Govt of Bangladesh
- Ensure availability of one Qualified First-aider throughout the working hours for every 150 workmen engaged as per clause 89 of Bangladesh Labour Law
- Every injury shall be treated, recorded and reported.
- Refresher course on first aid shall be conducted as necessary.
- List of Qualified first aiders and their contact numbers should be displayed at conspicuous places.

7.4.5.3 **FIRST AID BOX (as per rule 76(2) of Bangladesh Labour Rules.2015))**

- The subcontractor shall provide necessary first aid facilities. At every work place first aid facilities shall be provided and maintained.

- The first aid box shall be kept by first aider who shall always be readily available during the working hours of the work place. His name and contact no to be displayed on the box.
- The first aid boxes should be placed at various elevations so as to make them available within the reach and at the quickest possible time.
- The first aid box shall be distinctly marked with a Green Cross on white background.

- Details of contents of first aid box is given in Annexure No. 01
- Monthly inspection of First Aid Box shall be carried out by the owner as per format no. HSEP:14-F01
- The subcontractor should conduct periodical first –aid classes to keep his supervisor and Engineers properly trained for attending to any emergency.

7.4.5.4 **HEALTH CHECK UP**

The persons engaged at the site shall undergo mandatory health checkup from a qualified doctor as per the **format no. HSEP:13-F03 and Health Record 31-A** before induction. The persons engaged in the following works shall undergo health checkup at least once in a year:

a. Height workers
b. Drivers/crane operators/riggers
c. Confined space workers
d. Shot/sand blaster
e. Welding and Gas cutting personnel

7.4.6 **PROVISION OF CANTEEN FACILITY**

- Canteen facilities shall be provided for the workmen of the project inside the project site.
- Proper cleaning and hygienic condition shall be maintained.
- Proper care should be taken to prevent biological contamination.
- Adequate drinking water should be available at canteen.
- Fire extinguisher shall be provided inside canteen.
- Regular health check-up and medication to the canteen workers shall be ensured.

7.4.7 **PROVISION OF ACCOMODATION/LABOUR COLONY**

- The subcontractor shall arrange for the accommodation of workmen at nearby houses or by making a labour colony.
- Regular housekeeping of the labour colony shall be ensured.
- Proper sanitation and hygienic conditions shall be maintained and inspected once in a month.
- Adequate number of toilet facilities with water for workers as per norms to be provided. There must be separate toilet for women workers. Drinking water and electricity to be provided at the labour colony.
- Potable water shall be tested once in six months as per IS10500.
- MSDS of LPG shall be put up prominently. This shall be included in the induction training as well.
- The labour colony shall be appropriately secure so that only authorized persons have access to it.
- First aid facility shall be provided in the labour camp under the administration of trained first aiders.
- Common kitchen facilities to be ensured and cooking inside the room to be avoided. The canteen should be maintained in hygienic condition.
- No. of occupants in room rooms to be as per the standards practice.
- Awareness training shall be organized for the workers regarding fire safety, safe use of LPG, Health & Hygiene, and electrical safety etc. on monthly basis.
- Adequate drainage and approach roads to be done.
- Perimeter fencing, security and main gate entrance shall be established and maintained.
- Monthly inspection to be done to ensure the compliance and for opportunity of improvement.
- Workers shall not be transported in open vehicles i.e. trailers, truck beds etc within project boundaries which includes the labor colony.

7.4.8 **PROVISION OF EMERGENCY VEHICLE (in addition to Ambulance)**

Generally one vehicle (4 wheeler) is identified by each major package holder (sub-agency). Minor package holders are permitted to have a tie-up with major package holder

7.4.9 **PEST CONTROL**

Regular pest control should be carried out at all offices, mainly laboratories, canteen, labour colony and stores

7.4.10 GENERAL DISCIPLINE:

Workmen under influence of liquor or drug or any other intoxication shall not be permitted to work and sent out of the work area. Workmen shall not be permitted to smoke in work area. None shall be permitted to carry any arms or firearms. The workmen shall report to work on time and follow supervisor's instruction. Use of cell phone particularly in hazardous jobs shall be discouraged like height work, crane operation etc. Horseplay, willful violation of rules shall be dealt with suitable disciplinary action including suspension and termination. They shall be subjected to physical frisking or alcohol/drug test at random by security and security shall be authorized to take appropriate disciplinary action against any delinquent employee like throwing out of the gate for the day and so on. If any such employee returns to work, he shall be put through induction training once again.

7.4.11 **SCRAPYARD**

- In consultation with customer, scrap yard shall be developed to store metal scrap, wooden scrap, waste, hazardous waste.
- Scrap/Waste shall be segregated as Bio-degradable and non-bio-degradable and stored separately.

7.4.12 **ILLUMINATION (to be reviewed)**

- Adequate and suitable light shall be provided at all work places & their approaches including passage ways as per IS: 3646 (Part-II) or as per Bangladesh standard. Some recommended values are given below:

S. No.	Location	Illumination (Lux)
A.	**Construction Area**	
1.	Outdoor areas like store yards, entrance and exit roads	20
2.	Platforms	50
3.	Entrances, corridors and stairs	100
4.	General illumination of work area	150
5.	Rough work like fabrication, assembly of major items	150
6.	Medium work like assembly of small machined parts rough measurements etc.	300
7.	Fine work like precision assembly, precision measurements etc.	700
8.	Sheet metal works	200
9.	Electrical and instrument labs	450
B.	**Office**	
1.	Outdoor area like entrance and exit roads	20
2.	Entrance halls	150
3.	Corridors and lift cars	70
4.	Lift landing	150
5.	Stairs	100
6.	Office rooms, conference rooms, library reading tables	300
7.	Drawing table	450
8.	Manual telephone exchange	200

- Lamp (hand held) shall not be powered by mains supply but either by 24V or dry cells.
- Lamps shall be protected by suitable guards where necessary to prevent danger, in case of breakage of lamp.
- Emergency lighting provision for night work shall be made to minimise danger in case of main supply failure.

If the subcontractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instructions issued by the authorized BHEL official, BHEL shall have the right to take corrective steps at the risk and cost of the subcontractor

8.0 HSE TRAINING& AWARENESS (Trainer, venue and infrastructure shall be decided by site HSE team headed by BHEL site HSE head). Cost shall be borne by respective contractor alone or on sharing basis on case-to-case basis.

8.1 HSE INDUCTION TRAINING

All persons entering into project site shall be given HSE induction training by the HSE officer of BHEL /subcontractor before being assigned to work.
In-house induction training subjects shall include but not limited to:

- Briefing of the Project details.
- Safety objectives and targets.
- Site HSE rules.
- Site HSE hazards and aspects.
- First aid facility.
- Emergency Contact No.
- Incident reporting.
- Fire prevention and emergency response.
- Rules to be followed in the labour colony (if applicable)
- Proper safety wear & gear must be issued to all the workers being registered for the induction (i.e., Shoes/Helmets/Goggles/Leg guard/Apron etc.)
- They must arrive fully dressed in safety wear & gear to attend the induction.
- Any one failing to conform to this safety wear& gear requirement shall not qualify to attend.
- On completing attending subcontractor's in-house HSE induction, each employee shall sign an induction training form (format no. HSEP:14-F03) to declare that he had understood the content and shall abide to follow and comply with safe work practices. They may only then be qualified to be issued with a personal I.D. card, for access to the work site.

8.2 HSE TOOLBOX TALK

- HSE tool Box talk shall be conducted by frontline foreman/supervisor of subcontractor to specific work groups prior to the start of work. The agenda shall consist of the followings:
    - Details of the job being intended for immediate execution.
    - The relevant hazards and risks involved in executing the job and their control and mitigating measures.
    - Specific site condition to be considered while executing the job like high temperature, humidity, unfavorable weather etc.
    - Recent non-compliances observed.
    - Appreciation of good work done by any person.
    - Any doubt clearing session at the end.
- Record of Tool box talk shall be maintained as per format no. HSEP:14-F04

- Tool box talk to be conducted at least once a week for the specific work.

8.2.1 **PRE JOB BRIEFING**

- A separate documented daily pre job briefing must be conducted at the actual job/work site location with the supervisor and work crew, to cover working environment/conditions, safe work practices for the activities to be carried out, required PPE and review of the work package, JSA and permit requirements. Each crew member and the supervisor will sign-off on the pre job briefing form, and form will be submitted to the HSE department at the end of each shift

8.3 **TRAINING ON HEIGHT WORK**

Training on height work (3m and above from ground) shall be imparted to all workers working at height by in-house/external faculty at least twice in a year. Fall protection training must involve as much hands-on activity with the equipment as possible. The training shall include following topics:

- Fall hazards associated with the elevated work.
- Elements of the fall protection systems utilized
- Requirement for 100% tie-off when working at or above 6' or 2m.
- Body Harnesses of at least a five-point configuration shall be used in all fall arrest systems. The harness Dee-ring shall have a minimum tensile strength of 5,000 pounds (22.2 kN).
- Fall protection equipment used. Use of PPEs – Harness proper fit, storage and compulsory tie-off of body harness to a firm support/life-line or anchorage point).
- Anchorage selection used for attachment of personal fall arrest systems shall be capable of supporting at least 5,000 pounds (22.2 kN) per employee attached, determined by a competent person.
- Use of fall arrester (shock abosbing lanyard), retractable fall arrester, life line, safety nets etc.
- Safe climbing through monkey ladders.
- Maintenance and Inspection of PPEs.(Daily/periodical)-color coding
- Medical fitness requirements.
- Mock drill on rescue at height.
- Dos & Don'ts during height work.For the workers & staff passed through the vertigo test, an additional sticker for height pass to be issued. This is applicable for those who are supposed to work or inspecting in BTG area, etc.

8.4 **HSE TRAINING DURING PROJECT EXECUTION**

- Other HSE training shall be arranged by BHEL/sub-contractor as per the need of the project execution and recommendation of HSE committee of site.
- The topics of the HSE training shall be as follows but not limited to:

  - Hazards identification and risk analysis (HIRA)
  - Work Permit System
  - Incident investigation and reporting
  - Fire fighting
  - First aid
  - T & Ps fitness and operation
  - Electrical safety
  - Welding, NDE & Radiological safety
  - Storage, preservation & material handling.

- A matrix shall be maintained to keep an up-to-date record of attendance of training sessions carried out.
- Skill labour (like fitter, electrician, rigger, scaffolder, carpenter etc.) will pass through the trade test (written and practical) conducted at site by the respective engineer & EHS officer. A pass sticker of qualified person to be marked on their ID Card/Gate Pass.

8.4.1 HSE Induction for Visitors: No visitors are allowed to visit the construction site without safety induction, mandatory PPEs, and designated escort.

8.4.2 Safety Induction for all (Staff/engineers/sub-Contractors officials/supervisors): It is compulsory to provide safety induction and briefing about the site HSE management systems, requirements and individual's roles & responsibility to carry out the activities is safe manner, before deploying them.

8.5 HSE PROMOTION-SIGNAGE, POSTERS, COMPETITION, AWARDS ETC

8.5.1 **Display of HSE posters and banners**

- Site shall arrange appropriate posters, banners, slogans in local/Hindi/English languages at work place

8.5.2 **Display of HSE signage as per Safety signages will be as per BS 5378 *safety signs & Colors* and BS 5499 graphical symbols & signs)**

- Appropriate HSE signage shall be displayed at the work area to aware workmen and passersby about the work going on and do's and don'ts to be followed

8.5.3 **Competition on HSE and award**

- Site will arrange different competition (slogan, poster, essay etc.) on HSE time to time (Safety day, BHEL day, World Environment Day etc.) and winners will be suitably awarded. Monthly Safety Day shall be celebrated every month preferably on a fixed date or day at the site jointly by all the contractors as a promotional measure on cost sharing basis

9.0 HSE COMMUNICATION

9.1 INCIDENT INVESTIGATION, REPORTING AND RECORDS:

Every incident including near-misses or injury of any kind and at any level of severity shall be immediately reported by the contractor's workmen in their work area to the safety officer/ HSE coordinator, site engineer or RCM. The site HSE co-ordinator shall be the nodal person for this purpose.

For any reportable injury to any employee or to the contractor's workmen, the safety officer/ HSE-coordinator shall report the incident in incident/ incident report, to CUSTOMER

In the case of serious injury requiring hospitalization or fatality, communication shall be made to customer through telecom immediately with submission of incident report within 24 hrs and detail investigation report may be forwarded in INCIDENT INVESTIGATION REPORT FORMAT within seven days.

Investigations into all reportable incidents shall be conducted using accepted Root Cause Analysis (RCA) methodology cause and effect, 5 why's, etc, to determine the Physical, Human and Latent Root Causes for these type accident/incidents. However, it is recommended to conduct preliminary investigations into all other incidents as a proactive measure.

Every contractor shall maintain record of incidents / incidents at site, and shall be available for inspection by representatives of statutory agencies / officials visiting site from BHEL/customer The Safety Officer/ HSE coordinator shall maintain these records.

26.1 Incident Investigation Procedure:

The purpose of the investigation procedure is to find out root cause of accidents / incidents & not to find out faults, so as to avoid recurrences, in future and share lessons learned.

RCM shall constitute a committee of at-least 2 site engineers within 24 hours of such incidents. The investigation shall aim at finding out the basic unsafe acts / conditions that have caused the incidents. Immediately after all appropriate emergency measures, first aid and damage containment measures have been taken, every effort shall be made by the committee to:

- Preserve physical evidence
- Take photographs
- Take statement from incident victim(s) and eyewitnesses and anyone who may have knowledge of possible cause(s) of incidents

The committee shall also recommend corrective measures to prevent recurrence of similar incidents

25.2 Initial Incident Response:

In the event of an accident/incident, the supervisor and employees at the work site must:

- Stop work and make the work area safe (mitigate or remove the exposure to the hazard)
- Provide first aid and activate "Emergency Medical Services" and other emergency services, e.g. fire or police, as required,
- Ensure the injured worker is transported to "Emergency Medical Services" for medical attention if necessary,
- Secure the site to ensure the protection of employees and the public and to aid with the investigation,
- Report the incident immediately to the local Site In-Charge.

26.3 **Incident Investigation Report:**

The investigation committee on completion of the all investigations shall prepare and submit the report to the RCM. The report shall also include corrective measures with assigned responsibility to be taken at site to prevent similar incidents in future. The RCM shall forward the copy of the investigation report to BHEL

9.2 HSE EVENT REPORTING

- Important HSE events like HSE training, Medical camp etc. organized at site shall be reported to BHEL site management in detail with photographs for publication in different in-house magazines
- Celebration of important days like National Safety Day, World Environment Day etc. shall also be reported as mentioned above.

10.0 OPERATIONAL CONTROL

All applicable OCPs (Operational control procedures) will be followed by subcontractor as per BHEL instructions. This will be done as part of normal scope of work. List of such OCPs is given below. In case any other OCP is found to be applicable during the execution of work at site, then subcontractor will follow this as well, within quoted rate. These OCPs (applicable ones) will be made available to subcontractor during work execution at site. However for reference purpose, these are kept with Safety Officer of BHEL

at the Power Sector Regional HQ, or available in downloadable format in the website, which may be refereed by subcontractor, if they so desire.

LIST OF OCPs

Safe handling of chemicals	Safety in use of cranes	Hydraulic test
Electrical safety	Storage and handling of gas cylinders	Spray insulation
Energy conservation	Manual arc welding	Trial run of rotary equipment
Safe welding and gas cutting operation	Safe use of helmets	Stress relieving
Fire safety	Good house keeping	Material preservation
Safety in use of hand tools	Working at height	Cable laying/tray work
First aid	Safe excavation	Transformer charging
Food safety at canteen	Safe filling of hydrogen in cylinder	Electrical maintenance
Illumination	Vehicle maintenance	Safe handling of battery system
Handling and erection of heavy metals	Safe radiography	Computer operation
Safe acid cleaning	Waste disposal	Storage in open yard
Safe alkali boil out	Working at night	For sanitary maintenance
Safe oil flushing	Blasting	Batching
Steam blowing	DG set	Piling rig operation
Safe working in confined area	Handling & storage of mineral wool	Gas distribution test
Safe operation of passenger lift, material hoists & cages	Drilling, reaming and grinding(machining)	Cleaning of hot well / de-aerator
Electro-resistance heating	Compressor operation	O&M of control of AC plant & system
Air compressor	Passivation	Safe Loading of Unit
Safe EDTA Cleaning	Safe Chemical cleaning of Pre boiler system	Safe Boiler Light up
Safe Rolling and Synchronization		

10.1 HSE ACTIVITIES

While planning for any activity the following documents shall be referred for infrastructural requirements to establish control measures: Only specific portion of the following documents may be shared as reference at discretion of BHEL.

1) HSE Procedure for Register of OHS Hazards and Risks
2) HSE Procedure for Register of Environmental Aspects and Impacts
3) HSE Procedure for Register of Regulations
4) Operational Control Procedures
5) HSE Procedure for Emergency Preparedness and Response Plan
6) Contract documents

10.2 WORK PERMIT SYSTEM

- The following activities shall come under Work Permit System
- a The following activities shall come under Work Permit System
  a. Height working
  b. Hot work in general and at height including handling of hazardous substance viz, Acetylene, Oxygen and LPG
  c. Confined space

d. Radiography
e. Hazardous Energy Control (lockout/tagout)
f. Excavation and Trenching
g. Heavy lifting exceeding 50Metric Tonne
h. Handling of Hazardous Substances- Diesel, Caustic Soda, Citric Acid/EDTA, Thinner, Battery Acid, Oil-based paint, Lubricants, Transformer oil.
Refer Annexure 05 for Work permit formats.

- Permit applicant shall apply for general work permit and other permits as referenced above of particular work activity at particular location before starting of the work with Method Statement and HIRA/Job Hazard Analysis.
- Permit signatory shall check that all the control measures necessary for the activity are in place and issue the permit to the permit holder.
- Permit holder shall implement and maintain all control measures during the period of permit .He will close the permit after completion of the work. The closed permit shall be archived in HSE Department of site.

10.3 SAFETY DURING WORK EXECUTION

Respective OCPS are to be followed and adherence to the same would be contractually binding

10.3.1 Power supply & upkeep of installation -

- Only persons licensed to Govt of State shall maintain and operate power installations.
- All distribution boxes shall be locked and the key controlled by site management of concerned contractor.
- Electrical appliance shall have proper earthing and for appliances equal to & more than 415V shall have two separate earthing (as per IS-3043-1987)
- All electrical supply shall be provided through ELCB of 30mA sensitivity.
- The working condition and sensitivity of ELCB shall be checked periodically.
- All fuses and fuse wires shall be of standard size and rating.
- All power supplies through cables shall be underground or overhead with height > 3mtrs.

The following guidelines are to be considered the absolute minimum requirements to be supplemented by requirements of all applicable codes and standards for such work; Wiring and Branch Circuits Must be protected by a proper amperage over-current device such as a HRC fuse or circuit breaker. Such installations must be located so as to prevent physical damage to the wire conductors & panels.

- Portable electric lights used in wet or potentially wet locations must be either low voltage type (24 volts or less) or protected by a GFI (ground fault interrupter).

- Must be visually checked before each use and periodically while in use to assure their original integrity is maintained. Cords with cuts, breaks, deep abrasions, etc. shall be taken out of service immediately. Repairs to extension cords shall only be performed by qualified/ licensed electricians.

- Must not be allowed to lie in wet or potentially wet areas.

- Every electric line or cable of unknown origin that is discovered or exposed during a digging, drilling, probing, or similar operation is to be considered as energized and life threatening. The senior company employee on the site will ensure that all necessary safety precautions are taken in order to isolate the line from all workers and the public. Such precautions may include halting the operation if appropriate. The senior company employee on the site is to then contact the proper authorities to have the line identified and either confirmed to be abandoned and/or made safe for continuing the work.

- Any and all underground lines that are discovered or become severed must be considered energized on both sides, and be treated accordingly.
- In general, equipment or machinery being moved or transported must maintain minimum clearances of 25 ft to all power lines.
- TAG IN/ TAG OUT must be in force in Switch Room and all Distribution Boxes for live power line. The authorized person's name and contact no shall be displayed
- Ensure "double insulated" three - core cables and three pin connectors are used and are properly ground "all insulated" types, all electrical tools and appliances must be manufactured for industrial use.
- All connections shall be electrically and mechanically sound and properly insulated. Taped joints are not permitted. Connections to socket outlets must be made with proper plugs.
- Splices in electrical cords are not permitted. Reparirs must be made at the socket connection and retain the same mechanical and dielectric condition of the original connection.
- Damaged or defective electric tools, equipment and extension cords, etc must not be used and shall be tagged out of servive, removed from the work area and taken back to stores.
- Only licensed electricians are authorized to repair and work on electrical equipment. Tampering with electric tools or equipment by others could result in termination.
- Temporary electric cabling should be elevated 2.2 meters above the floor/ground or covered for protection. It must be kept clear of walkways and other locations where it may be exposed to damage or create a tripping hazard.
- Energized wiring in junction boxes, circuit breaker panels and similar places must be covered and locked at all times.
- Areas with live high voltage wires or terminals must be barricaded against entry and warning signs posted Danger – High Voltage and Authorized Personnel Only.
- Personnel should never work on energized equipment, deenergizing (lockout/tagout) the equipment is always the first requirement.
- The lockout and tagout procedure will be used when testing or working on, or around, energized installation.
- Working around energized equipment should never be done alone. A second electrician must always be available for assistance.
- If lockout/tagout of the work is infeasible (must be demonstrated), work on energized electrical circuits must be approved by the Site In-charge. All safety precautions necessary must be taken, PPE use must be evaluated per the exposure and used, i.e high/low voltage gloves, insulated shoes, overcoats/aprins, faceshields, and other protective equipment like insulated tools, blankets, mats, etc. must be used.
- The welding machines earth leads shall be properly fixed without loose contacts. The earth cable only has to be used. No steel members shall be used as earth leads.
- Electrical crews must be qualified for the equipment and tools they work on, including being trained in Cardio-Pulmonary Resuscitation (CPR) methods and First Aid for rendering help in the event of electric shock.

10.3.2 **Qualified and Unqualified Workers (Electrical Works):**

Basic electrical safety knowledge is a major concern. It is critical that only qualified workers be allowed to perform this work. Therefore only those persons that are both qualified and authorized may install, fabricate, repair, test, calibrate or modify electrical or electronic wiring, devices, parts, systems or equipment.

Qualified Person:
One who is trained and wiremen licensed to Govt as per Rule 58(9) of Bangladesh Labor Rules and familiar with the construction, operation and safety hazards of the equipment upon which they are permitted to work.

- Qualified persons are intended to be only those who are well acquainted/experienced with and thoroughly conversant in the electric equipment and electrical hazards involved with work being performed.
- Only qualified persons may be permitted to work on or near exposed energized parts. Such persons are required to have been trained in three specific areas:
    - Qualified persons must be capable of working safely on energized circuits;
    - Must be familiar with the proper use of special precautionary techniques and procdures bases on equipment and exposure; and
    - Must be familiar with required personal protective equipment, insulating and shielding materials, and insulated tools.
- Qualified persons are expected to be able to evaluate unknown situations and adjust their activities in such a way that only safe work practices are used. Such behavior is the responsibility of the qualified person.
- It is possible and likely for an individual to be 'qualified' with regard to certain equipment in the work place, and unqualified on other equipment they must no their limitation and stop work if not qualified on what equipment they were to work on.
- An employee who is undergoing on-the-job training, who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training, and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties. The process must be documented as proof.

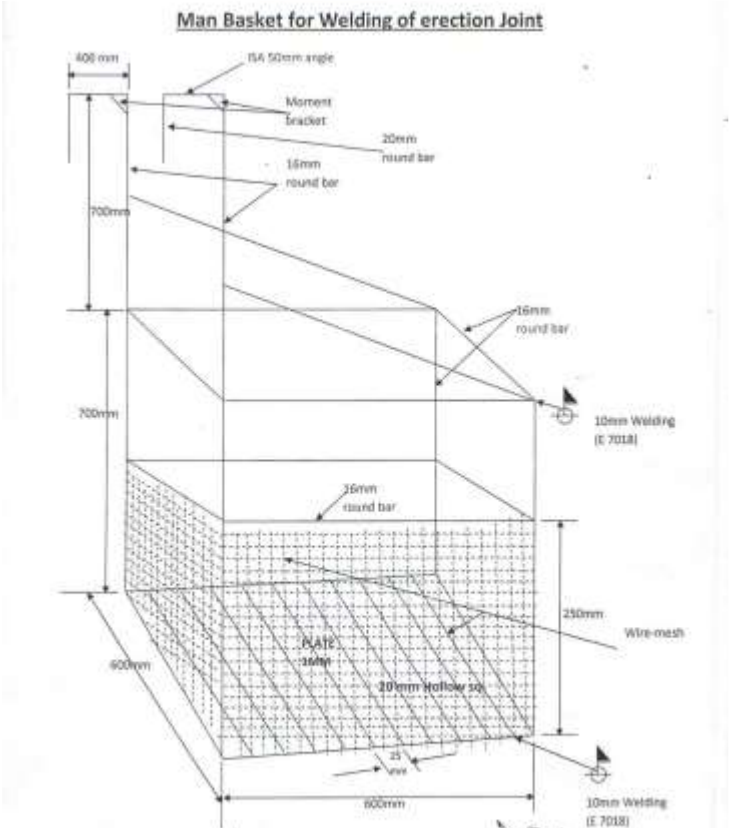
11.0 Lifting Operations:

All the cranes and lifting tools & tackles shall be inspected on daily basis and as well as formal monthly by expert and as per the law third party for annual certification. These shall be tested and certificates of fitness shall be obtained from 3rd party govt approved competent agency before deploying at site and later periodically (As per Rule 60 and 75, Schedule 3 of Bangladesh Labour Rules). The last date of Third Party Inspection and the next Due date shall be conspicuously displayed on all cranes. A copy of certificate shall be pasted on operators cabin of all the lifting equipment. The record shall be maintained in Form-24

The manufacturer's instruction for maintenance shall also be followed. All safety measures shall be followed. All tools tackles, lifting appliances; material-handling equipment etc used by the contractor shall be of safe design and construction. The operators, slingers and signalers shall be qualified as per IS 13367 (part-1):2003 "Safe use of cranes- code of practices". There shall be a person responsible for co-ordination

11.1 Personnel Lifts (Man-Basket): (To be treated as a T&P item)

A Personnel Man-Basket permit shall be completed prior to lifiting any people, along with a rigging plan. Man-basket shall be used where access through ladders or scaffolding is not feasible. Man-baskets shall be designed and engineered by a manufacturer (job made man-baskets are not allowed, unless designed and tested by a certified engineer), and built robust with MS Angles and flats or plates or channels only. Guard rails top and mid, must be in place and screened-in to avoid material from falling out of basket. The factor of safety shall be 200%. It shall have a door with double latches and shall open inside. Anchor points shall be identified within the man-basket. The man-basket shall be thoroughly inspected and load tested and a trial run perfomed without personnel before being put to job. It shall be treated as a lifting tool and shall undergo same certification cycle and inspection as other lifting equipments. An additional sling of required lifting capcity shall be fixed the the man-basket main lifting point and attached to the the crane above the ball or block.While lifting man-basket, the crane shall maintain a uniform speed of lift without any swing. Once man-basket reaches the destination, the lift brakes shall be locked as long as the basket remains at that point. The same care shall be taken in its descent. As for hanging man-basket, the same shall be hung off a rigid structure with help U-shaped handle welded to man-basket. This shall be tested once in a year by a competent person.



11.2 CRANES AND HOISTING EQUIPMENTS:

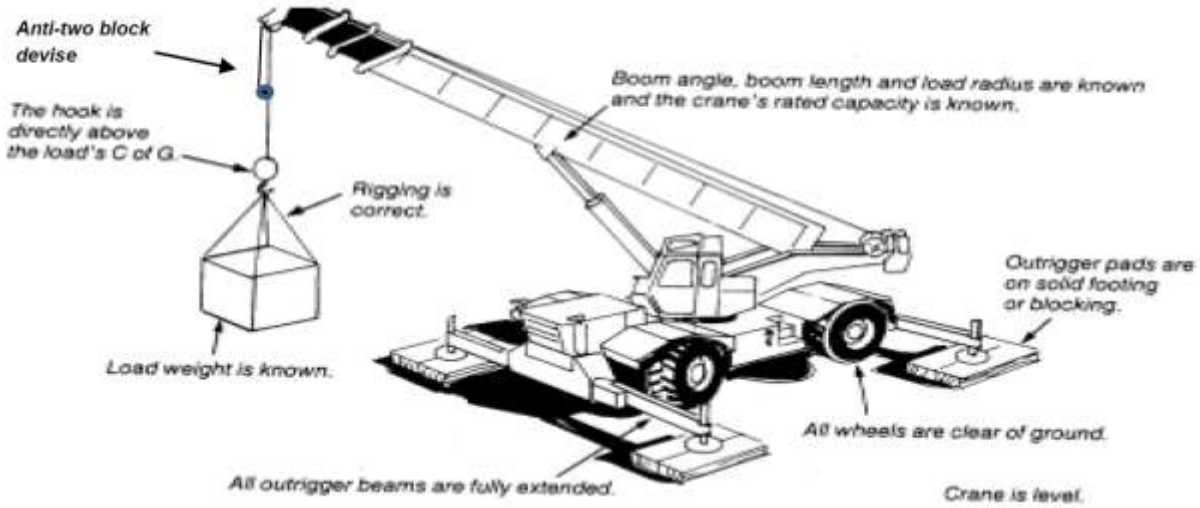
This procedure provides the guidelines to ensure proper rigging and lifting activities are accomplished safely and in accordance with applicable specifications, codes, and regulations.

- On every crane or piece of hoisting equipment notices of all rated load capacities, recommended operating speeds, and any hazard warnings or special instructions shall be conspicuously posted. All instructions and warning shall be visible from the equipment operator‘s station.
- Cranes shall have an Anti Two-block safety device installed
- All mobile cranes shall have overload and backup alarms
- Load angle indicators and limit switch

All areas within swing radius of cranes that are potentially accessible by pedestrian, vehicular, or equipment movement shall be barricaded to prevent anyone or any vehicle or equipment from being struck by the crane or hoisting equipment, or its load(s).

- No part of the lifting equipment or its load shall be within the distance as specified in the Indian Electricity Act from an energised power line
- Cranes shall have annual certified third party inspection and be inspected before use by the operator. Any defects shall be corrected before use. Logs of crane inspection shall be kept with the crane.
- Make certain that the rigging personnel, material, and equipment have the necessary capabilities for the job and are in safe condition.

- Communicate with person(s) directly responsible for accomplishing the work and / or work area to establish requirements/responsibilities and make certain that all preparatory work is complete.
- Mats/Pads must be used on all lifting equipment, equipped with out riggers.
- Pick and carry must have the load secured to the rig in front.
- Proper crane setup:



11..2.1 Safe Rigging Practices:

- Review the planned operation and requirements with the operator and rigging crew.
- Ensure a pre-lift meeting is conducted with crane operator, tagline operator, signal personnel, and Safety Manager.
- Designate a qualified person from the rigging crew to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desire clearance by visual means.
- Clear the lift area of all unnecessary personnel.

11.2.2 The following are rules for safe rigging:

- Use loops, thimbles and corner pads to prevent damage to slings when used around corners or on cutting edges.
- Never allow wire rope to lie on the ground for any length of time or on rusty steel or near solvents, chemicals or corrosive substances.
- Slings must not be pulled from between or under loads with load resting on the sling.
- Keep all rope away from flame cutting or welding operations.
- Never use rope as sling material.
- Never wrap a wire rope completely around a hook.
- Do not bend wire rope near any attached fitting.

- The sling must be selected to suite the most heavily loaded leg rather than the total weight when using multi-legged sling to lift loads in which one end is heavier than the other.
- When using 3 and 4 legged sling configurations, any two legs must be capable of supporting the entire load.
- Where possible, wire rope choker hitches must include a shackle with the eye around the shackle pin to prevent breaking wires of the choke. The choker hitch must be “snugged down” prior to lifting, not after tension is applied.
- Unless authorized by the hook manufacturer when more than two rope eyes are placed over a hook, install a shackle, pin resting in the hook, and place the rope eyes in the bowl of the shackle.
- Properly rig all loads to prevent dislodgment of any part.
- Use guide ropes or tag lines to prevent the rotation or uncontrolled motion of the load when necessary.
- Loads must be safely landed and properly blocked before being unhooked and unslung. Tag lines must not be used in situations that jeopardize the safety of the lift.
- Lifting beams must be plainly marked with their weight and designed working load and must only be used in the manner for which they were designed.
- The hoist rope or chain must never be wrapped around the load. The load must be attached to the hook by slings or other rigging devices that are adequate for the load being lifted.
- Multiple part lines must not be twisted around each other.
- The hook must be brought over the center of gravity of load before the lift is started.
- If there has been a slack rope condition, determine that the rope is properly seated on the drum and in the sheaves prior to lifting.
- Keep hands away from pinch points as the slack is being taken up.
- Leather gloves are recommended when handling wire rope.
- Avoid impact loading caused by sudden jerking when lifting or lowering. Lift the load gradually until the slack is eliminated.
- Never ride on a load that is suspended.
- Avoid allowing the load to be carried over the heads of any personnel.
- Never work under a suspended load until the load has been adequately supported from the floor and all conditions have been approved by the supervisor in charge of the operation.
- Never leave a load suspended unless emergency evacuation is required.
- Never make temporary repairs to sling.
- The capacity of a sling is determined by its angle, construction, type of hitch and size.
- Never lift loads with one leg of a multi-leg sling until the unused legs are made secure.
- Never point load a hook unless it is especially designed and rated for such use.
- Make certain that the load is broken free before lifting and that all legs are taking the load.
- When using two or more slings on a load make certain all slings are made from the same materials.
- Lower the loads on to adequate blocking to prevent damage to the slings.
- Materials and equipment being hoisted must be loaded and secured to prevent any movement which could create a hazard in transit.
- The weight of the hook, load block and any material handling devices must be included when determining crane capacity.
- Operator must have clear sight of loads being picked up or put down by crane. Tag lines will be used to control the loads. Loads must not be touched by hand while placing/ moving.

11.2.3 Synthetic Slings
The following are rules for safe use of synthetic slings:

- Synthetic slings must be marked to show the rated capacity for each type of hitch and type of web material.
- Nylon web slings must not be used where fumes, vapors, sprays or mists or liquids of acids or phenolic are present. Web slings with aluminum fittings must apply in this category.

11.2.3.1 Synthetic web slings must be removed from service and destroyed if any of the following conditions are present:

- Acid or caustic burns
- Melting or charring of any part of the sling surface
- Snags, punctures tears or cuts
- Broken stitches
- Distortion of fittings
- Synthetic web slings of polyester or nylon must not be used at or come in contact with temperatures in excess of 82°C
- Polypropylene web slings must not be used at or come in contact with temperatures in excess of 93°C
- Insulated hooks must be tested yearly to insure insulation integrity to at least manufacturer's specifications.

11.2.4 Wire Rope Slings must be removed from service and destroyed if any of the following conditions are present:

- In (10) randomly distributed wires broken in one (1) rope lay, or five (5) broken wires in one (1) strand in one (1) rope lay.
- Wear or scraping of one-third the original diameter of outside wires.
- Kinking, crushing, bird caging or any other damage resulting in distortion of the wire rope structure such as:
- Evidence of heat damage.
- End attachments that are cracked, deformed worn.
- Corrosion of the rope or end attachments.

11.2.5 Metal mesh slings must be immediately removed from service if any of the following conditions are present:

- A broken weld or broken brazed joint along the sling edge.
- Reduction in wire diameter of 25 percent due to abrasion or 15 percent due to corrosion.
- Lack of flexibility due to distortion or corrosion.
- Synthetic web slings must be removed from service and destroyed if any of the following conditions are present:
- Acid or caustic burns
- Melting or charring of any part of the sling service
- Snags, punctures, tears or cuts
- Broken stitches
- Distortion of fittings

11.2.6 Requirements of Plate Clamps:

- The rated load of the plate clamp must be marked on the main structure.
- Care must be taken to make certain the load is correctly distributed for the plate clamp being used.
- Do not allow load or plate clamp to come into contact with any obstruction.
- The plate clamp must not be used for side pulls or sliding the load.
- When lifting stainless steel or special alloys, ensure plate clamp is designed for use on the specific metal.

11.2.7 Crane operators must follow the followings:

- Pass an annual Operator's Physical examination
- Carry a valid experience certificate from the previous employers

11.2.8 Colour Coding Procedure

- Inspections and tests shall be documented by means of color coding which shall verify that inspections or testing are current and that all receptacles, portable Power tools, Lifting Tools & Tackles have been inspected and tested as required. The color codes used on the project shall be:

GREEN	BLUE	YELLOW	RED
January February March	April May June	July August September	October November December

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-
- The cycle of colors shall be Quarterly. The color code tape / Sticker shall be clearly visible to designate the period for which the inspections and tests were conducted.
- Following the initial inspection the equipment must be color-coded quarterly as per color-coding instructions that will be issued by the CONTRACTOR.
- Fire extinguisher with the current month color-coding inspection sticker must be provided and secured in the platform.
- All slings shall be regularly inspected in accordance with the requirement of the project for frequent and periodic inspections and removed from the job site if they fail to meet the minimum requirements of the project.
- The CONTRACTOR'S SFO shall ensure that all PPE is inspected prior to its issue. He is to ensure all SUBCONTRACTOR personnel are using safe and proper PPE equipment. Regular inspections on the PPE shall be carried out and personnel not adhering to those inspections shall be removed immediately from the SITE.
- A five (10) day interval period shall be given into each monthly color code change. During this five (10) day period either color shall be acceptable.



12.0 **Fire prevention, protection & preparedness – (Detailed procedure will be issued at site)**

The Fire Prevention, Protection and Prepardness Program is an integral part of the overall HSE Program. Effort and consideration must be given to safety, life and potential for delays in construction schedules and plant startup, as well as protection of property on a given project.

The purpose of which is to prevent -

- Inception of fire
- Loss of life or personal injury
- Loss of Property
- Interruption of operations

Site-in-charge / Safety Officer will make periodical review of the site Fire Protection, Prevention Preparedness Programme, Site conditions and available fire protection equipment. It is very imperative that the Sub-contractors along with BHEL to establish good contact with Local fire station for availability of Fire tender in case of emergencies, in additionan to their own fire equipment.

Fire Protection, Prevention and Prepardness Inspections - The Contractor /Sub-Contractor will be required to make frequent fire prevention inspections of his work site and operating facilities. Deficiencies will be corrected at once.

- Area where Hot work activities are carried out (Gas cutting / Welding/ any other spark producing work) above a working spot, a GI / fire-resistant non-asbestos sheet or suitable material shall be placed to prevent the fall of hot sparks. A bucket of water shall be kept nearby while doing hot work

- Hot work shall be preferably carried out in a designated area with a standing Hot Work Permit, to be renewed monthly. The designated area shall have fire extinguishers.

- Any hot work outside designated area shall require a Hot Work permit and fire watch.

No flammable material shall be stored within 35 feet from any fire load.

- Necessary fire extinguishers shall be kept at accessible area as per the chart below:
- The record of Fire safety training and Fire drill shall be maintained in Form-22 and 22(A)



- Emergency telephone number to be displayed at all conspicuous places.

General flammable material storage requirements:

- All flammable material shall be stored in deigned areas and/or in flammable storage cabinets, as necessary.
- Fire extinguishers shall be located near by and have unobstructed access.

13.0 RADIOGRAPHY: Wherever the process requires examination by radiography,

- BHEL /contractor shall use approved radiography contractors for the work on site.
- Site radiography shall be carried out after advance notification to the HSE officer and client personnel. All radiography on the site shall be subject to receipt of client/BHEL work permit and shall normally be performed outside of normal working hours. No ionising radiation sources shall be left unsupervised whilst on site.
- A minimum of 2 qualified persons from the radiography contractor are required for each activity involving ionising radiation. Adequate warning signs shall be posted on barriers and the work area shall be marked off at a safe distance with tape or hard barricades prior to starting radiography by concerned job sub-contractor.
- All personal executing radiography operations shall carry calibrated radiation monitoring devices at all times.
- The storage of radioactive sources on the site is prohibited, they shall be present only for the time required to complete the work. Whilst not in use, radiation sources and their container shall be secured in a safe location with adequate warning signs displayed as per AERB guidelines.

14.0 Confined Space Entry:

A confined space must have an opening of minimum dimension of 40.65cm X 30.65cm if shape is rectangular or oval and dia of 40.65cm if shape is round.

A hazard assessment must be completed prior to any entry into a confined space. The hazard assessment must identify the sequence of work to be performed in the confined space, the specific hazards known or anticipated, and the control measures to be implemented to eliminate or reduce each of the hazards to an acceptable level. No entry must be permitted until the hazard assessment has been reviewed and discussed by all persons engaged in the activity. Personnel who enter confined spaces must be trained per role e.g. entrant (worker), confined space supervisor & attendant, and must be informed of known or potential hazards associated with the confined spaces to be entered. Number of persons entering shall be kept at minimum. All confined spaces must be inventoried at site and kept on file. Confined spaces must be posted at the entrance with similar type wording “DANAGER - Do Not Enter – Confined Space - Permit Required”.



Once a hazard assessment is completed the Contractors/Subcontractors requirements are:

- All confined space activities must be reviewed with the Contractor’s Safety Manager prior to commencement of the work. Confined space permits are required as part of the entry process.
- Prior to entering the confined space, the area must be completely controlled to prevent the entry of any unauthorized individual, hazardous substances, or materials, which would threaten the safety of the entrants and the stability of the space. All energy sources, including stored or residual energy, must be isolated and/or blanked, and locked out.
- All shall be given a pep-talk by the concerned supervisor giving details of the jobs to be performed, hazards and risks associated and mitigation measures. The persons shall be provided with all necessary PPEs including respiratory masks, if necessary.
- The confined space must be monitored prior to one entering the identified area. Then periodic atmospheric testing must take place throughout the entry, especially after breaks or work interruptions during the entry. Continuous monitoring is preferable, and may be necessary in certain situations. Monitoring results must be documented on the entry permit with the initials of the individual conducting the testing.
- Contractors/Subcontractors must complete a Confined Space Permit before permitting workers to enter the space. This document must be reviewed and approved via a signature by the entry supervisor. The content of the completed permit must be reviewed with the entrants before entering the space and posted at the confined space enertance.
- A proper and accessible means of exit and exit shall be ensured before entry.
- The space shall be illuminated with 24V lamps only
- All gas cylinders/welding machines shall be preferably kept outside the confined space. Even cutting torches/ electrode holders shall be kept outside, when not in use, if possible.
- All electrical equipments shall be connected to ELCB
- The confined space must have an attendant monitoring the activities within the space. This individual must be in constant communication with work crew inside the space. The attendant must know who is inside the space, that must

be documented. The attendant must not have any other responsibilities than monitoring the space. He/she may not enter the space to perform rescue unless relieved of the duties as an attendant.

- Adequate ventilation must be provided to establish and maintain a stable atmospheric environment. Air circulation shall be ensured. Fumes/dusts generated inside shall be extracted. Ventilation systems must be designed for use in confined spaces.
- Any space 5' or more in depth must have a mechanical retrieval system. This system must be designed for the retrieval of human, and must not be used for equipment purposes. Workers inside the space must wear full body harnesses, and must be connected to the retrieval system.
- Rescue procedures must be established prior to any entry. The local fire department must be contracted prior to entry if they will be the primary source of rescue.
- All individuals involved in the confined space activities must be trained, including hands-on experience with the safety equipment involved. Documentation of the required training must be available prior to the start of any confined space work activities.
- The confined space shall be cleared off all cables, machines, cylinders, materials at the end of the day's work as far as possible.

Once the confined space work has been completed, the entry permit must be cancelled. A copy of the cancelled permit must be given to the HSE Manager

15.0 Welding and Gas Cutting Operations

- When possible, items to be welded, cut, heated, etc. shall be moved to a safe location free of combustible or flammable material. If this is not possible, then all combustibles/flammables that can be removed from the area shall be removed within a 35 foot circumference and a positive means of confining arcs and sparks generated by the process shall be taken and additional person(s) shall be stationed as fire watch for the area(s) still exposed, along with obtaining the Hot Work Permit as applicable.

- Appropriate fire-fighting equipment is to be available in close proximity of any welding and gas cutting operations at all times.

- Drums, tanks, and similar containers that have contained flammable or toxic material shall not be welded, cut, or heated until they have been made safe by water filling, thorough cleansing, or similar accepted practices. The container shall also be ventilated during the welding, cutting, or heating process.

- Proper ventilation is required for any welding or torch operations performed in a confined space.

- Any welding or gas cutting operations performed on metals of toxic compounds or coating such as zinc, stainless steel, lead, cadmium, chromium, and beryllium shall be properly ventilated and/or proper respiratory protection shall be worn by any person that could be exposed to fumes, vapors, and gasses created by the welding and gas cutting processes.

- Wherever it is practical, all arc welding operations shall be shielded to prevent direct light rays or sparks from contacting persons in the vicinity or from reaching areas normally used to travel through or into the vicinity. Where this is not practical, persons who shall be in the area are to use proper eye and skin protection. Other persons who are not participating in the welding or gas cutting operations are not to be allowed into the hazard zone.

- Welders and other employees who are exposed to arc welding radiation shall wear suitable clothing and protective apparel to prevent burns and other types of ultraviolet radiation damage to the skin.

- Arc welding machines shall be shut down when being moved or when they are not in continuous use.

- Electrode holders left unattended shall have electrodes removed and shall not be left where they might contact

employees or conducting objects.

- Arc welding power supply cable shall be of proper rating and material, e.g. copper.
- Welders shall guard against allowing materials adjacent to or behind them to reflect radiation back toward them or towards others in the area. Reflected radiation can cause skin burns and eye flash burns.
- Compressed gas cylinders shall always be secured from tipping or falling, whether in use, in storage or in transit. The cylinders shall always be secured upright, except during times when actually being hoisted or carried.
- Valve caps shall be in place when cylinders are not in use. Valve caps shall never be used for lifting the cylinder vertically.
- Regulators shall be removed when cylinders are not in use or are in transit, unless the cylinder is firmly secured on a special carrier designed for this purpose.
- Cylinders being transported by a powered vehicle shall be secured in an upright position. Gas cylinders are not allowed to be used in man-basket when occupied.
- Cylinders containing oxygen or fuel gasses shall not be taken into confined spaces.
- Oxygen cylinders shall be stored a minimum of (6) meters from fuel gas cylinders or shall have an approved firewall between them.
- Torches shall only be lit by approved strikers; never with matches, cigarette lighters, or hot work.
- While carrying out job at height, the sparks or molten slag shall be prevented from falling down by putting a fire-resistant (non-asbestos) sheet or even MS Sheet. If such can not be provided, the passage of falling sparks or molten slag shall be barricaded till ground floor and any cable/ tubes/ any other objects interfering in the passage shall either be removed or covered with Fire-resistant sheet or M S Sheet.

16.0 COMPRESSED GAS :

- All cylinder valves shall be closed when any work is finished and when any cylinders are empty or being moved.
- Valve protection caps shall be placed and secured properly before gas cylinders are transported, moved or stored.
- Compressed gas cylinders shall be secured in an upright position with chain or other appropriate means.
- All cylinders shall be kept at a safe distance from welding or cutting operations or shielded from safe.
- All cylinders shall be placed where they cannot become part of the electrical circuit.
- Oxygen and acetylene shall not be stored together.
- Oxygen and fuel gas regulators, hoses and associated equipment shall not be altered and shall be in proper working order while in use.
- Compressed air can be extremely dangerous if allowed to penetrate the skin. As such, the use of compressed air to clean off yourself or other workers shall be strictly prohibited.

17.0 **WORK AT HEIGHT:** All work at height above 3meter above ground level without complete platforms, handrails and other related fall protection shall require a work permit in the prescribed form. This shall require approval by the competent authority. The HSE officer of sub-contractors and subsequently BHEL shall follow the checklist religiously by physically verifying the condition of the work area before recommending for approval.

Whenever a fall hazard or other exposure exists for working at heights more than 3m, the nature and scope of work will be evaluated for conditions and environmental factors before selecting the appropriate fall protection system (active, passive or a combination of measures, as appropriate). A personnel fall protection system must include:

- The only permissible personal fall arrest system is an industry approved safety harness. Employees can use positioning belts with two-D ring attachment points as long as they are used in conjunction with a safety harness. Safety harnesses must be secured to an overhead object of substantial capacity capable of supporting five thousand pounds. In order to accomplish this and ensure 100% protection, the worker may need to use two lanyards. The primary lanyard is never unhooked until the secondary lanyard is secure.

- The type of work and the environment conditions determine lanyard and lifeline selection. If welding, chemical cleaning that may damage lanyards, connectors or lifelines, sandblasting, etc., either protect the components or use more appropriate type of system. Lanyards and lifelines must incorporate, or be used with, an appropriate deceleration (shock absorbing) device. Deceleration devices include rope grabs, rip-stitch lanyards, specially woven lanyards, tearing, or deforming lanyards, automatic self-retracting lifelines and lanyards which dissipate or limit the energy imposed on the employee during fall arrest. Once in use, the system's effectiveness is to be monitored. In some cases, a program for cleaning and maintaining the system may be necessary. Lanyard and lifelines must use locking snap hooks only and under no circumstances must two lanyard snap hooks be connected.

Minimum Requirements:

Prior to the start of work at elevation, the HSE Manager involved with the work must meet with the work supervisor to review the scope of work, and must review all the possible fall hazards and effective safety responses. The evaluation/analysis must be documented and kept on file and on site by the HSE Manager.

The procedures for the safety response to identified fall hazards developed and resuce plans by must be reviewed with all individuals exposed to the hazards.

The HSE Manager must establish an inspection process of fall protection systems. Some equipment requires documented inspections by its manufacture on a regular schedule. This equipment must have evidence of the inspection and re-certification process on it. This information must be reviewed before the equipment is actually used. Individuals must visually inspect the fall protection equipment before each use. Failure to complete this inspection process could result in serious injury or death.

Immediately remove from service any fall protection equipment that is identified as defective, damaged, or has been subjected to an impact. Damaged fall protective equipment must be destroyed to prevent re-use and not be discarded into trash containers, as the worn or damaged equipment could be unintentionally re-used.

Aerial lifting devices, excluding scissors lifts require the use of full body harnesses and lanyards in any elevated position.

All lifelines in general are to be made of min 8mm dia steel rope and tied to columns with 3 clamps at each end. Wherever columns are not available to tie the lifelines, the vertical posts are to be provided after carrying out drop-

load test initially.

18.0 SCAFFOLDS: (As per IS 3696 or any international standard)

The safe and efficient erection, use, dismantling, and storage of scaffolds, ladders and elevated work platforms are considered important objectives in maintaining a safe work environment. This procedure provides the guidelines for erection, use, dismantlement, and storage of scaffolding and elevated work platforms.

There is no such thing as a temporary scaffold. All scaffolds must be erected and maintained to conformed standard. The Scaffold Tagging defines satisfactory, incomplete or defective scaffolds.

Management must ensure or have each worker who performs work while on a scaffold trained by a person qualified in the subject matter to recognize the hazards associated with the type of scaffold being used and to understand the procedures to control or minimize those hazards.

All employees must be competent for the type of scaffolding work they are undertaking and should have received appropriate training relevant to the system they are working on.

- All scaffolds shall be erected / dismantled by scaffolding crew under direct supervision of **competent scaffolding supervisors.**

- All scaffolds shall be capable of supporting 4 times maximum intended load and erected on sound, rigid footing, capable of carrying the maximum intended load without settling or displacement. Bambo scaffolding is not permitted for use on site.

- Guard rails and toe boards shall be installed on all open sides and ends of platforms more than (2) meters above ground or floor

Scaffold planks must be at least 5 cm x 25 cm (2” x 10”) full thickness lumber scaffold grade or better.

- Scaffold planks shall not span distances greater than 2.5 meters (8 feet).

Scaffold planks shall extend over end supports not less than 6 inches nor more than 12 inches and be secured to the scaffold. Scaffolding and accessories with defective parts shall be immediately repaired or replaced.

- All scaffolding must be a minimum of two planks wide. No one may work from a single plank.

- Scaffold planks must be inspected before use. Planks that have been damaged must be removed from the site.
- Access ladders must be provided for each scaffold. Climbing the end frames is prohibited unless the design incorporates an approved ladder.
- Adequate mudsills or other rigid footing capable of withstanding the maximum intended load must be provided.
- Scaffolds more the 6 meters (20 feet) in height must be tied to the building or structure at intervals which do not exceed 4 meters (13 feet) vertically and 6 meters (20 feet) horizontally.
- Do not overload scaffolds. Material should be brought up as needed. Scaffolding must not be loaded in

excess of its rated capacity.

- Barrels, boxes, kegs, blocks or similar unstable object must never be used as work platforms or to support scaffold.
- Where persons must work under or pass under a scaffold then a 18 gauge wire mesh screen must be installed between the toe board and guard rail.
- Employees exposed to overhead hazards while working on a scaffold will be protected by 5 cm (2") thick planks.
- Wooden/bamboo ladders shall not be allowed at any cost. Ladder's rungs shall be fitted /welded properly. Before every use the rungs should be checked for safe use.
- The platform should have permanent hand rail and mid rail with Toe board without fail.

- All platforms are to be tightly planked for the full width of the scaffold, except as may be necessary for entrance openings. Platforms shall be secured in place.

- On suspension scaffolds designed for a working load of 500 pounds, no more than two workers are permitted to work on the scaffold simultaneously. On suspension scaffolds with a working load of 750 pounds, no more than three workers are permitted on the scaffold simultaneously. Each employee on the scaffold shall use an approved safety harness attached to an independent lifeline. The lifeline is to be securely attached to substantial members of the structure (not the scaffold itself) or to securely rigged lines, which shall safely suspend a worker in event of a fall.

Suspension Scaffold

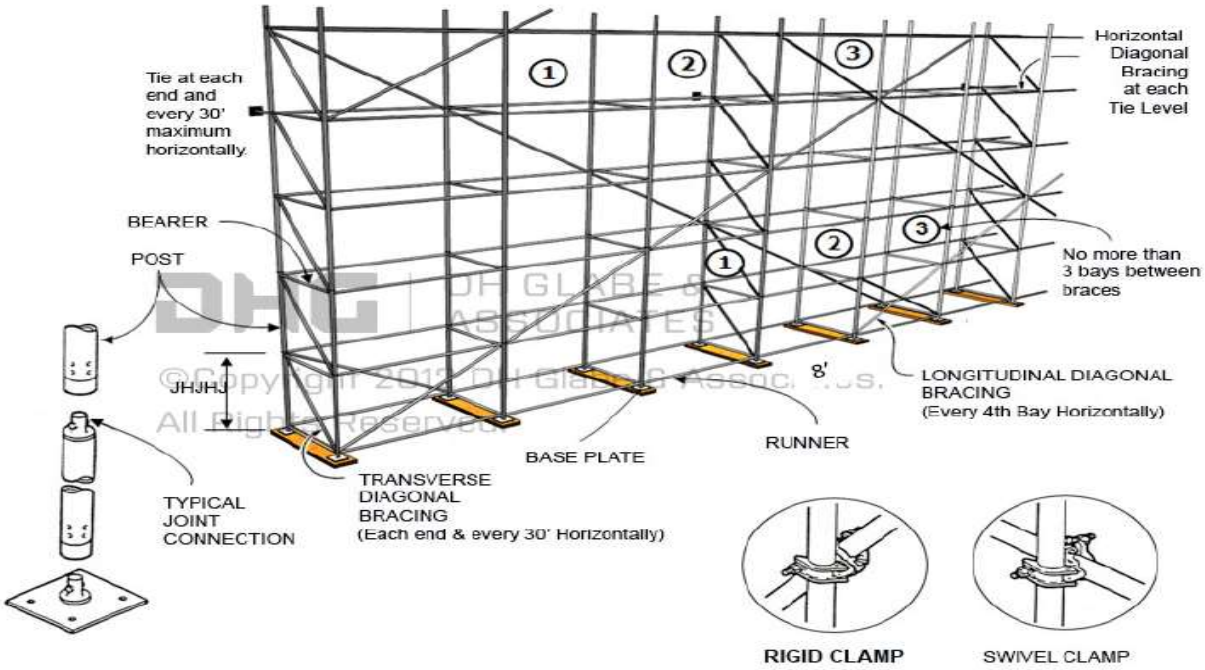
- Suspended scaffolds are platforms suspended by ropes, or other non-rigid means, from an overhead structure.
- Requirements for use are to be preapproved by HSE Head, under a specific Permit to Work.

Rolling Scaffolds

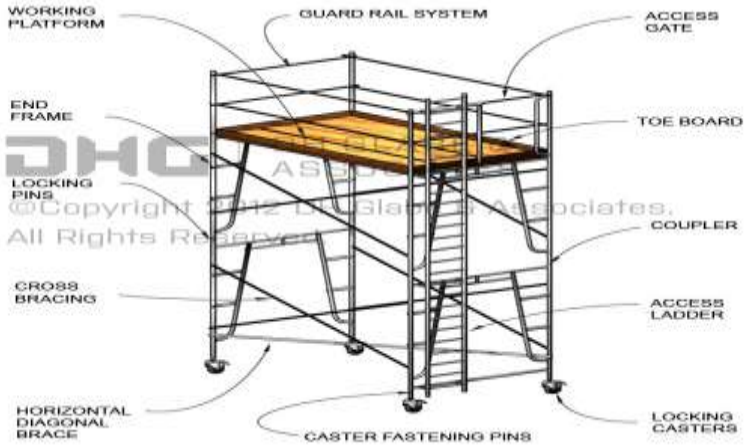
- The height of rolling scaffolds shall not exceed three times the minimum base dimension.
- The minimum base dimension of rolling scaffold will be 1.25 meters (4 feet).
- Adequate help must be provided when moving a rolling scaffold.
- Secure or remove all loose materials, equipment and tools before moving a rolling scaffold.
- No one is permitted to ride a rolling scaffold when it is being moved. Castor brakes must be locked - on when the scaffold is not being moved.

Typical Scaffold Designs

Tube & Coupler Scaffold –



Rolling Scaffold –



Scaffold Tagging:

Scaffolds being erected, modified or dismantled must be tagged as suitable for use. The scaffolds can only be accessed by those involved with the process.

- GREEN scaffold tag- shall be fixed when scaffold is complete and safe for use, signed and dated by the **scaffolding competent person** daily.

- RED scaffold tag – to be fixed if scaffold is in some way defective and cannot be used or is still under errection.

Examples of scaffold tags:





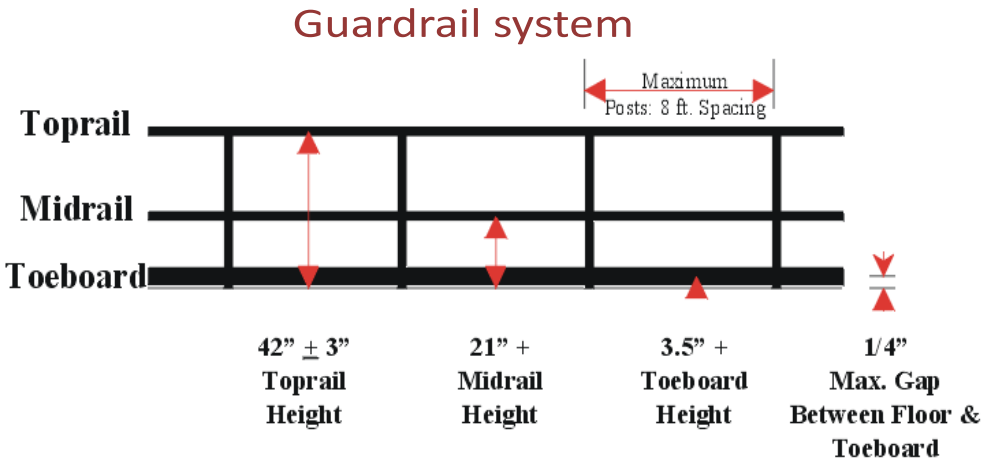
18.1SAFE USE OF LADDERS.

- ❖ Fall protection is required when working on a ladder above 2 meters and when climbing above nearby guardrails.
- ❖ Ladders must be inspected prior to use and by a competent person quarterly, with documentation.
- ❖ Use portable ladders for height up to 4 M only
- ❖ Provide fixed ladders for height above 4 M
- ❖ Place the ladder at an angle of 75 degrees (approx) from the horizontal (1:4)
- ❖ Extend ladder at least 1 M above the top landing
- ❖ Secure top and bottom of the ladder firmly to prevent displacement- anti skid lining at the bottom
- ❖ Ensure that the width of the ladder is not less than 300 mm and distance between rungs is not more than 300 mm
- ❖ Provide landings of minimum size 600 x 600 mm at intervals not more than 6 M for fixed ladders. Check the ladders daily for any defects
- ❖ Ensure that the areas around base and top of the ladder are clear. Getting on and off the ladder is more hazardous than using it. Use a mudsill if the ladder is to rest on soft, loose or rough soil
- ❖ Do not use ladders of conducting material near power lines, and only use ladders near powerline or other energize system with exposed parts if they are confirmed locked-out and de-energized.

- ❖ Stand no higher than the fourth rung from the top for carrying out any job standing on a ladder.
- ❖ Never reach out from a ladder to perform work where your belt buckle protrude past the ladder rung.
- ❖ Always face the ladder while climbing up or down
- ❖ Maintain three point contact while climbing up or down a ladder i.e. two hands and one foot or two feet and one hand on the ladder at all the times.
- ❖ Avoid climbing up or down a ladder while carrying anything in hands. Lift tools, equipment and materials with a rope.
- ❖ Work from portable and extension ladders near guarrail where fall expouse exisit over the guardrail regardless of height, and above 2.0 mtr. heights from the working/walking surface will require the use of personal fall arrest equipment.

18.2 Precautions against the fall of materials and persons and collapse of structures

- ❖ Adequate precautions should be taken such as the provision of fencing, or barriers to protect any person who might be injured by the fall of materials, or tools or equipment being raised or lowered. Cradle may be used for lifting materials - however this shall be made of MS angles and flats only and duly certified by the HSE officer. Operators may also use designed containers for lifting small tools.
- ❖ Guardrails (including scaffolding) erected over/adjacent working areas must have the guardrails screened (opening < 0.5), to prevent material from falling outsite the platform/decking.
- ❖ Guardrails must be able to withstand a 200 pound force exerted in any one direction.
- ❖ Where necessary to prevent danger, guys, stays or supports should be used or other effective precautions should be taken to prevent the collapse of structures or parts of structures that are being erected, maintained, repaired, dismantled or demolished.
- ❖ All openings through which workers are liable to fall should be kept effectively covered or fenced and indicated in the most appropriate manner.
- ❖ As far as practicable, guard-rails and toe-boards in accordance with Indian laws and regulations as depicted below:



- Guardrails shall be provided to protect workers from falling from elevated work places. The rails are generally made of MS pipes of suitable dia. Rebar shall not be used for any handrails, ladder or cover purpose. Wherever the guard-rails and toe-boards cannot be provided:

  (a) adequate safety nets or safety sheets shall be erected and maintained; or
  (b) adequate safety harnesses shall be provided and used and or
  (c) adequate fall arrestor shall be provided and used.

  As mentioned under PPE clause, all these PPEs shall be defect free and regularly inspected for any defect. The full body safety harness shall have double lanyard only with max 1.8m length.

  The monkey ladders shall have sufficient fall arrestors. Adequate lifelines of 8mm steel wire rope shall be provided across the work area.

  The HSE officer shall recommend appropriate PPEs after analysing hazards and risks involved.

18.3 **Safety Nets:**

- All safety net systems shall meet the requirements of Indian Standard (IS: 5175)
- Safety net mesh openings shall have a maximum size of 6 inches x 6 inches and be secured at each crossing to prevent elongation of the opening. All nets must meet IS: 5175 standard.
- Safety nets must be installed with sufficient clearance to prevent contact with the surface or structures under them
- Safety nets shall be installed as close as possible to the working level but in no case more than 25 feet below the working level.
- The safety nets shall extend out at least 8 ft. from the side of the open edge.
- Material, equipment and other items that fall into the net are to be promptly removed.
- Safety nets are to be inspected before use and then daily for wear or damage caused by falling materials.
- Safety net installation shall be inspected by a competent person.
- Safety nets must be installed below the working decks of the super structure for protection from falls of personnel and material.
- Safety nets and safety net installations must be drop-tested at the jobsite:
  - After initial installation and before being used.
  - Whenever relocated.
  - After major repair.
  - At 6-month intervals if left in one place.
- The drop test consists of a 400 pound bag of sand 28-32 inches in diameter dropped into the net from the highest surface at which employees are exposed to fall hazards, but not from less than than 42 inches above that level.
- When the employer can demonstrate that it is unreasonable to perform the drop-test described above, the employer or a designated competent person shall certify that the net and net installation have sufficient clearance and impact absorption by preparing a certification record prior to the net being used as a fall protection system. The certification must include:
  - Identification of the net and net installation.
  - Date that it was determined that the net and net installation were in compliance.
  - Signature of the person making the determination and certification.

19.0 SAFETY IN JETTY CONSTRUCTION:

A jetty is to be constructed close to the power plant site over a river. The construction activity involves deployment of cranes and other lifting appliances – a few may be mounted on vessels.
Prior to taking up job at the identified space, a HIRA shall be prepared and corrective measures shall be prepared by an expert group. This shall be shared with the subcontractor/gang to be deployed for the job through meeting/TBM as well as proper documentations.

- The safety rules as described in clause 12.0 shall be followed for all safety appliances. However, the operators shall be certified specifically for operating the lifting appliances mounted on the vessels by the owner of the vessels or the lifting supervisor of the agency.
- The lifting appliances on vessels shall be fixed and securely anchored
- Lifting appliances/ mobile plant shall be kept away from dangerous locations such as openings, edges close to water.
- The operation zone shall be clearly demarcated and properly fenced off.

19.1 SAFE USE OF LIFE JACKETS AND BUOYANCY AIDS:

- Lifejackets/buoyancy aids should be provided to and worn by workers with risk of falling into water.
- Lifejackets/buoyancy aids should conform to BS EN ISO 12402-1, 2, 3 or 4, or other equivalent international standards according to working conditions
- Lifejackets should be thoroughly checked by the user before each use.







Efficient state: Green

Maintenance Record

- A lifebuoy with sufficient lifeline (not less than 30 meters) shall be provided and the locations of the lifebuoys shall be at less than 50 metre intervals along the edges of places where work is being carried out overside or in exposed position on vessels where there is a reasonably foreseeable risk of falling or being washed overboard. To avoid any delays to rescue operations, lifebuoys shall be tightly tied to the posts.



- The lifejacket/ buoyancy aid shall preferably be provided w or a self-activating light (for night work) in order to aid locating the wearer and facilitating rescue.
- The lifejackets /buoyancy aids shall be inspected and checked periodically by a competent person.



- The life jackets/ buoyancy aids shall be properly maintained in a good serviceable condition according to the manufacturer's instructions.
- All inflatable life jackets shall be serviced by an authorized person/agent at least once a year.

19.2 WORKING AT HEIGHT

- Suitable guard-rails and toe-boards shall be installed at edges. Openings shall be properly covered where persons are liable to fall from height, to land surfaces or into water.
- Suitable working platforms, with suitable guard-rails and toe-boards, shall be provided for work at height. Safe means of access and egress shall be provided for the working platform.
- Safety harnesses with continuous and effective anchorage system shall be provided when it is impracticable to provide a suitable working platform, access and egress and safe place of work.
- Access and egress shall be sufficiently illuminated and free from any obstructions, openings, projections in order to avoid any slip, trip and fall.

20.0 NIGHT SHIFT OPERATION:

Night shift operation shall be avoided to the extent possible, so shall be any complicated or heavy job. However, prior administrative approval shall be obtained from BHEL for such operation. The following shall be ensured:

i. Adequate illumination along access, work area and egress

ii. Supervision
iii. Issue of strict instruction to workmen not to stray away from the work area and earmarked approach
iv. Non-deployment of women workforce
v. Non-deployment of fatigued workforce
vi. Vacating the area immediately on completion of the job
vii. informing first-aid facility and ambulance in advance

21.0 CONTROL OF MOVEMENTS AND USE OF HAZARDOUS SUBSTANCES AND CHEMICALS:

- The hazardous substances and chemicals shall be stored in a cool, well ventilated, dry and covered space with restricted entry only
- The loading, unloading, issue and use of these materials shall be strictly in accordance with the Material Safety Data Sheet (MSDS) and under strict supervision. Every supply shall accompany a MSDS as per standard purchase order clause.
- The site HSE team shall maintain MSDS of all these items and the same shall be shared with the stores or the user as and when required.
- Each container shall be labeled.
- The stores shall check the expiry date of perishable chemicals while receiving and store in such a fashion so as to follow First-in-first-out queue.
- There shall be enough space for movement of material and people in the stores.
- Containment shall be provided so as to arrest spillage from spreading.
- There shall be sufficient fire extinguishers and sand buckets in the stores and at point of use. In case of any spillage, dry sand shall be put on the spill and soaked sand shall be disposed as per the procedure for hazardous waste.
- There shall be provision of water preferably flowing one and a face shower at stores and point of use
- The persons handling these items shall strictly wear appropriate PPEs like leather gloves, apron, shield etc

22.0 CHEMICAL CLEANING: The chemicals have to be handled as instructed in MSDS. Only authorized person(s) shall be engaged for this job under strict supervision. The waste chemicals shall be drained out to a suitable storage provision and disposed off as per the relevant procedure. The area shall be barricaded while carrying out cleaning operation so as to prevent any unauthorized entry. Once the operation is completed, the surplus material along with the containers shall be returned to stores or scrap yard, as the case may be. The users shall use all appropriate PPEs and shall have water and sand for handling any incidental spillage or splash etc. The area shall be left completely clean before removing barricades.

22.1 PAINTING

Requirements provide a detailed procedure to be implemented by all concerned employees and sub-contractors involved in painting activities.

Significant Environmental Hazards:

- Chemical hazard due to inhalation of lead fumes (lead containing paint)
- Chemical hazard due to inhalation of VOC's from paining operations
- VOC's from painting and coating operation
- Disposal of paints and coats drums

Control Procedure for Painting:

- Chemical products used in painting and coating operation shall have proper MSDS sheet in place. Whenever any doubt arise with respect to handling and safety point of view it should be accessed to all concerned.
- Toxic substances and hazards relate the toxic chemicals shall be indentified.
- Proper PPE shall be used including plastic gloves appropriate overall etc.,
- Arrangement for cleaning of spillage shall be ensured

- In case of nauseating feeling by any one immediate action shall be taken
- Only trained workers shall be allowed and proper training should be imparted to the works.
- Exposure limits of the toxic substances shall be checked before starting the work and nobody shall be allowed to carry the work beyond the permissible limit.
- Ventilation or exhaust facility shall be provided at place where painting and coating operations are carried out.
- Overalls shall be supplied by the contractors/subcontractors to the workmen and adequate facilities shall be provided to enable the painters to wash at the cessation of work.
- Smoking, open flames or sources of ignition shall not be allowed in places where paints and other flammable substances are stored.
- A caution board in national /regional language “smoking strictly prohibited” shall be displayed in the vicinity.
- Suitable fire extinguishers/sand buckets shall be kept available at places where flammable paints are stored, handled or used.
- In case of indoor painting or painting in confined spaces, exhaust ventilating shall be provided. If adequate ventilation is not provided a proper respirator shall be provided and used by persons who are trainined and fit tested.
- The VOC’s from painting and coating operations shall not exceed the permissible level of CPCB/ SPCB norms. The paints and coats must be selected as per the guidelines.
- Workers shall thoroughly wash their hands and feet before leaving the work.

23.0 SAFETY IN THE USE OF HAND TOOLS AND POWER-OPERATED TOOLS

23.1 General provisions

i. All hands and power tools and similar equipment, shall be maintained in safe condition.
ii. When power operated tools are designed to accommodate guards, they shall be equipped
iii. with such guards, when in use;
iv. Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains and other reciprocating, rotating or moving parts of the equipment shall be similarly guarded;
v. Personnel using hand and power tools and exposed to the hazard of falling, flying, abrasive, and splashing objects, or exposed to harmful dusts, fumes, mists, vapours, or gases shall be provided with the particular personal protective equipment necessary to protect them from the hazards;
vi. All hand-held powered platen sanders, grinders, grinders with wheels of 5 cm or less, routers, planers, laminate trimmers, nibblers, shears, scroll saws and jigsaws with blade shanks of 0.5 cm wide or less shall be equipped with only a positive on-off control.
vii. All hand-held powered drills, tappers, fastener drivers, horizontal, vertical or angle grinders with wheels greater than 5 cm in diameter, disc sanders, belt sanders, reciprocating saws, saber saws and other operating powered tools shall be equipped with a momentary contact on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.

23.2 Hand Tools

i. The contractor shall not issue or permit the use of unsafe hand tools;
ii. Wrenches including adjustable pipe end and socket wrenches shall not be used when saws are sprung to the point that slippage occurs;
iii. Impact tools such as drift pins, wedges and chisels shall be kept free of mushroomed heads;
iv. The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight on the tools.

23.3 Power operated tools

i. Electric power operated tools shall be either of the approved double-insulated type or shall be grounded;
ii. The use of electric cords for hoisting or lowering loads shall not be permitted;

iii. Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming incidentally disconnected;
iv. Safety clips or retainers shall be securely installed or maintained on pneumatic impact (percussion) tools to prevent attachments from being incidentally expelled;
v. All pneumatically riveting machine staplers and other similar equipment provided with automatic fastener feed, which operate at more than 7 kg/cm2 pressure at the tool a safety device on the muzzle to prevent the tool from ejecting the fasteners unless the muzzle is in contact with the work surface;
vi. Compressed air shall not be used for cleaning purposes except when the pressure is reduced to less than 2 kg/cm2 and that too with effective chip guarding. The 2 kg/cm2 pressure requirement does not apply to concrete form, mill scale and similar cleaning purposes;
vii. The manufacturer's safe operating for hoses, pipes, valves, filters and other fittings shall not be exceeded;
viii. Only personnel who has been trained in the operation of the particular tool shall be allowed to operate power-actuated tools;
ix. The tool shall be tested each day before loading to see that the safety devices are in proper working condition. The method of testing shall be accordance with the manufacturer's recommended procedure;
x. Any tool found not in proper working order, or that which develops a defect during use, shall be immediately removed from service and not used until properly repaired;
xi. Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any other person. Hands shall be kept clear of the open barrel end;
xii. Loaded tools shall not be left unattended;
xiii. Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tiles, surface hardened steel, glass block, live rock, face brick or hollow tiles;
xiv. Driving into materials that can be easily penetrated shall be avoided unless backed by a
xv. substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side;
xvi. No fastener shall be driven into a palled area caused by an unsatisfactory fastening;
xvii. Only non-sparking tools shall be used in an explosive or flammable atmosphere;
xviii. All tools shall be used with the correct shield, guard or attachment as recommended by thee manufacturer.

23.4 Abrasive wheels and tools

i. All grinding machines shall be supplied with sufficient power to maintain the spindle speed at safe levels under all conditions of normal operation;
ii. Grinding machines shall be equipped with suitable safety guards;
iii. The maximum angular exposure of the grinding wheel periphery and sides shall not be more than 900, except that when the work requires contact with the wheel below the horizontal plane of the spindle, the angular exposure shall not exceed 1200. In either case, the exposure shall begin not more than 8.650 above the horizontal plane of the spindle. Safety guards shall be strong enough to withstand the bursting of the wheel;
iv. Floor and bench-mounted grinders shall be work-rests, which shall be rigidly supported and readily adjustable. Such work-rests shall be kept at a distance not to exceed 5 mm from the surface of the wheel;
v. Cup type wheels used for external grinding shall be protected by either revolving cup guard or a band type guard;
vi. When safety guards are required, they shall be mounted as to maintain proper alignment with the wheel and the guard and the guard and its fastening shall be adequate strength to retain the fragments of the wheel in case of incidental breakage. The maximum angular exposure of the grinding wheel periphery and sides shall not exceed 1800;
vii. Portable abrasive wheel used for internal grinding shall be provided with suitable safety flanges;
viii. When safety flanges are required, they shall be used only with wheels designed to fit the
ix. flanges. Only safety flanges, of a type and design and properly assembled so as to ensure that the pieces of the wheel will be retained in case of incidental breakage, shall be used;

x. All abrasive wheels shall be closely inspected and ring tested before mounting to ensure that they are free from cracks or defects;

xi. Grinding wheels shall fit freely on the spindle and shall not be forced on. The spindle nut shall be tightened only enough to hold the wheel in place;

xii. All employees using abrasive wheels shall be protected by suitable eye protection equipment.

23.5 Woodworking tools

i. All fixed power driven woodworking tools shall be provided with a disconnect switch that can either be locked or tagged in the **off-position**;

ii. The operating speed shall be attached or otherwise permanently marked on all circular saws over 0.5 m in diameter or operating at over 3000 peripheral rpm. Any saw so marked shall not be operated at a speed other than that marked on the blade. When a marked saw is retensioned for a different speed, the marking shall be corrected to show the new speed;

iii. Automatic feeding devices shall be installed on machines wherever the nature of the work will permit. Feeder attachments shall have the feed rolls or other moving parts covered or guarded so as to protect the operator from hazardous points;

iv. All portable power driven circular saws shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to the covering position.

23.6 Defective tools to be tagged out for maintenance, as ***DEFECTIVE, DO NOT USE***, and sent to tool/store room for repair or to be discarded.

24.0 START UP, COMMISSIONING AND TESTING:

There are various activities involved prior to commissioning- the major ones are -Hydraulic Test, Steam Blowing, Charging of transformers, Boiler Light Up, Rolling and Synchronisation and Full loading of unit.

These activities shall be personally supervised by the site executive along with the commissioning engineer. The readiness of upstream and downstream system shall be ensured before taking up. These shall be handled strictly by the authorised persons only and the team shall be suitably briefed about the activity including hazards & risks involved and control plan by the concerned executive-in-charge before start. Entry of persons to the area of activity shall be suitably restricted and the emergency functions like Ambulance, first aid centre and Fire station shall be intimated about the plan well in advance. Tag-in/ Tag-out shall be in place while charging transformer and whenever necessary. Electricians with valid wiremen license only shall be permitted to work on power lines.
The area and the passage shall be adequately illuminated.

25.0 **DEMOLITION WORK**

Before any demolition work is commenced and also during the process of the work the following shall be ensured:

- All roads and open areas adjacent to the work site shall either be closed or suitably protected.
- No electric cable or apparatus which is liable to be a source of danger nor a cable or an apparatus used by the operator shall remain electrically charged.
- All practical steps shall be taken to prevent danger to persons employed from the risks of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render them unsafe.

26.0 **EXCAVATION**

Wherever there is open excavation in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping into the excavations. All safety precautions shall be taken for foundation and other excavation marks as per IS-3764. Any excavation above 2m shall be considered as hazardous job.

27.0 ENVIRONMENTAL CONTROL

Environment protection has always been given prime importance by BHEL. Environmental damage is a major concern of the principal contractor and every effort shall be made, to have effective control measures in place to avoid pollution of Air, Water and Land and associated life. Chlorofluorocarbons such as carbon tetrachloride and trichloroethylene shall not be used. Waste disposal shall be done in accordance with the guidelines laid down in the project specification.

Any chemical including solvents and paints, required for construction shall be stored in designated bonded areas around the site as per MSDS.

In the event of any spillage, the principle is to recover as much material as possible before it enters drainage system and to take all possible action to prevent spilled materials from running off the site. BHEL shall use appropriate MSDS for clean-up technique

All contractors shall be responsible for the cleanliness of their own areas and must not pollute the ground, air and water.

BHEL shall ensure that noise levels generated by plant or machinery are as low as reasonably practicable. Where the contractor anticipates the generation of excessive noise levels from his operations the contractor shall inform to Construction manager of BHEL accordingly so that reasonable &practicable precautions can be taken to protect other persons who may be affected.

27.1 **Water Supply and Wastewater Discharge Requirement**

- Source of water is provided by client from the existing system.
- Wastage of water to be controlled by monitoring the required water for construction & domestic use and actual consumed.
- No contaminated water to be discharged in the storm water drain confirming the standard parameters before discharge. Proper approval to be taken if applicable as per Bangladesh Environmental Standards

27.2 **Storm water runoff Management**

- Expansion of existing plant, no existing drainage systems will be disturbed and damaged.
- No construction waste water to be discharged in the existing storm water drain or newly construction storm water drains.

27.3 **Noise Mitigation**

High noise is harmful to the human health and it can cause impairment if exposed for long duration at regular intervals, and also cause disruption in nearby communities.

- Noise monitoring shall be carried out in all construction locations periodically.
- Use of silent DG is allowed at site during construction.
- Low noise generation equipment's to be preferred
- Acoustic enclosure to be used in case noise level is high for particular equipment or system.
- Work areas where noise levels exceed the 85db shall be posted as hearing protection required.
- Use of PPEs / ear plug/ear muff for personnel entering into high noise area.
- Activities generation High noise will be planned in day shift.

Noise Level Chart (As per Bangladesh Environmental Standards)

Parameter	Night Noise level dBA	Daytime Noise Level dBA
At 1-meter from each piece of equipment	85	85
At Property boundary	70	70

27.4 **Air pollution Control**

- Water sprinkling on road for suppression of fugitive dust to be done regularly.
- Startup and commissioning activities to be planned for compliance with contract, regulatory and permit requirements..(As per Bangladesh Environmental Standards)
- Required monitoring to be done in the respective work location as applicable.

27.5 **Land and Water Resource Protection**

- Only prior approved land by CUSTOMERL to be used during construction work.
- Contract clauses to be followed
- All hazardous substances will be stored with proper containment facilities to avoid any release into the water system, causing land/water contamination.

28.0 HOUSEKEEPING

- Keeping the work area clean/ free from debris, removed scaffoldings, scraps, insulation/sheeting wastage /cut pieces, temporary structures, packing woods etc. will be in the scope of the subcontractor. Such cleanings has to be done by subcontractor within quoted rate, on daily basis by an identified group. If such activity is not carried out by subcontractor / BHEL is not satisfied, then BHEL may get it done by other agency and actual cost along with BHEL overheads will be deducted from contractor's bill. Such decisions of BHEL shall be binding on the subcontractor
- Proper housekeeping to be maintained at work place and the following are to be taken care of on daily basis:
  - ❖ All surplus earth and debris are removed/disposed off from the working areas to identified locations.
  - ❖ Unused/Surplus cables, steel items and steel scrap lying scattered at different places/elevation within the working areas are removed to identified locations.
  - ❖ All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from workplace to identified locations. Sufficient waste bins shall be provided at
  - ❖ Different work places for easy collection of scrap/waste. Scrap chute shall be installed to remove scrap from high location.
  - ❖ Access and egress (stair case, gangways, ladders etc.) path should be free from all scrap and other hindrances.
  - ❖ Workmen shall be educated through tool box talk about the importance of housekeeping and encourage not to litter.
  - ❖ Labour camp area shall be kept clear and materials like pipes, steel, sand, concrete, chips and bricks, etc. shall not be allowed in the camp to obstruct free movement of men and machineries.
  - ❖ Fabricated steel structures, pipes & piping materials shall be stacked properly.
  - ❖ No parking of trucks/trolleys, cranes and trailers etc. shall be allowed in the camp, which may obstruct the traffic movement as well as below LT/HT power line.
  - ❖ Utmost care shall be taken to ensure over all cleanliness and proper upkeep of the working areas
  - ❖ The paint and thinner and other chemical containers (filled, partly used and empty) shall be carefully stored, used and tracked. All empty containers shall be removed after getting punctured/lid removed and deformed to the scrap yard. The partial used one shall either be returned to store or carefully kept at a corner much away from any hot work or source of fire.

29.0 WASTE MANAGEMENT

There are operations on construction projects that may create hazardous waste, which would require handling, storage, transferring, and transporting. Therefore, hazardous waste guidelines apply for Hazardous Waste Planning:

29.1 Minimum Requirements:

- Contractors must designate a Material Manager who is responsible for checking delivered materials as potential hazardous waste and informing the Contractor's Safety Manager.
- Contractors who create, may be expected to create or could accidentally create a material that could be classified to be hazardous waste must provide Disposal number (or equivalent) and other pertinent information on file.
- All hazardous waste or waste which could be considered hazardous waste, as determined by the methodology and definitions from environmental regulators must be stored and collected in special areas and properly disposed of by the Contractor.
- No waste haulers, disposers, recyclers, or scavengers will be allowed on the site without the permission of the owner. It will be the responsibility of the Contractor to provide copies of all licenses, permits, and authorizations to the.
- No waste may be removed from the site by any person without the authorization of the Contractor. No waste may be brought onto the site and disposed of using the Contractor's systems or facilities.
- Burning of waste, if not used for generating energy, shall be generally prohibited

29.2 General Requirements

- For non-hazardous waste disposal. Receptacles e.g., dumpsters, etc. must be placed around the site for collection of waste materials. No material is to be abandoned on the site.
- Dumpsters will be inspected frequently, and any potentially hazardous material or waste will be removed from the dumpster and placed in the appropriate storage area at the expense of the responsible Contractor.

29.3 Definitions

- Solid Waste - Any garbage, refuse, sludge, or any other waste material which is not an "excluded waste."
  - The following solid wastes are not hazardous wastes unless otherwise designated as such by local authorities:
  - Fly ash waste, bottom ash waste, slag waste, and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels
  - Drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of crude oil, natural gas, or geothermal energy.

- Other Waste Material - Any solid, liquid, semi-solid, or contained gaseous material, resulting from industrial, commercial, mining or agricultural operations which are discarded. This is usually an incidental by-product of the operation. Discarded material must be treated as follows:
  - Disposed of, and not used, reused, reclaimed, or recycled
  - Burned or incinerated, except where the material is being burned as a fuel for the purpose of recovering usable energy
  - Physically, chemically, or biologically treated (other than burned or incinerated) in lieu of or prior to being disposed of.

- Excluded Waste - Materials that are not solid wastes. The following materials are not solid wastes for the purpose of this part:
  - Domestic sewage ("Domestic sewage" means untreated sanitary wastes that pass through a sewer system.)
  - Any mixture of domestic sewage and other wastes that passes through a sewer system to a publicly-owned treatment works for treatment
  - Industrial wastewater discharges that are point source discharges.

29.4 Treatment - Any method, technique, or process, including neutralization, designed to change the physical, chemical, or biological character or composition of any hazardous waste to neutralize such waste, to recover energy or material resources from the waste, or to render such waste non-hazardous.

29.5 Improper Disposal - The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into the environment.

29.6 Temporary Storage - The holding of a hazardous waste for a period less than 90 days, at the end of which the hazardous waste is properly disposed of.

29.7 **BINS AT WORK PLACE**

- Sufficient rubbish bins shall be provided close to workplaces.
- Bins should be painted yellow and numbered.
- Sufficient nos. of drip trays shall be provided to collect oil and grease.
- Sufficient qty. of broomsticks with handle shall be provided.
- Adequate strength of employees should be deployed to ensure daily monitoring and service for waste management.

29.8 **STORAGE AND COLLECTION**

- Different types of rubbish/waste should be collected and stored separately.
- Paper, oily rags, smoking material, flammable, metal pieces should be collected in separate bins with close fitting lids.
- Rubbish should not be left or allowed to accumulate on construction and other work places.
- Do not burn construction rubbish near working site.

29.9 **SEGREGATION**

- Earmark the scrap area for different types of waste.
- Store wastes away from building.
- Oil spill absorbed by non-combustible absorbent should be kept in separate bin.
- Clinical and first aid waste stored and incinerated separately.

29.10 **DISPOSAL**

- Sufficient containers and scrap disposal area should be allocated.
- All scrap bin and containers should be conveniently located.

- Provide self-closing containers for flammable/spontaneously combustible material.
- Keep drainage channels free from choking.
- Make schedule for collection and disposal of waste.

29.11 **WARNING AND SIGNS**

- Appropriate sign to be displayed at scrap storage area
- No toxic, corrosive or flammable substance to be discarded into public sewage system.
- Waste disposal shall be in accordance with best practice.
- Comply with all the requirements of Pollution Control Board (PCB) for storage and disposal of hazardous waste.

30.0 **WORK VEHICLES (Limited to contractual provision)**

Work vehicle shall be as safe stable efficient and roadworthy as private vehicles on public roads. Site management shall ensure that drivers are minimum 18 years of age, physically fit, suitably qualified and trained for the equipment they are operating. All vehicle e.g. heavy motor vehicle forklift trucks dump trucks mobile cranes shall ensure that the work equipment conforms to the following:

- A high level of stability.
- Equiped with backup alarms.
- A safe means of access/egress.
- Suitable and effective service and parking brakes.
- Windscreens with wipers and external mirrors giving optimum all round visibility.
- Provision of horn, vehicle lights, reflectors, reversing lights, reversing alarms.
- Provision of seat belts.
- Guards on dangerous parts.
- Driver protection - to prevent injury from overturning and from falling objects/materials.
- Driver protection from adverse weather.
- No vehicle shall be parked below HT/LT power lines.
- Valid Pollution Under Control certification for all vehicles

30.1 **TRANSPORTATION OF PERSONNEL AND MATERIALS BY VEHICLES**

- All drivers shall hold a valid driving License for the class of vehicle to be driven and be registered as an authorized BHEL driver with the Administration Department.
- Securing of the load shall be by established and approved methods, i.e. chains with patented tightening equipment for steel/heavy loads. Sharp corners on loads shall be avoided when employing ropes for securing.
- All overhangs shall be made clearly visible and restricted to acceptable limits
- Load shall be checked before moving off and after traveling a suitable distance.
- On no account is construction site to be blocked by parked vehicles Drivers of vehicles shall only stop or park in the areas designate by the stringing foreman.
- Warning signs shall be displayed during transportation of material.
  All vehicles used by BHEL shall be in worthy condition and in conformance to the Land Transport requirement

31.0 EMERGENCY PREPAREDNESS AND RESPONSE Preferably to be maintained jointly by all stake-holders in the project) (A separate document titled "Emergency Preparedness and Response Plan bearing document no HSEP:EPRP:MAITREE is to be read along with this plan) Emergency preparedness and response plan requirements are to protect worker life and health, and to safeguard property used and stored on the project. This plan

is prepared in anticipation of an emergency to prevent losses to any Incident. This plan describes how the organization identifies, respond to and review emergency situations.

This plan covers fire, medical and other environmental incidents. It aims at controlling the emergency and generally mitigating the adverse effects of a major Incident. This plan is applicable to all activities carried at all BHEL project sites. Determination of hazard potential and identification and assessment of hazards is the first part in emergency planning. This requires systematic study of the site / plant to identify emergencies that can occur.

31.1 Definition:

A major emergency can be defined as an Incident that has potential to cause serious injury of loss of life. It may cause extensive property damage and adversely affect the environment as a whole.

31.2 Emergency scenarios and General Guidelines:

Various scenarios that are anticipated to cause emergency at BGRESL site are discussed in brief along with guidelines.

- Personal injuries:
  In spite of putting best efforts some technical failure or human error may lead to personal injury at site. Guidelines are given below when personnel injuries happen:
  - Contact medical center over phone/cell/radio;
  - Contact security control room over phone/cell/radio;
  - Contact HR/Admin department over phone/cell/radio;
  - Tell your location nature of injury or near miss incident;
  - Inform site safety department;
  - Provide First Aid treatment if properly trained person is available, otherwise take the injured person to Medical center if pratical; or
  - Stay with the injured person until medical assistant arrives.

- In case of fire:
  - Shout “fire fire”;
  - Inform the persons nearby. Contact Fire Center and give your location and other details as warranted and act very calmly and swiftly. Then contact security and safety department once in a safe location;
  - Try to put out the fire by using available portable fire extinguisher if trained and fire is in incipient stage only, otherwise let firefighting personnel tend to it;
  - Do not make any attempt to collect your belonging;
  - Get out and away from the area immediately and walk do not run. Follow shortest escape route and assemble at assembly point; and
  - Under no circumstance put your precious life at risk.

- Mishaps involving failures of crane, structures, equipment and vehicular incidents, etc., can also lead to an Emergency situation on construction sites. Guidelines for actions to be taken in case of such situations are as:
  - Inform immediate authority and also inform security and safety departments.
  - Try to assist in rescue personnel involved only if safe to do so;
  - Cordon off the area to prevent entry of personnel in affected area;
  - Security shall ensure movement in affected area in coordination with Section/Site In-charge.

- Fire/Security service departments responding to affected area to contain and control the situation;
- All other personnel not involved in mitigation operation shall be directed to assembly point; and
- Contractor/ sub-contractor management shall ensure that their workmen are away from emergency site, not gathering around location of emergency.

- Toxic leakage from nearby live units can also lead to emergency situation at construction site. Guidelines for actions to be taken are as:
  - Inform immediate authority and also inform security and safety departments;
  - Evacuate all the personnel from the area immediately depending upon the wind direction to safetest assembly point;
  - Call for help from fire and medical by phone/Cell/radio;
  - Arrange transport for any victims to medical Centre; and
  - Do not panic, act swiftly, do not run and proceed as per advice of emergency services.

- Bomb threat, sabotage, riot etc., also may lead to emergency situation at construction site. Such situation shall be dealt by HR/Admin and security department with the advice of Site In-charge.
  - Notification to the owner and authorizes to follow immediately.

- Natural calamities like earthquake, cyclone, and flood like situation can also lead to emergency situation at construction site. Site In-charge will act with required diligent and directive received from Concerned State Government, Corporate office and Owner.

- High Angle rescue -
  - First arrival. The first arriving HSE Officer should assume command after arriving on the scene;
  - HSE Officer should secure a witness as soon as possible after arriving on scene. This will help in identifying the problem and locating the victim;
  - Locate the victim to determine nature of injuries if any and report to Medical for response as needed.
  - Administer first aid to the victim as necessary;
  - Resuce team to use proper rescue kit / equipment to reach the victim;
  - Personnel manbasket or arial lift may be used to reach the vitim if applicable;
  - Assess the hazards. HSE Officer to identify all potential hazards and assist rescuers.
  - The HSE Officer will be responsible for securing those hazards or making all members aware of those hazards.
  - HSE Officer shall be made aware of the specific emergency action plans once the emergency response team arrives.
  - The HSE Officer shall also be responsible for assuring that all safety procedures are adhered to.

31.3 Communication system

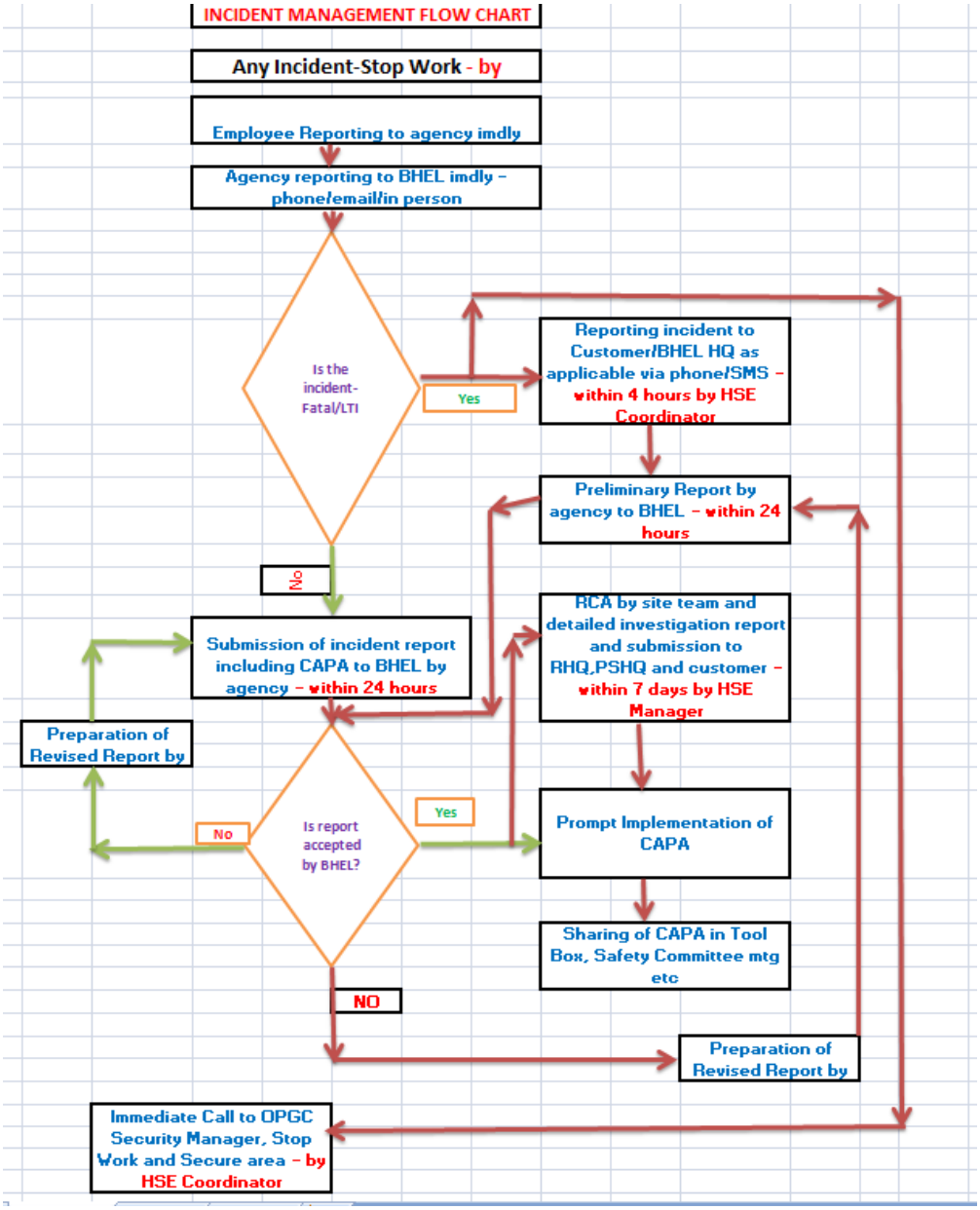
An important key to effective emergency response is an effective communication system. At BHEL, site telephone, mobile and radios will be used for communication during emergency.

- Whosoever is observing any emergency shall inform about emergency to:
  - HR/Admin department
  - HSE-Head /Officers /
  - Medical and Security department
  - Fire department,

- BHEL Site/Section In-charge

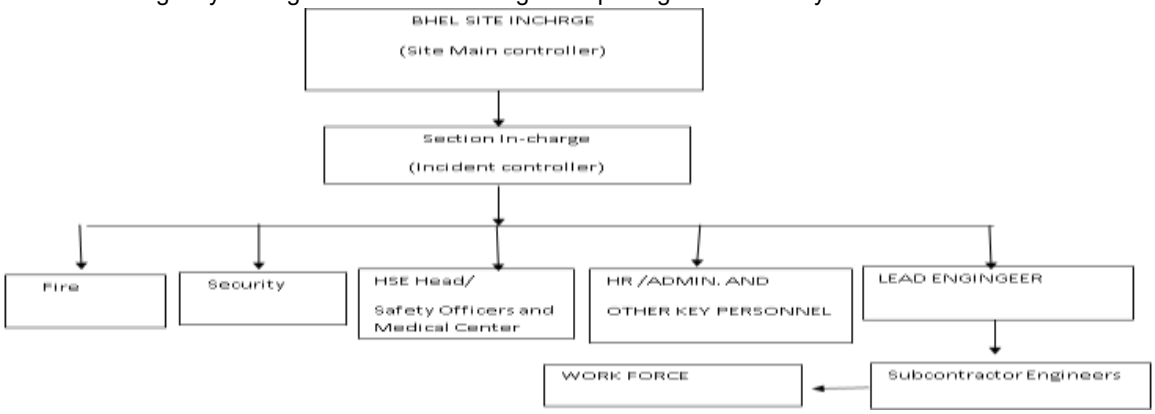
- BHEL Section In-charge will confirm the information with emergency services and also inform the Regional Manager as well as sub-contractors Site In-charge.

31.4 Communication matrix shall be as:



31.5 Emergency Organization -

An emergency organization establishment is based on nature of emergency at BHEL site. The matrix for the Emergency Management Team showing the reporting of various key members is as:



31.6 List of Key Personnel -

Sl. No.	Name	Designation	Telephone Number	Mobile number

31.7 Emergency Control Center -

For the coordination with emergency situations at BHEL site Site In-charge office shall operate as an Emergency Control Room. Site Main Controller (Site In-charge) will coordinate from this Emergency Control Room. Control Room shall be equipped with all necessary communication devises necessary to manage particular emergencys.

31.8 Emergency Drills -

The site HSE Manager and Emergency and Rescue Teams must participate in regular emergency drills of various types. The intervals between such drills must not exceed three months. The records of the drills must be prepared and kept on site for review by the Owner and site Management. The records must be reviewed during regularly scheduled project HSE Committee meetings.

- After each drill, a formal, documented debriefing must be conducted to discuss areas of improvement and an Action Plan developed with Responsible Person and Anticipated Completion Dates describing improvements to be implemented.

31.9 Roles & Responsibility -

Responsibility of Site In-charge (Site Main Controller):

- Immediately on receiving message regarding emergency will proceed to their cabin and fill their role as Main Controller and activate the Emergency Control Room and Emergency Management Team.
- Take strategic and technical decisions in line with the incident scenario to mitigate the cause of emergency.
- Provide leadership and guidance to the Emergency Management Team.
- As soon an emergency call is received they shall inform respective Section In-charge.
- Call for available resources Fire, Medical, Security as needed based on emergency situation.
- Stay in contact with Section In-charge for coordination efforts of resources and evacuation of personnel.
- Ensure head count is conducted and received.
- Notify Owner representative of situation and plan.

Responsibility of Section In-charge (Area Controller):

- If not at the location, once notified of an emergency will proceed to the area and act as an incident controller if safe or as appropriate based on the nature of emergency.
- Will be overall in-charge of the area situation in consultation with emergency responding offices and mobilized resources in coordination with Main Controller.
- Will assess the situation and take necessary action to control the emergency and give necessary instruction to site personnel as necessary and appropriate.
- Will evaluate if fire emergency and attempt to extinguish if safe and in incipient stage and assist injured as applicable.
- Shall instruct the sub-contractors and ensure that all non-essential employees are moved to safe assembly point and organize head count.
- Ensure safe exvacuation of site personnel to safe assembliy point in coordination with Main Controller.
- Shall keep in contact with Main Controller keep them informed about site situation and seek directives for mitigation of emergency.
- Communicate with shift Fire Officer of fire condition and rescue measures.
- Communicate with shift Security Officer assist in barricading the affected area.
- Communicte with shift Medical for transporting of causalities, if any.

Fire officer /shift Fire in charge:

- Respond to the emergency call with fire crew in first turn out. Report to Incident controller at site of emergency.
- Decide line of control action in consultation with Section In-charge/Incident Controller for firefighting and other control actions including evacuation of trapped personnel.
- Deploy auxiliary fire squad for assisting fire crew.
- Ensure safety of the crew members
- Keep in constant contact with Emergency Control Room and Team.

Security officer / In charge:

- Instruct and deploy security personnel at security posts/gates and around the affected area.
- Communicate with the auxiliary fire squad at emergency site immediately on receiving emergency call to ensure their mobilzation.
- Cordon off the affected area and guide traffic /emergency vehicles and manage crowd control by dispersing unnecessary persons from the area.
- Ensure vigilance at security posts /gates and be in contact with area manager and other members connected with firefighting or rescue operation.
- Mobilize for evacuation of personnel to safe locations/assemble point.

Medical Center:

- Upon receiving notification of an emergency, anticipate the casualties and prepare accordingly as per medical response plan. Inform Medical Staff and nearest Hospital in advance.
- Dispatch ambulance to incident site along with necessary staff.
- Provide medical treatment/first aid as necessary.

HR/Admin and HSE Teams:

- Coordinate with Main Controller and all other Emergency Management Team members and Government agencies as per requirement.
- Identify appropriate Assembly Points at project site, provide directions and marked areas clearly.
- Assist with arrangement of necessary PPE and use of.
- Support the Emergency Management Team as directed and/or necessary based on situation.

31.10 General Requirements:

- Emergency preparedness and response capability of site shall be developed as per Emergency Preparedness and Response plan issued by Regional HQ
- Availability of adequate number of first aiders and fire warden shall be ensured with BHEL and its sub-contractors
- Assembly point shall be earmarked and access to the same from different location shall be shown in consultation with the owner
- Fire exit shall be identified and pathway shall be clear for emergency escape.
- Appropriate type and number of fire extinguisher shall be deployed as per Fire extinguisher deployment plan and validity shall be ensured periodically through inspection
- Adequate number of first aid boxes shall be strategically placed at different work places to cater emergency need. Holder of the first aid box shall be identified on the box itself who will have the responsibility to maintain the same.
- First aid center shall be developed at site with trained medical personnel and ambulance
- Emergency contact numbers (format given in EPRP) of the site shall be displayed at prominent locations.
- Tie up with fire brigade shall be done in case customer is not having fire station.
- Tie up with hospital shall be done in case customer is not having hospital.
- Emergency Organization group shall be formed at site.
- Mock drill shall be conducted on different emergencies periodically (every three months) to find out gaps in emergency preparedness and taking necessary corrective action

31.11 **WEATHER SEVERITY PLAN**

A. OBJECTIVE AND SCOPE:

considering the over all monsoon and wind speed in the area the emergencies like cyclone and flood shall be considered from safety point of view during project work.

Warning/alerts issued by Bangladesh Meteorological department shall be acted upon by appropriate measures. These alerts are mostly conveyed to District Administration which in turn passes on to the owner of the project i.e. BIFPCL in this case. BIFPCL shall convey such alert to contractors. and coordinate appropriate response. Such alert is transmitted over Radio and TV channels also. However, contractors shall also remain alert to w3eather conditions and share with BHEL and fellow contractors any input received. Contractors shall actively participate in the Emergency Response activities

This safety plan provides procedure to be followed during emergency due to flood and cyclone for the period of entire project work with respect:

- To give clear guidance as to the actions that must be implemented.
- To inform employees what to do in an Emergency Scenario.
- To establish an emergency response and communications procedure.

B. RESPONSIBILITIES

RCM or his assignee shall coordinate with various departments in charge and supervisors, who will execute the alert procedures in their assigned areas. The coordination shall be in line with directives received from the Client/consultants.

C. CYCLONE

In the event of CYCLONE, alert warning is in three parts. The alert will be issued by BHEL Site Manager.

The actions required during cyclone/Rough Weather:

- Check and assist subcontractors in cleanup. Pick up all loose and unused material of respective supervisor's area
- Check tie-down arrangement is proper for all temporary structure, cranes and tall objects etc.
- Tie to secure all gas cylinders to avoid displacement and unsafe conditions which could be due to wind pressure.
- Secure portable electricity generating sets and other equipments, pumps, hoses etc.
- Make preparation for removal of water logging.
- Take review of work activity and make preparation for removal of equipments and material from all areas.
- Isolate/Turn off all electrical power from the main panel/switches. Secure and anchor panels properly.
- Recheck anchorage/tie of all temporary structures/sheds, tall objects, cranes, rigs, scaffolds etc to avoid toppling due to wind force.
- Cranes boom shall be either locked or lowered the booms as reasonably & practicably and rigs to safe position for the safety point of view.
- Group up all trash barrels, wooden pallets, forms; wooden decks etc. and anchor properly.
- Welding machines, air compressors, and such equipments are to be grouped together and secured to the stable objects. Welding leads, electrical cables, hoses are to be rolled up and secured properly.
- Set on site vehicles on high ground in the site area with brakes set firmly.
- Anchor all tanks, vessels, gas cylinders that may be moved by high wind and water.

- Evacuate job site.

D. **PERSONNEL EVACUATION**:

Personnel Evacuation will be required if predicted wind speed and storm surge heights are beyond acceptable limits as per the guidelines of BHEL management.

Special cyclone shelter shall be arranged in consultation with BHEL management. This shelter shall be equipped with first aid kit and emergency kit containing torch, sufficient batteries, jackets, emergency treatment manual. The map of escape routes and other site specific instructions of emergency situations shall be prominently displayed in the shelter.

Once the warning received from Client/Consultant, the emergency response team shall evacuate and transport all personnel involved in the project to the cyclone shelter.

Cyclone may followed by the calm “EYE” be aware of it. If the wind suddenly drops, don’t assume the cyclone is over. Violent wind may resume from the opposite side direction. Wait for the official “All clear Signal”.

After the cyclone do not go outside until officially communicated about safe situation outside. Use recommended routs for returning. Do not panic or rush while returning.

Checking of gas leaks and wellbeing of electrical appliances is essential before leaving the site.

Listen to local radio for official warning and advice. The site manager shall also obtain updates from client/consultants/metrological departments and communicate to the personnel on project site.

E. MONSOON:

During monsoon following precautions needs to be considered.

- **Excavation:** Inspect all excavations and protect from collapsing or subsidence. Clear all excavated material.
- **Storm water drains:** Check all storm water drains ahead of monsoon for any blockage etc. Identify way for draining out water collected in the site. If required, temporary drains should be prepared for draining out accumulated water in site. The sufficient number of dewatering pumps should be available for the purpose and logged water shall be pumped to nearest drain by dewatering pumps.
- **Access Routes:** Identify access routes to the site in case of flood. Sand should be available to spread over slippery surface.
- **Electrical Supply:** Beforehand check earthing of electrical panels and electrical cables for joints, cracks, insulation failure etc. Keep additional stock of electrical cables and plug tops for replacement of damaged one or to energize dewatering pumps. Do not keep electrical cables/welding cables on the ground but route them above head level. Do not use welding / DB sheds as shelters. All electrical equipment shall be equipped with ELCBs/RCCBs.
- **Power Cable route demarking:** cable rout shall be demarked by either by temporary or permanent.
- **Scaffolding:** Check all scaffolds for stability after heavy rain/storm.

- **Work restrictions:** Do not perform any height work, electrical work and rigging activities during rain. Lower the crane boom to avoid striking of lightning.
- **Vehicular movement:** Instruct the vehicle operators about following safety precautions during monsoon in daily tool box meeting, Slippery surface and road conditions, Speed limit, Wind shield wiper, Fog light, break condition is proper, break light is in proper condition & functioning. Not to take vehicle in loose soil.
    - **Lightening protection:** Boiler structure shall be facilitated with thunder protecting equipment.
    - **Workmen shed construction:** workmen rest shed shall be constructed in robust way. RCC pillar shall be used instead of brick pillar. It shall be facilitated with lightning arrestor as per site resource. However if the rest room is nearby high mast light. Lighting arrestor may or may not be provided.
    - **Field Training Programme on Lightening/Thunder: Dos or Dos not.**

F. SAFETY PRECAUTIONS FOR SNAKE MENACE:

Preventive Measures –

③ Remove vegetations around the site

③ Pour Carbolic acid around site boundaries in regular intervals to keep away poisonous snakes. . In summer and rainy season, frequency will be once a month and in other seasons, it will be once a quarter. It may be noted that as the location of the project is on a sand bed, there is almost no wild growths. Hence, Snake menace may not of significant severity and scale.

Precautions to avoid snake bite –

③ Avoid stepping out in the dark, especially during monsoon without safety shoes and torch.

③ Before wearing shoes, check inside the shoes for any snake/insect hiding inside. Similarly before lifting any material with hand lying on ground for long time, look for snake/insect handling inside. Wear leather hand gloves. Always check inside gunny bags, cartons, boxes before putting your hand in side or lifting them.

③ Be aware of your surroundings at all time. Never sit or step over obstacles without looking carefully. Never go near bushes for natural calls.

③ Don't chase snakes as they become aggressive. Never try to hit a snake or try to catch it, where there is one, there are likely others.

③ Never handle a snake, even if you think it is dead.

Symptoms of Snake Bite –

③ A pair of punctured mark, severe pain, Redness & swelling around bitten area

③ Victim gets nausea, vomiting sensation, sweating, disturbed breathing and increased salivation.

Actions required in case of snake bite –

③ Reassure the victim

③ Immobilize the bitten body part without compression.

③ Get the patient to hospital as fast as safely possible

③ Tell the doctor any of the symptoms appearing on the way to the hospital.

Snakebite Emergency: DO's and DON'Ts

Do's:

③ Avoid yourself and victim from the risk of second bite.

③ Remove tight clothing, shoes, watch or ring near bitten area before swelling starts. Calm the victim. Tell victim that virtually all snakebites are successfully treated. Panic can increase the danger to the victim by inducing rapid heartbeat.

③ Clean / disinfect bite area thoroughly, apply hard direct pressure with gauze pad over bite area, soak gauze pad with Betadine if possible before application and strap pad tightly in place with adhesive tape

③ Wrap affected extremity with 2" – 3" elastic bandaging as tightly as one would for sprain, keep the affected extremity positioned at or as close to heart level as possible and immobilize affected extremity; use a splint if possible.

③ Get medical attention as soon as possible

③ Ensure the availability of anti venom serum in the hospital.

Don'ts:

③ Do not bleed the wound, cut or increase bite marks or put ice on the bite

③ Do not eat or drink anything and engage in strenuous physical activity

③ Do not apply oral suction to bite

③ Do not take alcoholic beverage or any self medication

③ Do not apply cold / hot packs or burn wound

③ Do not delay seeking medical attention

③ Do not remove dressings/elastic wrap until at hospital

G. EMERGENCY CONTACT LIST:

Following emergency contact numbers shall be available / displayed at site and updated regularly.

Emergency Contact Numbers

(Contact numbers to be filled by Site Management)

Client		
	Project Manager	
	Plant Safety Manager	
	OPGC Fire Services	
	Medical and Ambulance Services	
	ADMIN-OPGC	
	Security- OPGC	

BHEL		
	RCM	
	Safety Manager	
	HSE COORDINATOR	
	HR-ADMIN	
SUB-CONTRACTOR		
	RCM	
	Project Manager	
	Safety Manager	
	Ambulance	
	HR-ADMIN	
Emergency Services		
	Near Hospital	
	Near Fire Station	
	Ambulance Service	
	Police Station	

32.0 HSE INSPECTION

Inspection on HSE for different activities being carried out at site shall be done to ensure compliance to HSEMS requirements. The subcontractor shall maintain and ensure necessary safety measures as required for inspection and tests HV test, Pneumatic test, Hydraulic test, Spring test, Bend test etc as applicable, to enable inspection agency for performing Inspection. If any test equipment is found not complying with proper safety requirements then the Inspection Agency may withhold inspection, till such time the desired safety requirements are met.

32.1 DAILY HSE CHECKS

Both the Site Supervisors and safety officer of Subcontractor are to conduct daily site Safety inspection around work activities and premises to ensure that work methods and the sites are maintained to an acceptable standard. The following are to form the common subjects of a daily safety inspection:

- Personal Safety wears & gear compliance.
- Complying with site safety rules and permit-to-work (PTW).
- Positions and postures of workers.
- Use of tools and equipment etc. by the workers.
- The inspection should be carried out just when work starts in beginning of the day, during peak activities period of the day and just before the day's work ends.

32.2 INSPECTION OF PPE

- PPEs shall be inspected by HSE officer at random once in a week as per format no. HSEP:14-F06 for its compliance to standard and compliance to use and any adverse observation shall be recorded in the PPE register.
- The applicable PPEs for carrying out particular activities are listed below.

32.3 INSPECTION OF T&Ps

- A master list of T&Ps shall be maintained by each subcontractor.
- All T&Ps being used at site shall be inspected by HSE officer once in a month as per format no. HSEP:14-F07 for its healthiness and maintenance.
- The T&Ps which require third party inspection shall be checked for its validity during inspection. The third party test certificate should be accompanied with a copy of the concerned competent person's valid qualification record.
- The validity of T&P shall be monitored as per "Status of T&Ps" format no. HSEP:14-F08

32.4 INSPECTION OF CRANES AND WINCHES

- Cranes and winches shall be inspected by the operator through a daily checklist for its safe condition (as provided by the equipment manufacturer) before first use of the day.
- Cranes and Winches shall be inspected by HSE officer once in a month as per format no. HSEP:14-F09 for healthiness, maintenance and validity of third party inspection.
- The date of third party inspection and next due date shall be painted on cranes and winches.
- The operators/drivers shall be authorized by sub-contractor based on their competency and experience and shall carry the I-card.

32.5 INSPECTION ON HEIGHT WORKING

- Inspection on height working shall be conducted daily by supervisors before start of work to ensure safe working condition including provision of
    - Fall arrestor
    - Lifelines
    - Safety nets
    - Fencing and barricading
    - Warning signage
    - Covering of opening
    - Proper scaffolding with access and egress.
    - Illumination
- Inspection on height working shall be conducted once in a week by HSE officer as per format no. HSEP:14-F10.

- Medical fitness of height worker shall be ensured.
- Height working shall not be allowed during adverse weather.

32.6 INSPECTION ON WELDING AND GAS CUTTING OPERATION

- Supervisor shall ensure that no flammable items are available in near vicinity during welding and gas cutting activity.
- Gas cylinders shall be kept upright.
- Use of Flash back arrestor shall be ensured at both ends.
- Inspection during welding and gas cutting operations shall be carried out by HSE officer once a month as per format no. HSEP:14-F11.
- Use of fire blanket to be ensured to avoid falling of splatters during welding or gas cutting operation at height.
- Availability of fire extinguisher at vicinity shall be ensured.

32.7 INSPECTION ON ELECTRICAL INSTALLATION / APPLIANCES

- Ensure proper earthing in electrical installation
- Use ELCB at electrical booth
- Electrical installation shall be properly covered at top where required
- Use appropriate PPEs while working
- Use portable electrical light < 24 V in confined space and potentially wet area.
- Monthly inspection shall be carried out as per format no. HSEP:14-F12.

32.8 INSPECTION OF ELEVATOR

- Elevators shall be inspected by concerned supervisors once in a week as per format no. HSEP:14-F13.
- All elevators shall be inspected by competent person and validity shall be ensured.
- The date of third party inspection and next due date shall be painted on elevator.

33.0 HSE PERFORMANCE EVALUATION:

HSE performance of the subcontractor shall be monitored as per the following parameters: (For each contract-wise package). PERIODICITY: RA Bill period

Sl. No.	Parameters of measurement	Ref Clauses	Weightage	Actual
1	Availability of safety officers at site – absence up to 15% permissible. Score proportionately gets reduced with higher rate of absence. Availability to be reckoned from start date of manpower mobilisation	7.0,7.1	10	
2	Attendance by the safety officer and site CM (as applicable) in the meeting convened by BHEL	7.2.1 and 7.2.2	5	
3	Level of compliance w.r.t decisions taken in previous meetings/audit/inspection/as reported.	32.0,35.0,36.0	5	
4	Timely submission of monthly report on safety in the prescribed format		3	
5	Timely reporting any incident including near–miss to BHEL /Customer/statutory authority(if required) and submission of investigation report of all LTIs/ Major Property Loss incident and HSE events	10.0	10	

6	Degree of PPE compliance, Fall protection arrangements and safety net coverage	8.3, 19.2,19.3	15	
7	Level of compliance w.r.t safety rules	11.0 to 26.0	25	
8	Availability of proper first-aid facility , ambulance, hygienic labour colony and other adequate labor welfare initiatives, conducting of health check-up as per BOCW requirements	8.4	6	
9	Conducting induction training ,skill training, tool box meeting, mock-drills, HSE Promotion, Emergency Preparedness and Response. Participation in BHEL training also counted	9.0, 31.0	6	
10	Level of House-keeping, Environmental Control	27.0, 28.0, 29.0	10	
11	Level of general illumination	8.4.11	5	
A	**TOTAL Obtained**		100	

Penalty score:

i. For each fatality: -10
ii. For each Major Incident: -07

NET TOTAL score will be arrived after deducting penalty score from Total score.

33.1 HSE PENALTIES/ REWARDS (Performance Related)

- Suitable HSE reward system shall be developed at site level to promote HSE compliance amongst workmen.
- To decide HSE reward performance towards HSE shall be evaluated for workmen and it shall be awarded regularly in public gathering.
- If safety record of the subcontractor in execution of the awarded job is to the satisfaction of safety department of BHEL, issue of an appropriate certificate to recognize the safety performance of the subcontractor may be considered by BHEL after completion of the job.

33.2 PENALTIES AGAINST SPECIFIC NON-COMPLIANCE WITH HSE RULES/ INCIDENTS: (To be operated in addition to any other deduction on unsatisfactory HSE performance under relevant clause in the contract)

S. No	Nature of Non - Compliance	Penalty in BTk	Remarks
1.	Not wearing safety helmet/ safety shoes/ welding shield	250	Per lapse/ Person/ day
2.	Not wearing double lanyard full body harness while working at height (> 2 metres)or not anchoring to lifeline/ not providing fall arrestor/ safety net Using defective or non-standard or uninspected scaffolding/ scaffolding not properly supported Using defective ladders/ drums for work at height	1000	Per Person/ lapse/day or per lapse/day
3.	Not wearing gloves/ goggle/earplug/nose mask/ apron	250	Per lapse/ Person/ day
4.	Not using 24 V supply for lighting in confined spaces	500	Per occasion

5.	Improper earthing of welding & Other electrical machines and DBs/ no ELCB/ no rubber mat/ not properly covered/ person without valid wireman license/ no Tag in-Tag out	500	Per lapse/ Machine
6.	Electrical plug not used for connection/ loose insertion	200	Per connection
7.	Using damaged slings or not slinging properly/ damaged hooks/ slings without any identification mark/	1000	Per event Per T&P
8.	Use of lifting equipments including cage or man-basket without having valid Test certificate / without SLI display	5000	Per equipment
9.	Using frayed/ broken welding cables / not using double insulation electrical cable	500	Per machine
10.	Non removal of scrap from work areas and shift to scrap yard/ not providing bins/ improper house keeping	1000	Per location
11.	Lifting cylinders without cage or rolling of cylinders	500	Per occasion
12.	Gas cutting without flash back arrestor at both ends	200	Per machine
13.	Gas cutting at height without sheet below/ barricade at level below (Spark falling from height)	500	Per event
14.	Not having valid driving license for the type of vehicle/ T&P/operator identification card/ rash driving or operation/ not having safety devices like reverse horn & light/ overload switch	500	Per driver / operator
15.	Not providing proper barricades / signage/ unauthorized excavation or barricading	500	Per location per day
16.	Not keeping filled gas cylinders vertically/ mix-up of cylinders/ using broken or damaged manifold/ using domestic LPG cylinder	500	Per occasion
17.	Activity carried out without valid safety work permit	1000	Per occasion
18.	Not carrying out mandatory health check up/ not maintaining First aid box/ centre properly	1000	Per occasion
19.	Non reporting of incident in time / completion of CAPA in time	1000	Per occasion
20.	Non-display of emergency numbers/ non-availability of sufficient fire-extinguishers/ insufficient display of safety posters/ insufficient initiative for safety promotion like TBM	1000	Per occasion

- If principal customer or statutory and regulatory bodies impose penalty on ground of statutory non-compliance or non-compliance of HSE rules by the subcontractor or any incident of any nature including fatality or permanent disability, the same shall be passed on to the subcontractor with appropriate overhead
- The penalty amount shall be recovered from subcontractors from the RA Bill, otherwise Final bill.
- The list of non-compliances is not exhaustive. The site CM has liberty to impose a penalty for any other non-compliance and incidents of any nature including fatality and permanent disability.

340 OTHER REQUIREMENTS

- In case of any delay in completion of a job due to mishaps attributable to lapses by the subcontractor, BHEL shall have the right to recover cost of such delay from the payments due to the subcontractor, after notifying the subcontractor suitably.
- If the subcontractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given reasonable opportunity to do so and/or if the subcontractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instruction regarding safety issued by BHEL, BHEL shall have the right to take corrective steps at the risk and cost of the subcontractor after giving a notice of not less than 7 days indicating the steps that would be taken by BHEL.
- If the subcontractor succeeds in carrying out its job in time without any fatal or disabling injury incident and without any damage to property BHEL may, at its sole discretion, favorably consider to reward the subcontractor suitably for the performance.
- In case of any damage to property due to lapses by the subcontractor, BHEL shall have the right to recover the cost of such damages from the subcontractor after holding an appropriate enquiry.
- The subcontractor shall take all measures at the sites of the work to protect all persons from incidents and shall be bound to bear the expenses of defense of every suit, action or other proceeding of law that may be brought by any persons for injury sustained or death owing to neglect of the above precautions and to pay any such persons such compensation or which may with the consent of the subcontractor be paid to compromise any claim by any such person, should such claim proceeding be filed against BHEL, the subcontractor hereby agrees to indemnify BHEL against the same.
- The subcontractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, overalls shall be supplied by the subcontractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.
- The subcontractor shall notify BHEL of his intention to bring to site any equipment or material which may create hazard.
- BHEL shall have the right to prescribe the conditions under which such equipment or materials may be handled and the subcontractor shall adhere to such instructions.
- BHEL may prohibit the use of any construction machinery, which according to the organization is unsafe. No claim for compensation due to such prohibition will be entertained by BHEL.

35.0 HSE AUDIT/INSPECTION

- Regular HSE Audit/inspection shall be carried out by Subcontractor as per Site HSE audit calendar.
- HSE checklist**(Annexure 02)**shall be used for carrying out audit/inspection and report shall be submitted to BHEL site mangement
- All non-conformities and observations on HSE identified during internal or external HSE audit shall be disposed off by site in a time bound manner and reported back the implementation status
- Corrective action and Preventive action on HSE issues raised by certification body issued by Regional HQs shall be implemented by site and reported to Site management.

36.0 MONTHLY HSE REVIEW MEETING

- Site shall hold HSE review meeting every month to discuss and resolve HSE issues of site and improve HSE performance. It will also discuss the incidents occurred since previous meeting, its root cause and Corrective action and Preventive action. The agenda is given below:
  - Implementation of earlier MOM
  - HSE performance
  - HSE inspection
  - HSE audit and CAPA
  - HSE training
  - Health check-up camp
  - HSE planning for the erection and commissioning and installation activities in the coming month
  - HSE reward and promotional activities
- The meeting shall be chaired by Construction Manager, convened by HSE coordinator and attended by all HOS, Site In charge of Subcontractors and HSE officer of Subcontractors. MOM on the discussion will be circulated to the concerned for implementation.

37.0 FORMATS USED (Details available in Annexure-04) (subject to revisions any time during the contract)

SL. No.	Format Name	Format No.	Rev No.
01	Inspection of First Aid Box	HSEP:14-F01:MAITREE	00
02	Health Check Up	FORM-26	00
03	HSE Induction Training	HSEP:14-F03	00
04	Tool Box Talk	HSEP:14-F04	00
05	MONTHLY HSE REPORT AND HSE INDICES	HSEP:14-F05	00
06	Inspection of PPE	HSEP:14-F06	00

07	Inspection of T&Ps	HSEP:14-F07	00
08	Status of T&Ps	FORM-24	00
09	Inspection of Cranes and Winches	HSEP:14-F09	00
10	Inspection on Height Working	HSEP:14-F10	00
11	Inspection on Welding & Gas Cutting	HSEP:14-F11	00
12	Inspection on Electrical Installation	HSEP:14-F12	00
13	Inspection on Elevator	HSEP:14-F13	00
14	Hse Performance and Penalty	HSEP:14-F14	00
15	incident / property damage /fire incident report	HSEP:14-F15	00
16	Crane operators Identification cum Authorization	HSEP:14-F16	
17	List of T&P	FORM-24	00
18	WORK PERMIT- EXCAVATION (DEEP)	HSEP:14-F18	00
19	WORK PERMIT- RADIATION	HSEP:14-F19	00
20	WORK PERMIT- CONFINED SPACE	HSEP:14-F20	00
21	WORK PERMIT- WORK-AT-HEIGHT (ABOVE 1.8M)	HSEP:14-F21	00
22	WORK PERMIT- HOT WORK	HSEP:14-F-22	00

36.0 ANNEXURES

ANNEXURE 01

As per Rule 76(2):

(1) The first-aid box shall be distinctively marked with a GREEN Cross and shall contain the following items, namely:

(a) For establishments in which the number of contract labour employed does not exceed fifty, each first aid box shall contain the following equipment:

(i)	6 small sterilized dressings
(ii)	3 medium size sterilized dressings
(iii)	3 large size sterilized dressings
(iv)	6 pieces of sterilized eye pads in separate sealed packets.
(v)	6 roller bandages 10 cm wide.
(vi)	6 roller bandages 5 cm wide.
(vii)	One tourniquet
(viii)	A supply of suitable splints
(ix)	Three packets of safety pins.
(x)	Kidney tray.
(xi)	3 large sterilized burn dressings.
(xii)	1 (30ml) bottle containing a two percent alcoholic solution of iodine
(xiii)	1 (30 ml) bottle containing Sal volatile having the dose and mode of administration indicated on the label
(xiv)	1 snake bite lancet
(xv)	1 (30gms) bottle of potassium permanganate crystals.
(xvi)	1 pair scissors
(xvii)	A bottle containing 100 tablets (each of 5 grains) of aspirin
(xviii)	Ointment for burns
(xix)	A bottle of suitable surgical anti-septic solution
(xx)	3 packets of ORS

(2) Adequate arrangement shall be made for immediate recoupment of the equipment when necessary.

ANNEXURE 02

HSE AUDIT/INSPECTION CHECKLIST CUM COMPLIANCE REPORT

PROJECT:_____ SUBCONTRACTOR:_____

DATE : _____ OWNER :_____

INSPECTION BY:_____

Note : write 'NA' wherever the items is not applicable

Item	Yes	No	Remarks	Action
HOUSEKEEPING				
Waste containers provided and used				
Passageways and walkways clear				
General neatness of working area				
Other				
PERSONNELPROTECTIVEEQUIPTMENTS				
Goggles; shields				
Face protection				
Hearing protection				
Respiratory masks etc.				
Safety belts				
Other				
EXCAVATIONS / OPENINGS				
Openings properly covered or barricaded				
Excavations shored				
Excavations barricaded				
Overnight lighting provided				
Other				
WELDING, CUTTING				
Gas cylinders chained upright				
Cable and hoses not obstructing				
Fire extinguisher (s) accessible				
Others				
SCAFFOLDING				
Fully decked platforms				
Guard and intermediate rails in place				
Toe boards in place				
Adequate shoring				
Adequate access				
Others				
LADDER				
Extension side rails 1 m above				
Top of landing				
Properly secured				
Angle $\pm$ 70^0 from horizontal				
Other				

HOISTS, CRANES AND DERRICKS				
Condition of cables and sheaf OK				
Condition of slings, chains, hooks OK				
Inspection & maintenance log maintained				
Outriggers used				
Signals observed and understood				
Qualified operators				
Others				
MACHINERY, TOOLS & EQUIPMENT				
Proper instruction				
Safety devices				
Proper cords				
Inspection and maintenance				
Other				
VEHICLE AND TRAFFIC				
Rules and regulations observed				
Inspection and maintenance				
Licensed drivers				
Other				
TEMPORARY FACILITIES				
Emergency instructions posted				
Fire extinguishers provided				
Fire-aid equipment available				
General neatness				
Others				
FIRE PREVENTION				
Personnel instructed				
Fire extinguishers checked				
No smoking in prohibited areas.				
Hydrants				
Clearance				
Others				
ELECTRICAL				
Proper wiring				
ELCB's provided				
Ground fault circuit interrupters				
Protection against damage				
Prevention of tripping hazards				
Other				
HANDLING & STORAGE OF MATERIALS				
Properly stored or stacked				
Passageways clear				
Other				
FLAMMABLE GASES AND LIQUIDS				
Containers clearly identified				
Proper storage				
Fire extinguisher nearby				
Other				
WORKING AT HEIGHT				

Safety nets				
Safety belts				
Safety helmets				
Anchoring of safety belt to the life line rope				
ENVIRONMENT				
Lubricant waste/engine oils properly dispose.				
Waste from Canteen, offices, sanitation etc. disposed properly.				
Disposal of surplus earth, stripping materials, expired batteries, oily rags and combustible materials done properly.				
HEALTH CHECKS				
Hygienic conditions at labor camps O.K.				
Availability of first-aid facilities				
Proper sanitation at site, office & labor camps.				
Arrangement of medical facilities.				
Measures for dealing with illness.				
Availability of potable drinking water for workmen & staff.				

BHEL	**HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE SUB-CONTRACTORS (MAITREE PROJECT)**	Doc no.: HSEP: 14-MAITREE:VENDOR REV: 00
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BHEL HSEP-14:F-21	_____ **POWER PROJECT**	For Entry at HSE Department :
		Permit No.:
	WORKING AT HEIGHT PERMIT	Registered by (sign.):
		Name :
		Design : Date:

Unit:	
Exact Location of Work:	
Name of the Contractor:	
Name of the Consultant:	
Nature of Work:	
Duration of Work:	**From** Date: **To** Date: ***Daily*** From: Hrs. To: Hrs.

The following items have been checked and compliance shall be ensured during the currency of the permit

Sl.No	Items	Done	Not Reqd.
1.	Equipment/ Work Area Inspected.		
2.	Considered hazard from other routine/ non-routine operations and concerned person (s) alerted.		
3.	ELCB provided for electrical connections.		
4.	Proper lighting provided (for dark hours).		
5.	Area is cordoned off.		
6.	Precautions against public traffic taken.		
7.	Scaffolding checked for soundness and green tag provided.		
8.	Adequately secured and protected platform provided.		
9.	Secured fixed ladder provided for access and exit to the working area.		
10.	All persons provided with proper safety awareness, helmet and other PPEs as required.		
11.	Floor openings are covered.		
12.	Safety net, life line & fall arrestor provided.		
13.	Height phobia ascertained& fitness certificate ensured. Authorization provided		

Additional Permit required and/ or attached: ☐ **Yes** ☐ **No (If Yes, specify)**…….

Additional precautions/ Remarks (if any) :

Declaration: ***All the points mentioned in the above checklist have been checked and found OK.***

Permit Receiver:

Site Engineer (Sub- Contractor):	
Signature:	
Name:	Designation:

Site Safety Officer (SUB- Contractor):	
Signature:	
Name:	Designation:

Permit Issuer:

Engineer of Concern Execution Department (BHEL):	
Signature:	
Name:	Designation:

Site Safety Officer (BHEL):	
Signature:	
Name:	Designation:

Package-in-charge (BHEL):	
Signature:	
Name:	Designation:

DAILY INSPECTION FOR EXTENDED HOURS (after 8 pm)

Date	Time/ Period		Remarks	Signature of Sub-Contractor Site Engineer	Signature of Sub-Contractor Safety Officer	Signature of BHEL Site Engineer	Signature of BHEL Safety Officer
	From	To					

TO BE SIGNED BY THE BHEL HSE &EXECUTION AFTER THE WORK IS OVER
Permit is here by returned after completing the job & ensuring safe removal of men and material.

Site Engineer, BHEL	**Site HSE Engineer, BHEL**
Signature:	Signature:
Name:	Name:

General Instructions:

1. This Permit is required for working at height of 2 mt. and above.
2. This permit must be available at the work site all the times of the work.
3. Location and description of the work must be clearly indicated by the permittee.
4. Terms applicable must be clearly indicated by the permittee.
5. This permit shall be renewed each day only after checking all the compliance jointly by the contractor Site Engineer and Contractor Safety Officer.
6. Permit shall be issued for not more that **7 days** including the issue date.
7. Permit shall be returned to the HSE Department of BHEL after completion of the job.
8. Before engaging anybody to work at height, height phobia needs to be ascertained and proper fitness certificate to be ensured.
9. All safety precautions to be taken as per work site HSE plan.
10. **Distribution of copy:**
    Original- Permittee, Duplicate –Department HOS, Contractor,Triplicate - Site HSE Dept.,

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HSEP-14: F-22	_____ **POWER PROJECT**	For Entry at HSE Department. : Permit No.:
	HOT WORK PERMIT	Registered by (sign.): Name : Design : Date:

Unit:	
Exact Location of Work:	
Name of the Contractor:	
Name of the authorized person to perform the work:	
Work Description in detail:	
Duration of Work: From:	**From** Date: **To** Date: (**Weekly)** From: Hrs. To: Hrs.

The following items have been checked and compliance shall be ensured during the currency of the permit

Sl. No.	Items	Done	Not Reqd.
1.	Gas Test		
2.	Equipment / Work Area Inspected.		
3.	Are all flammable materials removed around / below the hot work area and barricaded		
4.	Hot metal fall from height protection provision arranged		
5.	Required PPE Provided to the person who perform the hot work		
6.	Fire extinguisher provided near the work area		
7.	Safety devises for the hot work (flash back arrester, pressure gauge, welding cable connector for joint, insulated cable lugs, electrode holder etc.)		
8.	All the gas hoses / welding cable are routed properly		
9.	Gas hoses / welding cable are in good condition and checked		
10.	Working platform, access provided.		
11.	Are all the workers being trained and explained about the hazards		
12.	Fire watch provided		

Additional Permit required and/ or attached: ☐ **Yes** ☐ **No (If Yes, specify)**…….

Additional precautions/ Remarks (if any) :

Declaration:
All the points mentioned in the above checklist have been checked and found OK.

Permit Receiver:

Site Concern Engineer (Sub-Contractor):	
Signature:	
Name:	Designation:

Site Safety Officer(Sub-Contractor):	
Signature:	
Name:	Designation:

Permit Issuer:

Engineer of Concern Execution Department (BHEL):	
Signature:	
Name:	Designation:

Site Safety Officer(BHEL):	
Signature:	
Name:	Designation:

Package-in-charge (BHEL):	
Signature:	
Name:	Designation:

DAILY INSPECTION FOR EXTENDED HOURS (after 8 pm)

Date	Time/ Period		Remarks	Signature of Sub-Contractor Site Engineer	Signature of Sub-Contractor Safety Officer	Signature of BHEL Site Engineer	Signature of BHEL Safety Officer
	From	To					

TO BE SIGNED JOINTLY BY THE BHEL SITE ENGINEER & HSE AFTER THE WORK IS OVER
Permit is here by returned after completing the job & ensuring safe removal of men and material.

Site Engineer, BHEL	**HSE Engineer, BHEL**
Signature:	Signature:
Name:	Name:

General Instructions:

2. This Permit is required for all hot work including welding, cutting, grinding, pre-heating etc.
2. This permit must be available at the work site all the times of the work.
3. Location and description of the work must be clearly indicated by the permittee.
4. Terms applicable must be clearly indicated by the permittee.
5. This permit shall be renewed each day only after checking all the compliance jointly by the contractor Site Engineer and Safety Officer.
6. Permit shall be issued for not more that **7 days** including the issue date.
7. Permit shall be returned to the HSE Department of BHEL after completion of the job.
8. Hot work when to be carried out at elevated work area height work permits to be taken along with this hot work permit.
9. All safety precautions to be taken as per work site HSE plan.
10. **Distribution of copy:**

Original- Permittee, Duplicate - Site Engineer, Contractor, Triplicate - Site Engineer

BHEL HSEP-14:F-18	_____ **POWER PROJECT**	For Entry at HSE Department. : Permit No.:
	EXCAVATION PERMIT	Registered by (sign.): Name : Design : Date:

Location/Unit:	
Name of the Client:	
Name of the Contractor:	
Description of Work:	
Method of Excavation:	(Manual/Mechanical)
Duration of Work: From:	Hrs. Date To Hrs. Date

The following items have been checked and compliance shall be ensured during the currency of the permit

Sl. No.	Safety Checks for Excavation/ Description	Existing/ Not Existing	Precautions / Action Taken	Clearance from Authorized Signatures
1	Underground Electrical Cable			
2	Underground sewer/Drinking Water Line			
3	Underground Telecommunication Line			
4	Underground Product/Utility Line			
5	Underground Fire Water Line			

Safety Precautions

Sl. No.	Items to Check	Done	Not Required	Remarks
1	Hard Barricading & Edge Protection provided			
2	Separate Safe Access for Man and Vehicle			
3	Lighting arrangement			
4	Banks Man Provided			
5	Required basic PPEs provided			
6	Slope Cutting Maintained			
7	Shoring / Shuttering / Sheet piling done			
8	Excavated soil /Construction Material /Equipment kept away from the edge.			

Additional Permit required and/ or attached: Y☐ N☐ **If Yes, specify)**.....

Additional precautions/ Remarks (if any) :

Declaration:
All the points mentioned in the above checklist have been checked and found OK.

Permit Receiver:

HOD Civil (Sub- Contractor):
Signature:
Name: Designation:

Site Safety Officer (Sub- Contractor):
Signature:
Name: Designation:

Permit Issuer:

Engineer of Concern Execution Department
Signature:
Name: Designation:

Site Safety Officer (BHEL):
Signature:
Name: Designation:

Package-in-charge (BHEL):
Signature:
Name: Designation:

PERMIT RENEWAL FOR EXTENDED HOUR (after 8 pm)

Sl. No.	Extension Period		Signature of Sub-Contractor Site Engineer	Signature of Sub-Contractor Safety Officer	Signature of BHEL Site Engineer	Signature of BHEL Safety Officer
	(Date) From…….. To…….	(Time- Hrs) From…….. To…….				
1.						
2.						
3.						
4.						
5.						
6						

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TO BE SIGNED JOINTLY BY THE BHEL HSE &EXECUTION AFTER THE WORK IS OVER
Permit is here by returned/closed after completing the job.

Site Engineer, BHEL	**Site HSE Engineer, BHEL**
Certified that the subject work has been completed/stopped and the area cleaned.	**Certified that the subject work has been completed/stopped and the area cleaned.**
Signature (With Dt. & Time):	Signature (With Dt. & Time):
Name:	Name:

General Instructions:

3. Permittee to observe precautions as mentioned on pre-page, mentioned by concerned discipline coordinator.
2. Barricading with tape/hard barricading should be done on all sides of excavation.
3. Approved Excavation procedure shall be followed.
4. Permit must be available at the site all the time during work with permit receiver.
5. This Permit is valid for **15 days**. Every day permit shall be renewed before start of the shift by EPC contractor both HSE and Site Engineer.
6. **Distribution of copy:**
   Original- Permittee, Duplicate - Site Engineer, Contractor,Triplicate –HSE Dept., EPC Contractor

HSEP-14:F-20	_____ **POWER PROJECT**	For Entry at BHEL-HSE Department. :
		Permit No.:
	CONFINED SPACE ENTRY PERMIT	Registered by (sign.):
		Name :
		Design : Date:

Unit:	
Exact Location of Work:	
Name of the Contractor:	
Name of the Client:	
Description of Work:	
Duration of Work: From:	**From** Date: **To** Date: **Daily** From: Hrs. To: Hrs.

Safety Requirements:

Note- Positive isolation of vessel is mandatory.			
Check Points ***(Please put a tick mark under Yes/No& NR)***		**Yes/No**	**NR**
1.	Has the equipment been Isolated from Power/Steam/Air?		
2.	Has the equipment been Isolated from liquid or gasses?		
3.	Has the equipment been de-pressurized &/or drained?		
4.	Has the equipment been Blanked/blinded or disconnected?		
5.	Has the equipment been water flushed &/or steamed?		
6.	Whether man ways open and ventilated?		
7.	Whether constant Inert gas flow arranged?		
8.	Whether mechanically ventilated and adequately cooled?		
9.	Whether Radiation sources removed?		
10.	Whether 24 V lighting provided inside the confined space?		
11.	Whether training on confined space provided to the group?		
12.	Whether required PPEs (hand gloves, goggles, face shield, ear plug/muff, protective clothing etc.) used?		
13.	Whether Safety harness and Lifeline used?		
14.	Whether Dust/Gas/Air Line mask used?		
15.	Whether attendant with SCBA/Air mask available?		
16.	Whether grounded air Educator/Blower/ AC provided?		
17.	Whether Personal Gas alarm provided?		
18.	Whether communication Equipment Provided?		
19.	Whether rescue equipment/team available?		

20.	Whether fire fighting arrangement done?		

Additional precautions/ Remarks (if any) :

Declaration:

All the points mentioned in the above checklist have been checked and found OK.

Permit Receiver:

Site Concern Engineer (Sub-Contractor):	
Signature:	
Name:	Designation:

Site Safety Officer(Sub-Contractor):	
Signature:	
Name:	Designation:

Permit Issuer:

Engineer of Concern Execution Department (BHEL):	
Signature:	
Name:	Designation:

Site Safety Officer(BHEL):	
Signature:	
Name:	Designation:

Package-in-charge (BHEL):	
Signature:	
Name:	Designation:

DAILY INSPECTION

Authorization: (It is safe to enter the confined space)							
Date	**Time/ Period**		**O_2Level**	**Signature of Sub-Contractor Site Engineer**	**Signature of Sub-Contractor Safety Officer**	**Signature of BHEL Site Engineer**	**Signature of BHEL Safety Officer**
	From	**To**	**(Min- 19.5 %)**				

***Note: The daily Entry/Out Log Sheet to be maintained by standby person on daily basis**

Permit Closure

Sl. No.	Check Points		Remark
1.	Entry	Closed	
		Stopped	
		Will Continue on	
2.	Site Condition	Site Left in a Safe Condition	
		Housekeeping Done	
	Yes/No		**Not Applicable**
3.	Multi Lock Removed		
4.	Key Transferred		

TO BE SIGNED BY THE CONTRACTOR AFTER THE WORK IS OVER	
Permit is here by returned after completing the job & ensuring safe removal of men and material.	
Site Execution Engineer, Contractor	**Site Execution Engineer, BHEL**
Signature:	Signature:
Name:	Name:

General Instructions:

4. This Permit is required for entry into confined space.
2. This permit must be available at the work site all the times of the work.
3. Location and description of the work must be clearly indicated by the permittee.
4. This Permit shall be renewed each day only after checking all the compliance by contractor SE & SO.
5. All safety precautions to be taken as per work site HSE Plan.
6. Permit shall be issued for not more that 7 days including the issue date.
7. Permit shall be returned to the HSE Department of Contractor after completion of the job.
8. **Distribution of copy:**
   Original- Permittee, Duplicate - Site Engineer, Contractor,Triplicate - Site Engineer

HSEP-14:F-19

_____ **POWER PROJECT**

RADIOGRAPHY WORK PERMIT

For Entry at HSE Department:
Permit No.:
Registered by (sign.):
Name :
Design : Date:

Unit:			
Exact Location of Work:			
Name of the Contractor:		Name of the Client:	
Description of Work:			
Duration of Work: From:	Hrs. Date	To	Hrs. Date

Name of Persons Involved In Radiography Work					
Name	***RT Level***	***Certificate No. & Validity***	***Name***	***RT Level***	***Certificate No. & Validity***
1.			*4.*		
2.			*5.*		
3.			*6.*		
Source Strength:			**Curie:**		
Name of Radiography Agency: *BARC Regd. No:* *Validity:*			Name of Site In Charge(R.A): (Min RT Level-2): RT Level:		

Sl. No	**Check Points**	**Yes/No**	**NR**
1.	All the persons at the site informed/removed from the area.		
2.	Area around the source of radiation cordoned off with the rope/chords.		
3.	Radiation warning symbol/boards displayed around radiography work on rope/chord.		
4.	Radiographer worn radiation badges during testing.		
5.	Radiography camera and carrying case box having radiation symbol.		
6.	Radiation Survey Meter is in working condition, calibrated & within validity period.		
7.	Radiographer has valid certificate from BARC.		
8.	Blinking light provided on road during radiography (in dark hours).		

Additional permit required and/or attached: Yes ☐ NO ☐

(if Yes specify) :

Additional Precautions / Remarks (If Any):

Permit Receiver:

Site Engineer (Sub- Contractor):	
Signature:	
Name:	Designation:

Site Safety Officer (SUB- Contractor):	
Signature:	
Name:	Designation:

Permit Issuer:

Engineer of Concern Execution Department (BHEL):	
Signature:	
Name:	Designation:

Site Safety Officer (BHEL):	
Signature:	
Name:	Designation:

Package-in-charge (BHEL):	
Signature:	
Name:	Designation:

DAILY INSPECTION FOR EXTENDED HOURS (after 8 pm)

Date	Time/ Period		Remarks	Signature of Sub-Contractor Site Engineer	Signature of Sub-Contractor Safety Officer	Signature of BHEL Site Engineer	Signature of BHEL Safety Officer
	From	To					

TO BE SIGNED BY THE BHEL HSE &EXECUTION AFTER THE WORK IS OVER
Permit is here by returned after completing the job & ensuring safe removal of men and material.

Site Engineer, BHEL	**Site HSE Officer, BHEL**
Signature:	Signature:
Name:	Name:

General Instructions:

1. This Permit must be available at the work site all the times till the work not completed.
2. Location and description of work must be clearly indicated by the permittee.
3. Terms applicable must be clearly indicated by the permittee.
4. This permit shall be renewed each day only after checking all the compliance jointly by contractor site engineer / Safety officer.
5. Permit shall be issued for not more than 7 days including the issue date.
6. The closed out permit shall be recorded in the office of respective contractor.
7. All safety precautions to be taken as per BARC requirement.

HSEP:14-F09

Bharat Heavy Electricals Limited
Power Sector Eastern Region

INCIDENT (PERSONAL INJURY / PROPERTY DAMAGE) REPORT

(This report is to be sent within 24 hours directly to GM/Q &S/PS-HQ, , Noida with copy to MR(HSE)/PSER in respect of all incidents in addition to immediate Fax / Telegraphic intimation of fatalities and major damages including fires.)

1	NAME OF SITE		3	ACTIVITY AREA	
2	SCOPE OF WORK		4	NAME OF CONTRACTOR	
			5	NAME & DESIGNATION OF BHEL ACTIVITY I/C	
6	DATE & TIME OF INCIDENT		7	DATE RESUMED	
8	NO. OF WORK-DAYS LOST BY VICTIM (If duty not resumed, give estimated figure)				
9	NO. OF MANHOURS LOST BY OTHERS				
10	PERSONAL DETAILS OF INJURED AND / OR DETAILS OF MATERIALS / EQUIPMENT / PROPERTY DAMAGED				

NAME				NAME OF MATERIAL / EQUIPMENT / PROPERTY	
PERIOD OF EMPLOYMENT					
AGE	YRS	SEX	MALE/ FEMALE	ESTIMATED COST	ACTUAL COST
MARITAL STATUS		SINGLE / MARRIED			
OCCUPATION				NATURE OF DAMAGE	
PART OF BODY INJURED					
NATURE OF INJURY					
AGENCY (OBJECT / EQUIPMENT / SUBSTANCE) MOST RESPONSIBLE FOR CAUSING INCIDENT / INJURY / DAMAGE					
12	PERSON (NAME & DESIGNATION) WITH MOST CONTROL OVER AGENCY (OBJECT / EQUIPMENT / SUBSTANCE) CAUSING INCIDENT INJURY / DAMAGE				
13	DESCRIBE CLEARLY HOW THE INCIDENT OCCURRED AND IF THE VICTIM WAS WEARING THE APPROPRIATE PPEs. (USE ADDL SHEET, IF REQUIRED).				

ANALYSIS		
14	**WHAT ACTS AND / OR CONDITIONS CONTRIBUTED MOST DIRECTLY TO THIS INCIDENT**	
15	**WHAT ARE THE BASIC REASON FOR THE EXISTENCE OF THESE ACTS AND / OR CONDITION ?**	
16	**WHAT CORRECTIVE ACTIONS HAVE BEEN TAKEN TO PREVENT INCIDENT RECURRENCE ?**	
	DATE :	**SIGNATURE OF SITE HSE COORDINATOR**
17	**COMMENTS OF HEAD / SOX**	
	DATE:	**SIGNATURE OF HEAD/SOX**

BHARAT HEAVY ELECTRICALS LIMITED HSEP:14-F10
POWER SECTOR: EASTERN REGION

INVESTIGATION REPORT FROM PROJECT SITE :

INCIDENT(FATAL/SERIOUS INJURY/PROPERTY DAMAGE/FIRE)

DATE :

Instructions			
This report is to be sent within seven days to GM/Q&S/PS-HQ and RHQ Safety Department, in respect of incident requiring investigation by a committee.			
Report date	**Incident Date**	**Incident Time**	**Incident Type**
Name of Site :			
Scope of work :			
Name & Designation of BHEL Package I/C			
Name of Contractor :			
Incident Location :			

Victim(s) Information

Name	Designation	Age	Sex	Address

Witness Information	
Name	**Address**

1	**Describe, how the incident took place (Attach separate sheets, diagrams, and photographs, if possible.)**
2	**Description of Injury (Attach medical report as applicable)**
3	**Describe property and equipment damaged in the incident and extent of damage.**
4	**Describe any personal protective equipment used and other safety equipment that were in place.**

5	**Describe any perceived actual or possible safety violations in the area of incident.**

6	**Describe events and conditions immediately before the incident.**
7	**Are these conditions still in existence?**
8	**Were any unsafe actions performed by the victim or by others or were any safety rules violated that caused/ contributed to the incident.**

9	**Describe steps taken to secure the area.**

10	**Describe measures to be taken to prevent similar recurrences.**
11	**Any other information**

Prepared by			
Name	**Designation**	**Signature**	**Date**

Submitted to:

1 Construction Manager
2 RHQ: Safety Department
3 GM/Q&S/PS-HQ

POWER SECTOR

TOOL-BOX TALK

FORMAT NO: HSEP:14-F11
REV NO.: 00
PAGE NO. 01 OF 01

Name of Site :

Sub-Contractors Name :

Date : **Topic:**

Attendance Sheet

Name	Signature	Remarks

Signature of Site I/C of Subcontractor :

RECORD OF REVISION

CLAUSE No.	Rev No.	Brief of Revision	Date
All	00	New plan introduced	05.04.17

TENDER NO: PSER:SCT:KLN-E2060:20

VOLUME -IE

FORMS & PROCEDURES

FOR

Erection, Testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears, HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1, FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP, Rampal, Bangladesh.

BHARAT HEAVY ELECTRICALS LIMITED

(A GOVT. OF INDIA UNDERTAKING)
POWER SECTOR – EASTERN REGION
PLOT NO. – 9 / 1, DJ – BLOCK,
SECTOR – II, KARUNAMOYEE,
SALT LAKE CITY,
KOLKATA – 700091.

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SN	Description	Form No	Remarks
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• BANK GUARANTEE FORMATS FOR "RELEASE OF AMOUNTS WITHED/ LIQUIDATED DAMAGES AMOUNT", "SUPPLY FREE ISSUE MATERIAL" & "EARNEST MONEY" IS ALSO GIVEN.

: will be released later

Form No: F-01 (Rev 00)

OFFER FORWARDING LETTER / TENDER SUBMISSION LETTER

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

Offer Reference No:……. Date:……

To,

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

Dear Sir,

Sub : Submission of Offer against Tender Specification No: ……

I/We hereby offer to carry out the work detailed in the Tender Specification issued by Bharat Heavy Electricals Limited, Power Sector-…… ……., in accordance with the terms and conditions thereof.

I/We have carefully perused the following listed doc uments connected with t he above work and agree to abide by the same.

1. Amendments/Clarifications/Corrigenda/Errata/etc issued in respect of the Tender documents by BHEL
2. Notice Inviting Tender (NIT)
3. Price Bid
4. Technical Conditions of Contract
5. Special Conditions of Contract
6. General Conditions of Contract
7. Forms and Procedures

Should our Offer be accepted by BHEL for Award, I/we further agree to furnish 'Security Deposit' for the work as provided for in the Tender Conditions within the stipulated time as may be indicated by BHEL.

I/We further agree to execute all the works referred to in the said Tender documents upon the terms and conditions contained or referred to therein and as detailed in the appendices annexed thereto.

I/We have deposited/depositing herewith the requisite Earnest Money Deposit (EMD) as per details furnished in the Check List.

Authorised Representative of Bidder
Signature :
Name :
Address :

Place:
Date:

Form No: F-02 (Rev 00)

DECLARATION BY AUTHORISED SIGNATORY OF BIDDER

(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 Authorised Signatory**
Ref : 1) NIT/Tender Specification No: ……,
2) All other pertinent issues till date

I/We, hereby certify that all the information and data furnished by me with regard to the above Tender Specification are true and complete to the best of my knowledge. I have gone through the specifications, conditions, stipulations and all other pertinent issues till date, and agree to comply with the requirements and Intent of the specification.

I further certify that I am authorised to represent on behalf of my Company/Firm for the above mentioned tender and a valid Power of Attorney to this effect is also enclosed.

Yours faithfully,

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

Date:

Enclosed : Power of Attorney

Form No: F-03 (Rev 00)

NO DEVIATION CERTIFICATE

(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 : **No Deviation Certificate**
Ref : 1) NIT/Tender Specification No: ……,
2) All other pertinent issues till date

We hereby confirm that we have not changed/ modified/materially altered any of the tender documents as downloaded from the website/ issued by BHEL and in case of such observance at any stage, it shall be treated as null and void.

We also hereby confirm that we have neither set any Terms and Conditions and nor have we taken any deviation from the Tender conditions together with other references applicable for the above referred NIT/Tender Specification.

We further confirm our unqualified acceptance to all Terms and Conditions, unqualified compliance to Tender Conditions, Integrity Pact (if applicable) and acceptance to Reverse Auctioning process.

We confirm to have submitted offer in accordance with tender instructions and as per aforesaid references.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized representative of the bidder)

Form No: F-04 (Rev 00)

DECLARATION CONFIRMING KNOWLEDGE ABOUT SITE CONDITIONS

(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 confirming knowledge about Site conditions**
Ref : 1) NIT/Tender Specification No: ……,
2) All other pertinent issues till date

I/We, _____ hereby declare and confirm that we have visited the Pr oject Site as referred in BHEL Tender Specificat ions and acquired full knowledge and information about the Site conditions including Wage structure, Industrial Climate, the Law & Order and other conditions prevalent at and around the Site. We further confirm that the above information is true and correct and we shall not raise any claim of any nature due to lack of knowledge of Site conditions.

I/We, hereby offer to c arry out work as detailed in abov e mentioned Tender Specification, in accordance with Terms & Conditions thereof.

Yours faithfully,

(Signature, Date & Seal of Authorized
Representative of the Bidder)

Date :

Place:

Form No: F-05 (Rev 00)

DECLARATION FOR RELATION IN BHEL

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder failing which the offer of Bidder is liable to be summarily rejected)

To,

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

Dear Sir,

Sub : **Declaration for relation in BHEL**
Ref : 1) NIT/Tender Specification No: ……,

I/We hereby submit the followi ng information pertaining to relation/relatives of Proprieter/Partner(s)/Director(s) employed in BHEL

Tick(√) any one as applicable:

1. The Proprieter, Partner(s), Director(s) of our Company/F irm DO NOT have any relation or relatives employed in BHEL

   OR

2. The Proprieter, Partner(s), or Director(s) of our Company/Firm HAVE relation/relatives employed in BHEL and their particulars are as below:
   (i)

   (ii)

Signature of the Authorised Signatory

Note:

1. Attach separate sheet, if necessary.
2. If BHEL Management comes to know at a later date that the information furnished by the Bidder is false, BHEL reserves the right to take suitable against the Bidder/Contractor.

Form No: F-06 (Rev 00)

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

NON DISCLOSURE CERTIFICATE

I/We understand that BHEL PS __ is committed to Information Security Management System as per their Information Security Policy.

Hence, I/We M/s…….. who are subm itting offer for providing services to BHEL PS __ against Tender Specification No:_____ _____, hereby undertake to comply with the following in line with Information Security Policy of BHEL PS ___, _____

- To maintain confidentiality of documents & information which shall be used during the execution of the Contract.
- The documents & information shall not be revealed to or shared with third party which shall not be in the business interest of BHEL PS__.

(Signature, date & seal of Authorized Signatory of the bidder)

Date:

Form No: F-07 (Rev 00)

BANK ACCOUNT DETAILS FOR E-PAYMENT

(To be given on Letter head of the Company /Firm of Bidder, and **ENDORSED (SIGNED & STAMPED) BY THE BANK** to enable BHEL release payments through Electronic Fund Transfer (EFT/RTGS)

---

1. Beneficiary Name :

2. Beneficiary Account No. :

3. Bank Name & Branch :

4. City/Place :

5. 9 digit M ICR Code of Bank Branch :

6. IFSC Code of Bank Branch :

7. Beneficiary E-mail ID :
   (for payment confirmation)

NOTE: In case Bank endorsed certificate regarding above has already been submitted earlier, Kindly submit photocopy of the same

Form No: F-08 (Rev 00)

FORMAT FOR SEEKING CLARIFICATION

(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 : **Request for Clarification**
Ref : 1) NIT/Tender Specification No: ……,
2) All other pertinent issues till date

Sl no	Reference clause of Tender Document	Existing provision	Bidder's query	BHEL's clarification
1				
2				
3				

Yours faithfully,

(Signature, date & seal of Authorized
Representative of the Bidder)

Form No: F-09 (Rev 00)

CAPACITY EVALUATION OF BIDDERS FOR CURRENT TENDER

SL NO.	DESCRIPTION OF WORK (Similar to Tendered Scope)	WORK ORDER REF & DATE	CONTRACT VALUE (Rs. LACS)	CUSTOMER NAME & ADDRESS	CURRENT STATUS OF THE JOB ALONG WITH LATEST MILE STONE COMPLETED	%AGE OF WORK COMPLETED	VALUE OF BALANCE WORK (Rs. Lacs)
1							
2							
3							
4							
5							

NOTES:

1. BIDDERS ARE REQUIRED TO FURNISH ALL THE JOBS OF SIMILAR NATURE WHICH THEY ARE EXECUTING (IN PROGRESS) AT THE TIME OF SUBMISSION OF TENDER, AS PER ABOVE FORMAT.
2. BIDDERS HEREBY UNDERTAKE THAT THEY HAVE FURNISHED THE DETAILS SOUGHT AS PER POINT NO. 1 IN TOTALITY AND THAT THE DETAILS FURNISHED IS COMPLETE IN ALL RESPECT.
3. BHEL WILL TAKE APPROPRIATE ACTION AS DEEMED FIT , IN CASE, IT IS FOUND AT A LATER DATE THAT THE CONTRACTOR HAD SUPPRESSED THE FACTS AND HAVE NOT FURNISHED THE CORRECT & COMPLETE INFORMATIONS.

Signature

DATE :
PLACE:

Name, Designation & Seal of Bidder

CONTRACT AGREEMENT Form No: F-10 (Rev 00)

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector – ..... Region

CONTRACT AGREEMENT

AGREEMENT NO._____ _____

NAME OF WORK	
NAME OF THE CONTRACTOR WITH FULL ADDRESS	
VALUE OF WORK AWARDED	
LETTER OF INTENT NO.	
TIME ALLOTTED FOR COMPLETING THE WORK (DATE OF COMPLETION)	

_____ _____

SIGNATURE OF CONTRACTOR **(SIGNATURE OF BHEL OFFICER)**

CONTRACT AGREEMENT

THIS AGREEMENT MADE THIS _____DAY OF_____ between BHARAT HEAVY ELECTRICALS LIMITED (A Government of India Enterprise) a Company incorporated under the Companies Act, 1956, having its Registered Office at BHEL House, Siri Fort New Delhi- 110049 (herein after called BHEL) of the ONE PART.

AND

M/S _____
_____ (hereinafter called the `Contractor') of the SECOND PART.

WHEREAS M/s ----------state that they have acquired and possess extensive experience in the field of ----------

And Whereas in response to an Invitation to Tender No. ---------- issued by BHEL for execution of ---------- the contractor submitted their offer No.----------dated ----------And whereas BHEL has accepted the offer of the Contractor on terms and conditions specified in the Letter of Intent No.---------- ---------- dated ----------read with the references cited therein.

THIS AGREEMENT WITNESSES AND it is hereby agreed by and between the parties as follows:

1. That the contractor shall execute the work of ---------- ----------and more particularly described in Tender Specification No ----------including Drawings and Specifications (hereinafter called the said works) in accordance with and subject to terms and conditions contained in these presents, instructions to Tenderers, General Conditions of Contract, Special Conditions, Annexures, Letter of Intent dated ----------and such other instructions, Drawings, Specifications given to him from time to time by BHEL.

2. The Contractor is required to furnish to BHEL Security deposit in the form of cash/ approved securities/ Bank Guarantee valid upto ---------- for a sum of Rs.---------- towards satisfactory performance and completion of the Contract.

3. The Contractor has furnished a Bank Guarantee bearing no.----------dated ----------for a sum of Rs.----------executed by ---------- ---------- in favour of BHEL towards Security Deposit valid upto ---------

OR

The Contractor has furnished to BHEL an initial Security Deposit of Rs.----------in the form of cash / approved Securities/ B.G No.---------- dated ---------- for Rs.---------- executed by ---------- ---------- in favour of BHEL valid upto --- ---------- and has agreed for recovery of the balance security deposit by BHEL @ 10% of the value of work done from each running bill till the entire Security Deposit is recovered.

OR

The contractor has furnished to BHEL an init ial Security Deposit of Rs.-----(Rs.----------- vide Bank draft No.--- ----------dated ----------and by adjusting EMD of Rs.---------- submitted vide Bank dr aft No.---------- dt.---------) and has agreed for recovery of balance Security Deposit by BHEL @ 10% of the value of work done from each running bill till the entire security deposit is recovered.

4. The Contractor hereby agrees to extend the validity of th e Bank Gua rantee for such further period or periods as may be required by BHEL and if the Contractor fails to obtain such extension(s) from the Bank, th e Contractor, shall pay forthwith or accept reco very of Rs.---------- from the bills in one installment and the contractor further agrees that failure to e xtend the validity of th e Bank Guarantee or failure to p ay the aforesaid amount in the manner specified above shall constitute breach of contract. In addition to above, BHEL shall be entitled to take such action as deemed fi t and prop er for recovering the said sum of Rs.----------

OR

In case the contractor furnishes the bank guarantee at a later date the contractor hereby agrees to extend the validity of bank guarantee for such further period or periods as may be required by BHEL and if the cont ractor fails to obtain such extension(s) from the bank, the contractor shall pay forthwith o r accept recovery of the amount of bank guar antee given in lieu of security deposit from the bill s in one installment and the contractor further agrees that failure to extend the validity of bank guarantee or failure to pay the aforesaid amount in t he manner specified above shall constitute bre ach of contract. In addition to above, BHEL shall be entitled to take such action as deemed fit and pro per for recovering the said sum.

5. That in consideration of the payments to be made to the Contractor by BHEL in accordance with this Agreement the Contractor hereby covenants and undertakes with BHEL that they shall execute, construct, complete the works in conformity, in all respe cts, with the terms and conditions specified in this Agreement and the documents governing the same.

6. That the Contractor sha ll be deemed to have carefully exa mined this Agreement and the documents governing the same an d also to h ave satisfied himself a s to the nature and character of the Works to be executed by him.

7. That t he Contractor shall carr y out and c omplete the execution of the said works to the entire satisfaction of the Engineer or such ot her officer a uthorised by BHEL, wit hin the agreed time schedule, the time of completion being the essence of the Contract.

8. That BHEL shall, after proper scrutiny of the bills submitted by the Contractor, pay to hi m during the progress of the said works such su m as determined by BHEL in accordance with this Agreement.

9. That this Agreement shall be deemed to have come into force from -------- the d ate on which the letter of intent has been issued to the Contractor.

10. That whenever under this contract or otherwise, any sum of money shall be recoverable from or payable by the Contractor, the same may be deducted in the manner as set out in the General Conditions of Contract or other conditions governing this Agreement.

11. That all charges on account of Octroi, Terminal and other taxes including sales tax or other duties on material obtained for execution of the said works shall be borne and paid by the Contractor.

12. That BHEL shall be entitled to deduct from the Contractor's running bills or otherwise Income Tax under Section 194 (C) of the Income Tax Act, 1961.

13. That BHEL shall be further entitled to recover from the running bills of the Contractor or otherwise such sum as may be determined by BHEL from time to time in respect of consumables supplied by BHEL, hire charges for tools and plants issued (Where applicable) and any other dues owed by the Contractor.

14. That it is hereby agreed by and between the parties that non- exercise, forbearance or omission of any of the powers conferred on BHEL and /or any of its authorities will not in any manner constitute waiver of the conditions hereto contained in these presents and the liability of the Contractor with respect to compensation payable to BHEL or Contractor's obligations shall remain unaffected.

15. It is clearly understood by and between the parties that in the event of any conflict between the Letter of Intent and other documents governing this Agreement, the provisions in the Letter of Intent shall prevail.

16. The following documents

1. Invitation to Tender No----------
   and the documents specified therein.
2. Contractor's Offer No----------
   dated----------.
3. _____
4. _____
5. _____
6. Letter of Intent No_____ dated_____.
7. _____

shall also form part of and govern this Agreement.

IN WITNESS HEREOF, the parties hereto have respectively set their signatures in the presence of

WITNESS (CONTRACTOR)

(to be signed by a person holding
1. a valid Power of Attorney)

2.

WITNESS (For and on behalf of BHEL)

1.

2.

PROFORMA OF BANK GUARANTEE (in lieu of SECURITY DEPOSIT)

In consideration of the Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its Unit at Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700091 having agreed to exempt (Name of the Vendor / Contractor / Supplier) having its registered office at_____ [1] (hereinafter called the said Contractor which term includes supplier), from demand under the terms and conditions of the Contract reference No._____ [2] dated _____[2] valued at Rs……[2] (Rupees ----------)[2] for <Nature of the Work>[3] (hereinafter called the said Contract) of Security Deposit for the due fulfilment by the said contractor of the terms and conditions contained in the said Contract, on production of a Bank Guarantee for Rs._____ [4] (Rupees _____ only), we ____(indicate the name and address of the Bank) having its Head Office at _____(address of the head Office) (hereinafter referred to as the Bank) at the request of _____ [Name of Contractor(s)] do hereby undertake to pay to the Employer an amount not exceeding Rs._____ in the event of any breach by the said Contractor(s) of any of the terms and conditions contained in the said Contract.

We, _____(indicate the name of the Bank), do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Employer. Any such demand made on the bank, shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs._____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this guarantee shall be a valid discharge of our liability for payment hereunder and the Contractor(s) shall have no claim against us for making such payment.

We, further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claim satisfied or discharged or till _____ [5] or till the office/Department/Division of Bharat Heavy Electricals Limited certifies that the terms and conditions of the said Contract have been fully and properly carried out by the said contractor(s) and also including the satisfactory performance of the equipment during guarantee period and accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the _____[6], (3 months more than the present date of validity of Bank Guarantee) we shall be discharged from all the liability under this guarantee thereafter.

We, ____(indicate the name of the Bank)_____further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by any reason of any such variation or extension being granted to the said contractor(s) or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

We,……. BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed…… [7]

b) This Guarantee shall be valid up to ……[8]

c) Unless the Bank is served a written claim or demand on or before _____[9] (3 months more than the present date of validity of Bank Guarantee) all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, ____(indicate the name of the Bank)____ lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Any claim or dispute arising under the terms of this document shall only be enforced or settled in the courts of at Kolkata only.

Date _____ Day of _____

for____(indicate the name of the Bank)__

(Signature of Authorised signatory)

[1] *NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER .*

[2] *DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE*

[3] *PROJECT/SUPPLY DETAILS*

[4] *BG AMOUNT IN FIGURES AND WORDS*

[5] *VALIDITY DATE*

[6] *DATE OF EXPIRY OF CLAIM PERIOD*

[7] *BG AMOUNT IN FIGURES AND WORDS.*

[8] *VALIDITY DATE*

[9] *DATE OF EXPIRY OF CLAIM PERIOD*

Note:

1. **Units are advised that expiry of claim period may be kept 2/3 months after validity date.**
2. **In Case of Bank Guarantees submitted by Foreign Vendors-**
   - **a.** **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.
   - **b.** **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**
   - **b.1** In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter-Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

b.2 **In case, Foreign Vendors intend to provide BG from** Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.

b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.

b.4 The BG should clearly specify that the demand or other document can be presented in electronic form.

BANK GUARANTEE FOR ADVANCE

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its Unit at Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700091 having awarded to (Name of the Vendor / Contractor / Supplier) having its registered office at_____ [1] (hereinafter called "the Contractor" which expression shall include its successors and permitted assigns) a contract Ref No……dated ……[2]valued at Rs……(Rupees ----------) for <Nature of Work> [3](hereinafter called the 'Contract')

AND WHEREAS the Employer has agreed to advance to the Contractor, a sum of Rs…….. (Rupees…….. only), equivalent to _____% of the said value of the Contract (hereinafter called "the said Advance"), upon the condition, that the said Advance shall be secured by undertaking guarantee for Rs ---------- (Rupees ----------)[4] from a Bank as hereinafter appearing.

We, ……, (hereinafter referred to as the Bank), having registered/Head office at ……. and a branch at …… being the Guarantor under this Guarantee, hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer without any demur, merely on your first demand any sum or sums upto a maximum amount but not exceeding Rs ---------- (Rupees ----------).

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor/ Supplier in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment hereunder and the Contractors/Supplier shall have no claim against us for making such payment.

We the ……Bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

We …….. Bank further agree that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Contractor/Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Contractor/Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall remain in force upto and including…….. [5] and shall be extended from time to time on the request of the Employer for such period as may be desired by the Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor/Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms hereof. However, unless a demand or claim under this Guarantee is made on us in writing on or before the ……[6] (3 months more than the present date of validity of Bank Guarantee) we shall be discharged from all liabilities under this Guarantee.

We, …… BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed…… [7]
b) This Guarantee shall be valid up to ……[8]
c) Unless the Bank is served a written claim or demand on or before _____ [9] (3 months more than the present date of validity of Bank Guarantee) all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Any claim or dispute arising under the terms of this document shall only be enforced or settled in the courts of at Kolkata only.

For and on behalf of
(Name of the Bank)

Date…….
Place of Issue…….

[1] NAME OF VENDOR /CONTRACTOR / SUPPLIER

[2] DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

[3] PROJECT/SUPPLY DETAILS

[4] BG AMOUNT IN FIGURES AND WORDS

[5] VALIDITY DATE

[6] DATE OF EXPIRY OF CLAIM PERIOD

[7] BG AMOUNT IN FIGURES AND WORDS

[8] VALIDITY DATE

[9] DATE OF EXPIRY OF CLAIM PERIOD

Note:

1. **Units are advised that expiry of claim period may be kept 2/3 months after validity date.**

2. **In Case of Bank Guarantees submitted by Foreign Vendors-**

   a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.

   b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**

   b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

   b.2 **In case, Foreign Vendors intend to provide BG from** Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.

   b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.

   b.4 The BG should clearly specify that the demand or other document can be presented in electronic form.

Form No: F-13 (Rev 00)

FORM for EXTENSION OF VALIDITY OF BANK GUARANTEE

1. **To be typed on non judicial Stamp Papers of value as applicable in the State of India from where the BG has been issued or the State of India where the BG shall be operated**
2. **The non judicial stamp papers shall be purchased in the name of the Party on whose behalf the BG is being issued or the BG issuing Bank**

BANK GUARANTEE No: Date:……..

To

(Write Designation and Address of Officer of BHEL inviting the Tender)

Dear Sir

Sub : Validity of Bank Guarantee No:……. Dated ……. for ……. Rs …… in favour of yourself, expiry date ……., on account of M/s …… in respect of Contract Number..……., (herein after called the Original bank Guarantee)

At the request of M/s……., we …….. Bank, having its branch Office at …….. and having Head office at ……, do hereby extend our liability under the above mentioned Bank Guarantee number…….. dated …… for a further period of ……..Months/years from …… to expire on ……..

Except as provided above, all other terms and conditions of the Original Bank Guarantee No ……. Dated…… shall remain unaltered and binding on us.

Kindly treat this extension as an integral part of the original Bank Guarantee to which it would be attached.

Yours faithfully

Signature…….
Name & Designation……..
Power of Attorney/Signing Power No
Seal of Bank

MONTHLY PERFORMANCE EVALUATION OF CONTRACTOR

Project		**Vendor**			**Package/Unit**	
Sl. No.	**Parameter for Measurement**	**Classification**	**Max Score**	**Score Obtained**	**Measurement Key/Scheduled date**	**Supporting Documents**
#1.01	Cumulative number of days in the month, the nominated Quality Officer or his authorised nominee was not available	QUALITY	1.5		Quality Officer or his authorised nominee should be available for all the days of working at site	Daily Log Book entry/Incident Registers/letter references
#1.02	Number of instances of non- compliance wrt FQP, Standard Drawings, Specifications, E&C Manuals etc.	QUALITY	1.5		No deviation from FQP, Standard Drawings, Specifications, E&C Manuals etc. is allowed without BHEL Engineer's approval.	Daily Log Book entry/Incident Registers/letter references
#1.03	Percentage submission of test certificates for batches of welding electrodes, cement, sand, aggregate, consumable, Paints etc. as applicable for this month OR In case of MM & MH package, monthly checks for Storage/Preservation of material.	QUALITY	1		Submission of 100% Test certificates for materials as per FQP is mandatory. MM & MH package: Storage/Preservation as per manual/procedure.	Daily Log Book entry/Incident Registers/letter references
#1.04	Number of incidences of improper storage & preservation (not in accordance to the guidelines of BHEL MUs or approved FQP) of materials, consumables (viz. gases, welding electrodes & fluxes, fuel etc.) & bought-out items (paints, fasteners etc.) under the custody of the contractor	QUALITY	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#1.05	Rework/ Rejection instances in a month necessitated due to deviation from Standard Drawings /Specifications /Manuals /E&C procedures /FQPs or due to Poor Workmanship by contractor	QUALITY	2		Reworks/ Rejection should be as minimum as possible. Total number of reworks/ rejections due to reasons attributable to contractor.	Daily Log Book entry/Incident Registers/letter references
#1.06	Delay in preparation & submission of signed protocols / log sheets / site register / NDT test reports as per approved FQP/ Qualified Welder List along with photocopies of Welder ID cards / Welder Performance Evaluation records etc. in the month OR in case of MM / MH package reconciliation statement / verification report.	QUALITY	1		Within 2 days of measurements taken or within first 3 working days of next month, as advised by BHEL Engineer	Daily Log Book entry/Incident Registers/letter references
#1.07	Number of instances for Major equipment/product failure due to negligence/improper work/poor workmanship by contractor	QUALITY	1		No such event should happen	Daily Log Book entry/Incident Registers/letter references
#1.08	Total number of complaints received in the month on the quality of finish / aesthetics	QUALITY	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references

Project		**Vendor**			**Package/Unit**	
Sl. No.	**Parameter for Measurement**	**Classification**	**Max Score**	**Score Obtained**	**Measurement Key/Scheduled date**	**Supporting Documents**
#2.01	Cumulative number of days of delay in submission of Plan FOR THE MONTH supported by deployment plan of Major T&Ps and Manpower (as per Form F-14) and relevant construction/layout drawings - like A4 plan / elevation views of plan status for structures / pressure parts/Civil Works, Piping isometrics for piping, Layout / PID / System reference sketch, Unloading / storage plans etc.as applicable.	PERFORMANCE	5		Number of days delayed from second working day of the month	Daily Log Book entry/Incident Registers/letter references
#2.02	Percentage of timely submission of Daily Reports for Progress of work, Resources, Consumables etc.	PERFORMANCE	1.5		Percentage of timely submission of daily reports/ Scheduled date is successive next day for each day	Daily Log Book entry/Incident Registers/letter references
#2.03	Number of days delayed for submission of FQP log sheets / protocols / Monthly Progress Reports for the work executed during the month under measurement	PERFORMANCE	1.5		Number of days delayed/Scheduled date is first 2 working days of next month	Daily Log Book entry/Incident Registers/letter references
#2.04	Percentage Shortfall attributable to contractor w.r.t. “Plan - Shortfall attributable to BHEL” for the month as per Form-14	PERFORMANCE	35		As per Part-A of Form-14	Progress review formats
#2.05	Number of days delayed in submission of Running bills with complete supporting documents (including updated reconciliation statement of BHEL issued material) for the month	PERFORMANCE	2		Number of days delayed / Scheduled date is 7th day of next month	Daily Log Book entry/Incident Registers/letter references
#2.06	Number of times the Top Management of contractor did not respond to critical issues of site, for the month	PERFORMANCE	1		Total number of instances	Daily Log Book entry/Incident Registers/letter references
#2.07	Cumulative number of days in the month the works were stopped / refused on interpretation of contract clauses/scope due to tendency of taking undue advantage by interpreting contract clauses in their favour	PERFORMANCE	2		Cumulative number of days lost	Daily Log Book entry/Incident Registers/letter references
#2.08	Number of times rework was refused by contractor	PERFORMANCE	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references

Project		**Vendor**			**Package/Unit**	
Sl. No.	**Parameter for Measurement**	**Classification**	**Max Score**	**Score Obtained**	**Measurement Key/Scheduled date**	**Supporting Documents**
#2.09	Cumulative number of days in the month recording / logging was not done in daily log / history register / hindrance register / soft form in a PC maintained at BHEL Site Office	PERFORMANCE	1		Cumulative number of days recording or logging was not done / all days of the month	Daily Log Book entry/Incident Registers/letter references
#3.01	Percentage of Manpower Deployed w.r.t. Plan for the month as per Form-14.	RESOURCES	7		As per Part-B2 of Form-14	Daily Log Book entry/Incident Registers/letter references
#3.02	Percentage of T&P Deployed w.r.t. Plan for the month as per Form-14.	RESOURCES	7		As per Part-B1 of Form-14	Daily Log Book entry/Incident Registers/letter references
#3.03	Cumulative number of major instances in the month hampering / affecting progress of work due to breakdown or non-availability of major T&P and MME for the work, under the scope of Contractor	RESOURCES	3		Cumulative number of instances	Daily Log Book entry/Incident Registers/letter references
#3.04	Cumulative number of major instances in the month hampering / affecting progress of work due to non-availability of Consumables/ use of improper consumables under the scope of contractor	RESOURCES	3		Cumulative number of instances	Daily Log Book entry/Incident Registers/letter references
#4.01	Number of non-compliances during the month for Statutory requirements like validity of Labour Licence, Insurance Policy, Labour Insurance, PF, BOCW Compliance etc. and any other applicable laws/ Regulation, Electrical Licence, T&P fitness certificate, Contractors' All Risk Policy etc. as applicable	SITE INFRASTRUCTURE & SERVICE	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#4.02	Cumulative number of days in a month poor illumination is reported at storage area, erection area, pre-assembly area and other designated areas by BHEL site.	SITE INFRASTRUCTURE & SERVICE	0.5		Total number of non-compliances/random checks	Daily Log Book entry/Incident Registers/letter references
#4.03	Cumulative number of days of non-availability of well-maintained toilets facilities for workers (separate for men and women) and non-availability of potable drinking water stations for workers in specified areas.	SITE INFRASTRUCTURE & SERVICE	1		Total number of non-compliances/random checks	Daily Log Book entry/Incident Registers/letter references

MONTHLY PERFORMANCE EVALUATION OF CONTRACTOR

Project		**Vendor**			**Package/Unit**	
Sl. No.	**Parameter for Measurement**	**Classification**	**Max Score**	**Score Obtained**	**Measurement Key/Scheduled date**	**Supporting Documents**
#4.04	Total number of instances in the month, Housekeeping NOT attended to in spite of instructions by BHEL -i.e. removal / disposal of surplus earth / debris / scrap / unused / surplus cable drums / other electrical items / surplus steel items / packing materials, thrown out scrap like weld butts, cotton waste etc. from the working area to identified locations	SITE INFRASTRUCTURE & SERVICE	2		Total number of non-compliances/random checks	Daily Log Book entry/Incident Registers/letter references
#4.05	Total number of instances in a month, Site Office with reasonably good facilities including enough nos. of computers and printers etc. for use by office and supporting staff was not made available/maintained.	SITE INFRASTRUCTURE & SERVICE	0.5		No discrepancy during regular or surprise visits	Photograph and report of the Engineer
#5.01	Number of days delayed in making labour payments for the last month	SITE FINANCE	2		Number of days delayed / Scheduled date is 7th day of next month	Daily Log Book entry/Incident Registers/letter references
#5.02	Number of complaints from labour/ sub supplier/ sub-contractor for non-receipt of payments from contractor	SITE FINANCE	1.5		Total number of complaints or reporting	Daily Log Book entry/Incident Registers/letter references
#5.03	Number of times the site operations were hampered for want of funds at the disposal of site-in-charge.	SITE FINANCE	1.5		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#6.01	Cumulative number of days in a month the nominated Safety Officer was not available	HSE & SA	1		Safety Officer should be available for all the days	Daily Log Book entry/Incident Registers/letter references
#6.02	Shortfall in number of weekly safety meetings in the month conducted or attended by the Safety Officer	HSE & SA	0.5		Safety meetings to be held every week	Copy of Minutes of meeting
#6.03	Level of compliance w.r.t decisions taken in previous Safety meetings	HSE & SA	0.5		Number of consolidated issues discussed in Safety meetings	Copy of Minutes of meeting, Non-compliance intimation documents from BHEL site
#6.04	Delay in submission of monthly report on safety (including electrical safety for equipment & personnel etc.) in the prescribed form	HSE & SA	1		Number of days delayed/Scheduled date is third working day of next month	Daily Log Book entry/Incident Registers/letter references
#6.05	Number of days taken for lodging FIRs from date of occurrence/notice of incident of theft / accident etc.	HSE & SA	0.5		Number of days delayed/Scheduled date is within 24 Hrs of occurrence/notice of incidence	Copy of FIR lodged by Contractor

MONTHLY PERFORMANCE EVALUATION OF CONTRACTOR

Project		**Vendor**			**Package/Unit**	
Sl. No.	**Parameter for Measurement**	**Classification**	**Max Score**	**Score Obtained**	**Measurement Key/Scheduled date**	**Supporting Documents**
#6.06	Number of times written(email, letters etc.) warning issued for non-availability/ use of improper Fall protection and rescue arrangement as lifeline, fall arrestors, safety net, hand-railings, covered floors, man-basket, rescue basket & kit etc. by the contractor	HSE & SA	2		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#6.07	Number of times punitive fines imposed for unsafe practices as per contract like non-availability/use of PPEs as safety shoes, helmets, goggles, gloves, lifeline, safety belts etc.	HSE & SA	1		Total number of non-compliances	Non-compliance intimation documents from BHEL site
#6.08	Percentage compliance to Emergency preparedness and response plan: Portable Fire-extinguishers, Buckets, Fire-wardens, display of emergency numbers, mock-drills, Hazard Identification and Risk Assessment(HIRA) etc.	HSE & SA	1		Compliance should be 100% as per HSE Plan or as finalized in Safety Meetings	Non-compliance intimation documents from BHEL site
#6.09	Number of times the agency has defaulted on display of safety posters / safety slogans / safety barriers/emergency numbers etc. in identified areas	HSE & SA	0.5		Total number of instances	Non-compliance intimation documents from BHEL site
#6.10	Non compliances observed during HSE and Safety Audit	HSE & SA	0.5		Total number of non-compliances	Non-compliance intimation documents from BHEL site, Audit Reports
#6.11	Cumulative number of days in the month, non-availability of First Aid Kit, First Aider & Emergency Vehicles/Ambulance.	HSE & SA	0.5		Cumulative number of days	Non-compliance intimation documents from BHEL site
#6.12	Number of days taken for submission of Root Cause analysis (RCA) for the accident from the cut-off date intimated by BHEL for submission of RCA	HSE & SA	0.5		Number of days delayed/Scheduled date is cut-off date intimated by BHEL	Daily Log Book entry/Incident Registers/letter references
#6.13	Non conductance of training (induction, job specific, height work etc.), tool box meeting and health check-up as per Contract requirements	HSE & SA	0.5		Number of incidences of non-conductance during the month	Daily Log Book entry/Incident Registers/letter references
		Total	**100**			

MONTHLY PERFORMANCE EVALUATION OF CONTRACTOR

Project		**Vendor**			**Package/Unit**	
Sl. No.	**Parameter for Measurement**	**Classification**	**Max Score**	**Score Obtained**	**Measurement Key/Scheduled date**	**Supporting Documents**
Less Deduction in Score Due to Major Accidents (Fatal, Permanent Disability or bodily injury by which person injured is prevented to resume to work within 48 hours or more after accident,, Major Damage to Equipment etc.) attributable to the contractor @ 3 points/ accident						
Less Deduction in Score Due to Minor Accidents attributable to the contractor @ 1 point/ accident						
Less Deduction in Score Due to not Maintaining of Labour Colony (if applicable) as per BHEL HSE policy @2 points in a month on verification any day						
				Final Score		

Performance Score Summary for the Month	**Total Score**	**Score Obtained**
QUALITY	10	
PERFORMANCE	50	
RESOURCES	20	
SITE INFRASTRUCTURE & SERVICE	5	
SITE FINANCE	5	
HSE & SA	10	
OTHERS (deductions if any)	0	
TOTAL	**100**	

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 current month w.r.t. changes requested in the scores of immediate previous month.

Form No: F-19 (Rev 00)

MILESTONE COMPLETION CERTIFICATE
(issued by BHEL on the specific request of Contractor)

Ref :
Date:

To,

(Name & address of Contractor)

Dear Sir,

References
1. Contract No:
2. Job Description:

This is to hereby confirm that the following Milestone Activity has been achieved in respect of the Contract /Job under reference

Sl No	Milestone Activity	Remarks

This certificate is issued as per your request vide letter no …… without any prejudice to the rights of BHEL in line with the terms and conditions of the above referred Contract

Yours faithfully,

For and on behalf of Bharat Heavy Electricals Limited

Construction Manager/Head (Subcontracts)

Form No: F-20 (Rev 01)

CONTRACT COMPLETION CERTIFICATE
(Issued by BHEL/HQ on the specific request of Contractor)

Ref :
Date:

To Whom so ever it may concern

1	DESCRIPTION OF WORK	
2	NAME AND ADDRESS OF THE CONTRACTOR	
3	CONTRACT NO	
4	CONTRACT VALUE	
5	LETTER OF INTENT NO & DATE	
6	CONTRACT PERIOD//CONTRACT DURATION	
7	DATE OF START/COMPLETION	
8	FINAL EXECUTED VALUE	
9	PERFORMANCE	GOOD SATISFACTORY UNSATISFACTORY

This certificate is issued as per your request vide letter no …….
without any prejudice to the rights of BHEL to use this certificate for evaluation of your offers for future tenders

Yours faithfully,

For and on behalf of Bharat Heavy Electricals Limited

Head (Subcontracts)

Form No: F-21 (Rev 00)

INDEMNITY BOND

(To be executed on a Non Judicial Stamp Paper of the requisite value as per Stamp Duty prevalent in the respective State)

This Indemnity Bond executed by <name of company> having their Registered Office at <xxxxxxxxxx> in favour of M/s Bharat Heavy Electricals Limited, a Company incorporated under the Companies Act, 1956, hav ing its R egistered Office at BH EL House, Siri Fort, Asiad, Ne w Delhi - 110049 through its U nit at Power Secto r-_____ Region, ____ _____, _____ State. (Hereinafter referred to as the Company)

And whereas the Company has entered into a Contract with M/s xxxxxxxxx, th e executants of this D eed (hereinafter refe rred to as the Contractor) as it s contractor in respect of the work of "xxxxxxxxxxxxxxxxxxxxxxxxxx".

AND WHEREAS under the provisions of G CC further stipulates that the Contractor shall indemnify the Company against all claims of w hatever nature aris ing during the course of execution of Contract including defects liability period of <xx Months > i.e till <xx xx xxxx>

Now this deed witnes s that in case the Company is made liable by any Authority including Court to pay any claim or compensation etc. in respect of all labour ers or other matters at any stage under or relating to the Contract with the C ontractor , the Contractor hereby covenants and agrees with the C ompany that they shall indemnify and reimburse the Company to the extent of such payments and for any fee, including litigation charges, lawyers' fees, etc, penalty or damages claimed against t he Company by reason of th e Contractor falling to comply with Central/States Laws, Rules etc, or his failure to comply with Contract (including all expenses and charges incurred by the Company).

The Contractor further indemnifies the Company for the amount which the Company may be liable to pay by way of penalty for not mak ing deductions from the Bills of the Contractor towards such amount and depositing the same in the Government Treasury.

The Contractor further agree that the Company shall be entitled to with hold and adjust the Security Deposit and/or with ho ld and adjust payment of Bills of Contractor per taining to this Contract against any payme nt which the Company has made or is required to mak e for which the Contractor is liab le under the Contract and that such amount can be w ithheld, adjusted by the Company till satisfactory and final settlement of all pending matters and the Contractor hereby gives his consent for the same.

The Contractor further agrees that the terms of indemnity shall s urvive the ter mination or completion of this contract.

The contractor further agrees that the liability of the contractor shall be extended on actual basis notwithstanding the limitations of liability clause, in respect of :

1. breach of terms of contract by the contractor
2. breach of laws by the contractor
3. breach of Intellectual property rights by the contractor
4. breach of confidentiality by the contractor

Nothing contained in this deed, shall be construed as absolving or limiting the liability of the Contractor under said Contract between the Company and the Contractor . That this Indemnity Bond is irrevocable and the condition of the bond is that the Contractor shall duly and punctually c omply with the terms and the conditions of this deed and contractu al provisions to the satisfaction of the Company.

In witness where of M/s xxxxxxxxxxxxx these presents on the day, month and year first, above written at xxxxxxxx by the hand of its signatory Mr. xxxxxxxxxx.

Signed for and on behalf of
M/s xxxxxxxxxxxxxx

Witness:
1
2

Form No: F-22 (Rev 00)

CONSORTIUM AGREEMENT

(To be executed on Rs. 50/- Non – Judicial Stamp Paper)

THIS AGREEMENT is made and executed on this _____ day of _____, by and between (1) M/s _____ , (The First Party, i.e, the Bidder) a company incorporated under the Company's Act 1956, having its registered office at _____ _____(herein after called the "Bidder", which expression shall incl ude its' successors, administrators, executors and permitted assigns) and (2) M/s _____ _____, (The Second Party, i.e, the associates), a company incorporated under th e Company's Act 1956, having its registered office at _____ (herein after called the " Associates", whic h expression shall include its' successors, administrators, executors and permitted assigns).

WHEAEAS the Owner, Bharat Heavy Electr icals Ltd, a Government of India Undertaking, proposes to issue / issued an NIT (herein after referred to as the said NIT) inviting bids from t he individual Bidders for undertaking the work of _____, at _____ (herein after referred to as the said works).

WHEREAS the said NIT enables submis sion of a bid by a Consortium subject to fulfillment of the stipulations specified in the said NIT.

AND WHEREAS M/s _____ _____ (The F irst Party, i.e, the Bidder) will submit its proposal in response to the aforesaid invitation to bid by the Owner for _____ as detailed in the Bid doc. no. < TENDER REF-------->

AND WHEREAS M/s _____ _____ (The First Party, i.e the Bidder) itself is meeting all the qualifying requirements except the qualifying requirements of _____ _____ (as detailed in the NIT) and in order to fully meet the qualifying requirements of NIT, this tie-up agreement is being entered into with M/s _____ (The Second Party, the Associates), who fully meet the balance part of the said works (_____).

WHEREAS the First Party and the Second Party are contractors engaged in the business of carrying out various items of works. WHEREAS the two parties have agreed to constitute themselves into a consortium for the purpose of carrying out the said works, and that the consortium will be continued till the completion of the works in all respects.

WHEREAS the parties have agreed to certain terms and conditions in this regard:

NOW THEREFORE THIS AGREEMENT WITNESSETH AS FOLLOWS :

1. First and Second parties hereby constitute themselves into a Consortium for the purpose of bidding and undertaking the said works pursuant to the said NIT as hereinafter stated.

2. The First Party will be the leader (Lead Partner) and will be responsible for the entire works.

CONSORTIUM AGREEMENT

3. The First Party shall undertake the following part(s) of work detailed in the NIT namely

_____
_____
__

4. The Second Party shall undertak e the following part(s) o f work detailed in the said NIT namely

_____
_____
__

5. The parties hereby d eclare and confirm that each of them will fulfill the required minimum qualifying requi rements as prescribed in the said NIT for the wor ks agreed to be undertaken by them as stated here-in-above.

6. It is also agreed between the parties hereto that all of them shall be individually and severally responsibl e for the completion of the said works as per the schedule. Further, if the Employ er/Owner sustains any loss or damage on a ccount of any breac h of the C ontracts, we the, Consortium partners individually and severally undertake to promptly indemnify and pay such losse s / damages caused to the Employer/Owner on it s written dem and with out any demur , reservation, contest or protest in any manner whatsoever.

7. The parties hereby agree and under take that they shall provide adequate finances, suitable Tools, Plan ts, Tractors, Trailers, other transportation equipment, other Tools & Plant s, Measuring & Monitoring Equipments (MME s), Men and Machinery etc. for the proper and effective execution of the works to be undertaken by them as specified here-in-above.

8. It is agreed interse between t he parties hereto that all the consequences liabilities etc., arising out of any default in the due execution of the said works shall be borne by the party in default, that is by party in whose area of works default has occurred, provided however, so far as M/s Bharat Hea vy Electricals Limited is concer ned, all the parties shall be liable jointly and severally.

IN WITNESS HEREOF the parties above named have signed this agreement on the day month and year first above written at _____(Place) .

WITNESS For

1. NAME (FIRST PARTY)

2. OFFICIAL ADDRESS

WITNESS For

1. NAME (SECOND PARTY)

2. OFFICIAL ADDRESS

[The successful bidder shall have to execute the " JOINT DEED OF UNDERTAKING " in the format to be made available by BHEL at the time of awarding].

Form No: F-23 (Rev 00)

REFUND OF SECURITY DEPOSIT

To,
The Construction Manager
BHEL Site Office

Dear Sir,

Sub : **Refund of Security Deposit**
Ref : Contract No: ……,
Work:……..
I/We have submitted Final Bill in respect of the above Contract/Work vide our letter no:…… dated …….. . In line wit h Tender c onditions (GCC clause no 1.11), kindly arrange to release/refund the Security Deposit along with Final Bill payments.

The details of Security Deposit are as below:

1. Cash Portion :
2. BG Portion :

Thanking You

Date: _____ Authorised representative of Contractor

==========

To be filled up by BHEL

1. Security Deposit to be refunded:
    a. Cash Portion:
    b. BG Portion :
2. Less
    a. Amount spent by BHEL on behalf of Contractor:
    b. Payments made by BHEL on behalf of Contractor:
    c. Other recoveries for Services etc
    d. Any other recoveries
    e. Total of 'a' to 'd':
3. Net Amount to be released (1-2) :
4. Certified that
    a. The payment recommended for release is in order and there are no demands other than those included in the claim outstanding from the Contractor
    b. Contract Guarantee period of ……. Months commenced wef :_____
    c. All objections raised so far have been settled
    d. A note for refund of Security Deposit has been made in the Measurement Book

Signature of BHEL Engineer

Construction Manager

Date:----------

Form No: F-24 (Rev 00)

REFUND OF GUARANTEE MONEY

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR, _____ REGION

Ref No: Date:

1. Name and Address of Contractor :
2. Contract Agreement/LOI No :
3. Date of Contract Agreement/LOI :
4. Name of the Work undertaken :
5. Date of commencement of the Work :
6. Date of Completion of the Work :
7. Period of Maintenance (Guarantee Period) :
8. Date on which the Final Bill was paid :
9. Last date of making good the defect during Maintenance Period :
10. Expenditure incurred by BHEL during Maintenance Period, if any, recoverable :
11. Date on which Guarantee Money refund: falls due as per Contract
12. Amount of Guarantee Money to be refunded:
13. Less Amounts recoverable (with details)
    a. Amount spent by BHEL on maintenance :
    b. Payments made by BHEL on behalf of Contractor:
    c. Court dues/penalties/compensation :
    d. Other recoveries for Services, etc :
    e. Total of 'a' to 'd' :
14. Net Amount recommended for release (12-13) :

Signature of BHEL Engineer

Date: _____

CERTIFICATE TO BE FURNISHED BY THE CONTRACTOR

I/We have no claim or demand outstanding against BHEL_____, for the work done or for labour or material supplied or any other account arising out of or connected with the Contract Agreement/LOI (No_____ dated _____) and the payment of this bill shall be in full and final settlement of all my/our claims and demands including the 'Deposits' of the Contract Agreement/LOI referred to.

Signature of Contractor

Date:

CERTIFICATE TO BE FURNISHED BY SENIOR ENGINEER/CONSTRUCTION MANAGER

1. Certified that
   a. The payment recommended for release is in order and there are no demands other than those included in the claim outstanding from the Contractor
   b. Maintenance period (Contract Guarantee period) is over and the Contractor has carried out the works required to be carried out by him during the period of maintenanc e (Guarantee) to our satisfaction, and all expens es incurred by the Company on carrying out such works have been included for adjustment
   c. All objections raised so far have been settled
   d. A note for refund of Guarantee Amount has been made in the Meas urement Book and Contract Agreement/Work Order

Signature of BHEL Engineer

Construction Manager

Date:----------

FOR USE IN ACCOUNTS DEPARTMENT

Passed for Rs_____ (Rupees _____ only)

Accountant Accounts Officer

ACKNOWLEDGE BY THE CONTRACTOR

Received Rs _____ in full and final settlement of my/our claim

Signature of Contractor

Date:

Form No: F-25 (Rev 00)

POWER OF ATTORNEY for SUBMISSION OF TENDER/SIGNING CONTRACT AGREEMENT

(To be typed on non judicial Stamp Papers of appropriate value as applicable and Notarised)

KNOW ALL MEN BY THESE PRESENTS, that I/We do hereby make, nominate, constitute and appoint Mr …… …….. , whose signature given below herewith to be true and lawful Attorney of M/s…… hereinafter called 'Company', for submitting Tender/entering into Contract and inter alia, sign, execute all papers and to do necessary lawful acts on behalf of Company with M/s Bharat Heavy Electricals Ltd, Power Sector _____ Region, _____, in connection with …… …… …… vide Tender Specification No : _____, dated _____.

And the Company do hereby agree to ratify and confirm all acts, deeds, things or proceedings as may be lawfully done by the said attorney and by or on behalf of the company and in the name of the company, by virtue of the powers conferred herein and the same shall be binding on the company and shall have full force and effect.

IN WITNESS WHEREOF the common seal of the company has been hereunto affixed in the manner hereinafter appearing on the document.

Dated at _____, this _____ day of _____

Director/CMD/Partner/Proprietor

Signature of Mr……(Attorney)

Attested by: Director/CMD/Partner/Proprietor

Witness

Notary Public

Form No: F-26 (Rev 00)

ANALYSIS OF UNIT RATES QUOTED

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

Offer Reference No:…… Date:……

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

Dear Sir,

Sub : Analysis of Unit Rates Quoted
Ref : Tender Specification No: ……

Analysis of Unit Rates quoted by us in respect of above Tender is as detailed

SN	DESCRIPTION	% OF QUOTED RATE	REMARKS
01	SITE FACILITIES VIZ., ELECTRICITY, WATER OTHER INFRASTRUCTURE.		
02	SALARY AND WAGES + RETRENCHMENT BENEFITS		
03	CONSUMABLES		
04	T&P DEPRECIATION & MAINTENANCE		
05	ESTABLISHMENT & ADMINISTRATIVE EXPENSES		
06	OVERHEADS		
07	PROFIT		
	TOTAL	100%	

Yours faithfully,

(Signature, Date & Seal of Authorized Representative of the Bidder)

Form WAM 6

BHARAT HEAVY ELECTRICALS LIMITED
DIVISION.....
Running Account Bill
(Para 4.31.1 of Works Accounts Manual)

Name of the Contractor: Departmental Bill no: Date:
Name of the Work: Division: Sub-Division:
Sanctioned Estimate: Date of written order to commence the work :
Code No: Date of commencement of the Work:
Contract Agreement No : Dated: Due date of completion as per Agreement:

1. ACCOUNT OF WORK EXECUTED

On account payment for work not previously previously measured**			Item No of	Description of Work	Quantity as per agree-ment	Quantity executed up to date	Rate	Unit	Payment on the basis of actual measure-ment up to date	Quantity since last running account bill	Payment on the basis of actual measurement since last running account bill		Remarks
Total As per Running Account bill	since last running account bill	Total up to date											
Rs.	Rs.	Rs.					Rs.	P.	Rs.	P.	Rs.	P.	
1	2	3	4	5	6	7	8	9	10	11	12		13

* *1. Whenever payment is made on 'on account' basis without actual measurements the amount in whole rupees should be entered in columns 1 to 3 only and not in columns 7 to 12.
2. whenever there is an entry in column 12 on the basis of actual measurement, the whole of the amount previously paid without detailed measurement should be adjusted by a minus entry in column 2 equivalent to the amount shown in column 1, so that the total up to date in column 4 may become nil.

Form WAM 6 (contd…)

1	2	3	4	5	6	7	8	9	10	11	12	13

	Total value of work done up to date	(A) …
Running Account Bill	Deduct value of work shown on the last (B) …	
	Net value of work done since last	(C) …

Rupees (in words)
…….only.

Form WAM 6 (contd…)

II.MEMORANDUM OF PAYMENTS

		Rs. P.	I Rs. P.	II Rs. P.
1.Total value of work actually measured as per Account No. I. Column 10	(A)	……		……
2.Total up to date 'on account' payment for work covered by approximate Or plan measurements as per Account No. I, Column 3	(B)	……		……
3.Total up to date secured advances on security of materials as per column 8 Of the enclosed Account (Form WAM 10)	(C)	……		……
4.Total up to date payments [(A) + (B) + (C)]	(D)	……		……
5.Total amount of payments already made as per Entry (D) of last Running Account Bill No…….. Dated……..forwarde to the Accounts Office on …….	(E)			
6.Balance [(D)-(E)]		……..……		
7.Payments now to be made:				
a) by cash/cheque			……	
b) by deduction for value of materials supplied				
c) by BHEL vide Annexure A attached			……	
d) by deduction for hire of tools and plant vide				

Annexure B attached ……

e) by deduction for other charges vide Annexure C

Attached ……

f)by deduction on account of security deposit ……

h) by deduction on account of Income Tax …… ……

Note: Amounts relating to items 4 to 6 above should be entere in column II and those relating to item 7 in column I. The amount shownagainst item 6 and the total of item 7 should agree with each other.

III.CERTIFICATE OF THE ENGINEER IN CHARGE **Form WAM 6 (contd…)**

1. The measurements on which the entries in column 7 to 12 of Part I of this Bill (Account of work executed) are based were made by……and are recorded at pages……..of
(Name and Designation)

Measurement Book No ……..

2. Certified that the methods of measurement are correct and the work has been carried out in accordance with the terms and conditions, schedules, specifications and drawings etc, forming part of the contract agreement, subject to deviations included in the deviation statement (Annexure D).
3. Certified that in addition to and quite apart from the quantities of work actually executed as shown in column 10 of Part I, some work has actually been done in connection with several items and the value of the such work is, in no case, less than 'on account' payments as per column 3 of Part I, made or proposed to be made, for the convenience of the contractor in anticipation of, and subject to the results of, detailed measurement which will be made as soon as possible.

Signature of Contractor Signature of Engineer in charge

Date: Designation:

Date:

IV. CERTIFICATE OF THE SENIOR ENGINEER

1. Certified that measurements have been check measured to the prescribed extent by ……... ……at site and also by the undersigned and the relevant entries have been intialled in the Measurement book. (vide pages……)
(Name and Designation)
2. Certified that all the measurements recorded in the measurement book have been correctly billed for
3. Certified that all recoberable amounts in respect of materials tools and plant etc, and other charges have been correctly made vide Annexures A to C attached.

Certified for payment * of Rs…….(Rupees…….only)
To be paid in cash/by cheque in the presence of …….

ALLOCATION

The expenditure is chargeable as under and to be included in the accounts for……20……

Ledger Head	Debit (Gross amount) Rs. P.	Credit (Deductions) Rs. P.
_____	_____	_____
Total	_____	_____
	_____	_____

* Here specify the net amount payable.

Signature of Senior Engineer
Date:

Form WAM 6 (contd…)

V.ENTRIES TO BE MADE IN THE ACCOUNTS OFFICE

Accounts Bill No ……Dated……..
Entered in Journal Book vide entry No…….Dated…….
Passed for……Rs……
Less Deductions……..Rs……
Net Amount Payable……Rs……...
(Rupees…….only)
Payable to Shri/M/s……by cheque/cash
Entered in Contractor's Ledger No……Page……..

ALLOCATION

Estimate No: Code no:
Name of the Work:

Ledger Head	Debit (Gross amount) Rs. P.	Credit (Deductions) Rs. P.
_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _
	_ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _

Total _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Assistant Accountant Account Officer
Date: Date: Date:

VI. Received Rs.....(Rupees.....only) as per Memorandum of Payments on account of this work.

Signature of witness Revenue
Address :

Stamp
Signature of Contractor
Date: Date:

VII. ENTRIES TO BE MADE BY TREASURY SECTION

Cash Book entry No. and date: Amount paid Rs.....

Amount unpaid Rs.....

Total Rs.....

Signature of Cashier
Date:

Form WAM 6 (contd...)

ANNEXURE A

Statement showing details of materials issued to the contractor Shri/M/s……

In respect of Contract Agreement No ……..Dated……

Sl. No.	Stores issue Voucher No. and date	Issue voucher No. and date allotted by stores to the SIV	Description of material issued to the contractor	Quantity issued	Quantity actually incorp-rated in the work	Whether recover-able from the contrac-tor or supplied free	If recoverable from the contractor				REMARKS
							Rate at which recover-able	Amount recover-able	Amount recover-ed up to previous bill	Balance now recover-ed	
							Rs. P.	Rs. P.	Rs. P.	Rs. P.	
1	2	3	4	5	6	7	8	9	10	11	12
			Total								

Signature of contractor — Signature of Engineer in Charge — Signature of Senior Engineer

Date: — Date: — Date:

Form WAM 6 (contd…)

ANNEXURE B

Statement showing tools and plant issued to the contractor Shri/M/s……

In respect of Contract Agreement No ……..Dated……

Sl. No	Description of tools and plant issued	Period for which Issued	Rate at which recovery Is to be Made Rs. P.	Amount recover-able Rs. P.	Amount recovered upto previous bill Rs. P.	Balance now recovered Rs. P.	Remarks
1	2	3	4	5	6	7	8
					Total		

Signature of contractor — Signature of Engineer in Charge — Signature of Senior Engineer

Date: — Date: — Date:

Form WAM 6 (contd…)

ANNEXURE C

Statement showing details of other recoveries to be made from the contractor Shri/M/s……..……

In respect of Contract Agreement No ……..Dated……

Sl. No	Particulars	Unit	Quantity	Rate	Amount recover-able	Amount recovered upto pre-vious bill	Amount now recovered	Remarks
				Rs. P.	Rs. P.	Rs. P.	Rs. P.	
1	2	3	4	5	6	7	8	9
1.				Water Charges				
2.				Electricity charges				
3.				Seignorage charges				
4.				Medical charges				
5.	Empty containers not returned			Cost of empty gunny bags and				
6.								
7.								
8.								
9.								

10.

Total _

Signature of contractor | Signature of Engineer in Charge | Signature of Senior Engineer

Date: | Date: | Date:

Form WAM 6 (contd…)

ANNEXURE D

Name of the Contractor: Contract Agreement No:
Name of the Work: Date:

Sl. No.	Description of item	Unit	Quantity as per Agreement	Quantity as executed	Quantity further anticipated	Total quantity anticipated on completion	Rate as per agreement Rs. P.
1	2	3	4	5	6	7	8

Rate as the executed with any Rs. P.	Amount as per agreement Rs. P.	Amount as executed Rs. P.	Amount further anticipated Rs. P.	Total amount anticipated on completion Rs. P.	Difference _ _ _ _ _ _ _ _ _ _ _ Excess Rs. P.	Difference _ _ _ _ _ _ _ _ _ _ _ savings Rs. P.	Reason for deviation authority, if
9	10	11	12	13	14	15	16

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

BHARAT HEAVY ELECTRICALS LIMITED
DIVISION……
……And Final bill
(Para 4.3.2 Of Works Accounts Manual)

Name of Contractor		Departmental Bill no		Date	
Name of the Work		Division		Division	
Sanctioned Estimate		Date of written order to commence the work			
Contract Agreement/work Order No		Date of commencement of work			
		Due date of completion as per agreement			
		Date of actual completion of the work			

I. ACCOUNT OF WORK EXECUTED

On Account payment for the work not previously measured **			Item No of the agreement/ work order	Description of work	Quantity as per agreement	Quantity executed up to date	Rate Rs. P	Unit	Payment on the basis of actual measurement up to date Rs P	Quantity since last running account bill	Payment on the basis of actual measurement since last running account bill Rs P	Remarks
Total as per last running account bill Rs.	Since last running account bill Rs	Total up to date Rs										
1	2	3	4	5	6	7	8	9	10	11	12	13

BHARAT HEAVY ELECTRICALS LIMITED,
POWER SECTOR - EASTERN REGION, KOLKATA
TENDER NO. PSER:SCT:KLN-E2060:20

1	2	3	4	5	6	7	8	9	10	11	12	13

II MEMORANDUM OF PAYMENT												
										Rs.	P	
1	Total Value of work actually measured as per Account no I coloumn 10								(A)			
2	Deduct amount of paym,ents already made as per last running account bill No ……. Dated……. Forwarded to the Accounts Office on …….								(B)			
3	Payments now to be made { (A) - (B)}								(C)			
4	Deduct ammounts recoverable from the contractor on account of :								Rs	P		
	a	Material suplied by BHEL vide annexure A attached										
	b	Hire of Tools & Plants vide Annexure B attached										
	c	Other charges vide Annexure C attached										
	d	Income Tax										
		Total deduction										
5	Balance											
6	Refund of 50% of security deposite on completion of work											
7	Net amount to be paid to the Contractor											
III. CERTIFICATE OF THE ENGINEER IN CHARGE												
1	The measurement on which the entries in coulmns 7 to 12 of Part I of this bill (Account of work executed) are based were made by …….. (Name and designation)											
2	A statement showing the quantities of stores issued to the contractor (whether free or on recovery basis) and their disposal is attached.											
	Date:								Signature of Engineer in charge			
									Designation			

IV CERTIFICATE OF THE SENIOR ENGINEER

1 Certified that I have personally inspected the work and that the work has been physically completed on the due date in accordance with the terms and

2 Cretified that the measurements have been check measured to the prescribed extent by …….
…… (Name & designation). And by the the undersigned at site and relevent entries have been initiated in the measurement book (vide pages…… ….)

3 Certified that the methods of measurement are correct

4 Certified that the measurements have been technically checked with reference to contract drawings, deviations etc

5 Certified that all the measurements recorded in the measurement book have been correctly billed for at the contract rates or approved rates.

6 Certified that all the recoverable amounts in respect of stores, tools and pa\lant, e\water, electricity charges etc, have been correctly made vide Annexures A

7 Certified that the issues of all stores as per statement atytached (whether charged to the contractor or direct to the work) have been technically checked and

Certified for payment of * Rs …… (Rupees…… (Only). To be paid in cash/by cheque in the presence of ……..

ALLOCATION

The expenditure as under and to be included in the accounts for ……..19

Ledger Head	Debit (Gross Amount) Rs. P	Credit (Deduction) Rs. P
……	……	……
Total	……	……

* Here specify the net amount payable

Signature of Senior Engineer

Date

V. ENTRIES TO BE MADE IN THE ACCOUNTS OFFICE

Account Bill no…… Dated ……
Entered in Journal book vide entry No……Dated……
Passed for……Rs……..
Less Deductions……..Rs……
(Rupees…….Only)
Payable to Shri/M/s…….... by cheque/cash
Entered in contractors' Ledger no..... Page

Assistant Accountant Accounts officer
Date: Date: Date:

ALLOCATION

Estimate No: Code No
Name of the Work ……

Ledger Head	Debit (Gross Amount) Rs P	Credit (Deduction) Rs
……	.....	.....
Total	.....	.....

VI. Received Rs……..(Rupees……..Only) in full and final settlement of all moneys due under this contract and I / we have no further claims of this contract.

Signature of Witness
Address

Revenue Stamp
Signature of Contractor
Date:

VII . ENTRIES TO BE MADE BY TREASURY SECTION

Cash book entry no and date :

Amount Paid Rs…….
Amount unpaid Rs……..
Total Rs……..

Signature of Cashier
Date:

ANNEXURE A

Part I

Statement showing details of material issued to the contractor Shri/M/s…….. In respect of Contract Agreement/Work Order No…….. Dated ……

Sl No	Stores Issue voucher No and date	Issue voucher No and date alloted by stores to the SIV	description of material issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Whether recoverable from the contractor or supplied free	If recoverable from contractor				Remarks
							Rate at which recoverable Rs P	Amount Recoverable Rs P	Amount recoverable upto previous bill Rs P	Balance Now recovered Rs P	
1	2	3	4	5	6	7	8	9	10	11	12
						Total	…….				
	Signature of Contractor					Signature of Engineer in charge				Signature of Senior Engineer	
	Date					Date				Date	

ANNEXURE A

Part II

Statement showing details of material issued to the contractor Shri/M/s…….. in respect of Contract Agreement/Work Order No…….. Dated ……..……and not covered by the agreement

Sl No	Stores Issue voucher No and date	Issue voucher No and date alloted by stores to the SIV	description of material issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Issue Rate Rs P	Amount Recoverable Rs P	Amount recoverable upto previous bill Rs P	Balance Now recovered Rs P	Remarks
1	2	3	4	5	6	7	8	9	10	11
						Total	……			
						Add Departmental Charges Add Sales Tax (wherever applicable)	……..			
						Total	……..			
	Signature of Contractor					Signature of Engineer in charge				Signature of Senior Engineer
	Date					Date				Date

ANNEXURE B

Statement showing TOOLS & PLANTS issued to the contractor Shri/M/s…….. in respect of Contract Agreement/Work Order No…….. Dated ……and not covered by the agreement

Sl No	Description of tools & plants issued	Period for which issued	Rate at which Recivery is to be made	Amount recoverable Rs P	Amount recoverable upto previous bill Rs P	Balance Now recovered Rs P	Remarks
1	2	3	4	5	6	7	8
				Total	……		
	Signature of Contractor			Signature of Engineer in charge			Signature of Senior Engineer
	Date			Date			Date
ANNEXURE C							

howing detail of other recoveries to be made from the contractor Shri/M/s……
ent/Work Order No……Dated……

Sr.No	Particulars	Unit	Quantity	Rate Rs. P.	Amount recoverable Rs. P	Amount recovered upto previous bill Rs. P.	Amount now recovered Rs. P.	Remarks
1	2	3	4	5	6	7	8	9
1	Water Charges							
2	Electricity Charges							
3	Seignorage Charges							
4	Medical Charges							
5	Cost of empty gunny bags and empty containers not returned							
6								
7								
8								
9								
10								
		Total						

Signature of Contractor — Signature of Engineer Incharge — Signature of Sr. Engineer
Date — Date — Date

ANNEXURE F

Statement showing detail of materials issued to the contractor Shri/M/s……

t of Contract Agreement/Work Order No……Dated……

Name of work; **FREE OF COST**

Sr.No	Stores issue voucher No.	ription of ma	Unit	Quantity issued	Quantity requried as per data	Quantity consumed in the work	Balance(If any)	Nature of disposal for the balance	Rate chargeable for material not returned Rs.P.	Amount recoverable for material not returned Rs. P	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
			Total								

Signature of Contractor — Signature of Engineer Incharge — Signature of Sr. Engineer

Date — Date — Date

Note:Data statement of therotical consumption should be attached in support of the quantity specified in coloumn 6

BHARAT HEAVY ELECTRICALS LIMITED
DIVISION……
……And Final bill
(Para 4.3.2 Of Works Accounts Manual)

Name of Contractor		Departmental Bill no		Date	
Name of the Work		Division		Division	
Sanctioned Estimate		Date of written order to commence the work			
Contract Agreement/work Order No		Date of commencement of work			
		Due date of completion as per agreement			
		Date of actual completion of the work			

I. ACCOUNT OF WORK EXECUTED

On Account payment for the work not previously measured **			Item No of the agreement/ work order	Description of work	Quantity as per agreement	Quantity executed up to date	Rate Rs. P	Unit	Payment on the basis of actual measurement up to date Rs P	Quantity since last running account bill	Payment on the basis of actual measurement since last running account bill Rs P	Remarks
Total as per last running account bill Rs.	Since last running account bill Rs	Total up to date Rs										
1	2	3	4	5	6	7	8	9	10	11	12	13

BHARAT HEAVY ELECTRICALS LIMITED,
POWER SECTOR - EASTERN REGION, KOLKATA
TENDER NO. PSER:SCT:KLN-E2060:20

1	2	3	4	5	6	7	8	9	10	11	12	13

Total Value of Work Done up to date	(A)	
Deduct Value of work shown on the last running account bill	(B)	
Net value of work done since last running account bill	(C)	

Rupees (In Words).....Only

II MEMORANDUM OF PAYMENT

		Rs.	P
1	Total Value of work actually measured as per Account no I coloumn 10 (A)		
	Deduct amount of paym,ents already made as per last running account bill No ……. Dated…….		
2	Forwarded to the Accounts Office on ……. (B)		
3	Payments now to be made { (A) - (B)} (C)		
4	Deduct ammounts recoverable from the contractor on account of :	Rs	P
	a Material suplied by BHEL vide annexure A attached		
	b Hire of Tools & Plants vide Annexure B attached		
	c Other charges vide Annexure C attached		
	d Income Tax		
	Total deduction		
5	Balance		
6	Refund of 50% of security deposite on completion of work		
7	Net amount to be paid to the Contractor		

III. CERTIFICATE OF THE ENGINEER IN CHARGE

The measurement on which the entries in coulmns 7 to 12 of Part I of this bill (Account of work executed) are based were made by ……..

1 (Name and designation)

2 A statement showing the quantities of stores issued to the contractor (whether free or on recovery basis) and their disposal is attached.

Date:

Signature of Engineer in charge
Designation

IV CERTIFICATE OF THE SENIOR ENGINEER

1 Certified that I have personally inspected the work and that the work has been physically completed on the due date in accordance with the terms and
Cretified that the measurements have been check measured to the prescribed extent by …….
…… (Name & designation). And by the the undersigned at site and relevent entries have been initiated in the measurement book (vide
2 pages…… ….)
3 Certified that the methods of measurement are correct
4 Certified that the measurements have been technically checked with reference to contract drawings, deviations etc
5 Certified that all the measurements recorded in the measurement book have been correctly billed for at the contract rates or approved rates.
6 Certified that all the recoverable amounts in respect of stores, tools and pa\lant, e\water, electricity charges etc, have been correctly made vide Annexures A
7 Certified that the issues of all stores as per statement atytached (whether charged to the contractor or direct to the work) have been technically checked and

Certified for payment of * Rs ……. (Rupees…… (Only). To be paid in cash/by cheque in the presence of ……..

ALLOCATION

The expenditure as under and to be included in the accounts for ……..19

Ledger Head	Debit (Gross Amount) Rs. P	Credit (Deduction) Rs. P
……	……	……
Total	……	……

* Here specify the net amount payable

Signature of Senior Engineer
Date

V. ENTRIES TO BE MADE IN THE ACCOUNTS OFFICE

Account Bill no…… Dated …….
Entered in Journal book vide entry No……Dated……
Passed for……Rs……..
Less Deductions……..Rs……
(Rupees……Only)
Payable to Shri/M/s…….... by cheque/cash
Entered in contractors' Ledger no..... Page

Assistant Accountant Accounts officer
Date: Date: Date:

ALLOCATION

Estimate No: Code No

Name of the Work ……

Ledger Head	Debit (Gross Amount) Rs P	Credit (Deduction) Rs
…….	.....	.....
Total	.....	.....

VI. Received Rs……..(Rupees……..Only) in full and final settlement of all moneys due under this contract and I / we have no further claims of this contract.

Signature of Witness
Address

Revenue Stamp
Signature of Contractor
Date:

VII . ENTRIES TO BE MADE BY TREASURY SECTION

Cash book entry no and date :

Amount Paid Rs……
Amount unpaid Rs……..
Total Rs……..

Signature of Cashier
Date:

ANNEXURE A

Part I

Statement showing details of material issued to the contractor Shri/M/s…….. In respect of Contract Agreement/Work Order No…….. Dated …….

Sl No	Stores Issue voucher No and date	Issue voucher No and date alloted by stores to the SIV	description of material issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Whether recoverable from the contractor or supplied free	If recoverable from contractor						Remarks
							Rate at which recoverable		Amount Recoverable		Amount recoverable upto previous bill		Balance Now recovered		
							Rs	P	Rs	P	Rs	P	Rs	P	
1	2	3	4	5	6	7	8		9		10		11		12

Total ……

Signature of Contractor
Date

Signature of Engineer in charge
Date

Signature of Senior Engineer
Date

ANNEXURE A

Part II

Statement showing details of material issued to the contractor Shri/M/s…….. in respect of Contract Agreement/Work Order No…….. Dated ……and not covered by the agreement

Sl No	Stores Issue voucher No and date	Issue voucher No and date alloted by stores to the SIV	description of material issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Issue Rate Rs P	Amount Recoverable Rs P	Amount recoverable upto previous bill Rs P	Balance Now recovered Rs P	Remarks
1	2	3	4	5	6	7	8	9	10	11

Total ……

Add Departmental Charges

Add Sales Tax (wherever applicable) ……..

Total ……..

Signature of Contractor
Date

Signature of Engineer in charge
Date

Signature of Senior Engineer
Date

ANNEXURE B

Statement showing TOOLS & PLANTS issued to the contractor Shri/M/s…….. in respect of Contract Agreement/Work Order No…….. Dated …….and not covered by the agreement

Sl No	Description of tools & plants issued	Period for which issued	Rate at which Recivery is to be made	Amount recoverable Rs P	Amount recoverable upto previous bill Rs P	Balance Now recovered Rs P	Remarks
1	2	3	4	5	6	7	8

Total ……

Signature of Contractor
Date

Signature of Engineer in charge
Date

Signature of Senior Engineer
Date

ANNEXURE C

showing detail of other recoveries to be made from the contractor Shri/M/s……
nent/Work Order No……Dated……

Sr.No	Particulars	Unit	Quantity	Rate Rs. P.	Amount recoverable Rs. P	Amount recovered upto previous bill Rs. P.	Amount now recovered Rs. P.	Remarks
1	2	3	4	5	6	7	8	9
1	Water Charges							
2	Electricity Charges							
3	Seignorage Charges							
4	Medical Charges							
5	Cost of empty gunny bags and empty containers not returned							
6								
7								
8								
9								
10								
	Total							

Signature of Contractor
Date

Signature of Engineer Incharge
Date

Signature of Sr. Engineer
Date

Form WAM 7 (Contd.)

ANNEXURE D

DEVIATION STATEMENT

Name of the Contractor :
Name of the Work :

Contract Agreement/Work Order No. :
Date :

Sl. No.	Description of item	Unit	Quantity as per agreement	Quantity as executed	Rate as per agreement Rs. P.	Rate as executed Rs. P.	Amount as per agreement Rs. P.	Amount as executed Rs. P.	Difference		Reason for the deviation with authority, if any
									Excess Rs. P.	Savings Rs. P.	
1	2	3	4	5	6	7	8	9	10	11	12

Signature of Engineer in Charge
Date :

Signature of Senior Engineer
Date :

Form WAM 7 (Contd.)

ANNEXURE E

Statement showing the consumption of materials issued to the contractor Shri/M/s.....
in respect of Contract Agreement/Work Order No..... Dated.....

Name of the Work :

ON RECOVERY BASIS

Sl. No.	Description of material	Unit	Quantity actually issued	Quantity actually incorporated in the work	Balance	Particulars of disposal of balance	Quantity to be issued as per approved data for work actually done	Variation in consumption (Difference between column 5 and 8)		Rate chargeable for excess/ short consumption, if any	Amount recoverable for excess/ short consumption, including materials not returned	REMARKS
								More	Less	Rs. P.	Rs. P.	
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	Cement											
2.	Bricks											
3.	Wood.....											
4.	Asbestos Sheet											
5.	Iron Materials											
6.												
7.												
8.												
9.												
10.												

Signature of Contractor
Date :

Signature of Engineer in Charge
Date :

Signature of Senior Engineer
Date :

Note : 1. The quantities shown in columns 4 and 5 above should tally with those shown in columns 5 and 6 respectively of Annexure A (Part I and II).

2. Data statement of theoretical consumption should be attached in support of quantity specified in column 8.

ANNEXURE F

Statement showing detail of materials issued to the contractor Shri/M/s……
ct of Contract Agreement/Work Order No……Dated……

Name of work; **FREE OF COST**

Sr.No	Stores issue voucher No.	ription of ma	Unit	Quantity issued	Quantity requried as per data	Quantity consumed in the work	Balance(If any)	Nature of disposal for the balance	Rate chargeable for material not returned Rs.P.	Amount recoverable for material not returned Rs. P	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
		Total									

Signature of Contractor
Date

Signature of Engineer Incharge
Date

Signature of Sr. Engineer
Date

Note:Data statement of therotical consumption should be attached in support of the quantity specified in coloumn 6

ANNEXURE C

QUESTIONNAIRE TO BE ANSWERED BY ENGINEER IN CHARGE AND SENIOR ENGINEER	
(Correct particulers and answers to be recorded)	
Name of the work :	
Name of the Contractor :	
Date of commencement of the work:	
Contract agreement/work ordered no. and date:	
Reference to supplementary agreement no,if any :	
Whether adminstrative approval and techanical sanction has been accorded by the cmpetent authority ? If so ,citc reference	
Whether sanction of the competent authority and financial concurrencr of the Accounts Departnment for award of the work has been accorded ? If so,cite reference.	
Wheter the work has been completed in time ? If not ,wheter penalty has been levied or sanction of the competent authority for extension of time granted and communicated to the Accounts Department with reasons for grant of extension? (Due and actual date of completion of the work and reference to letter no. and date granting the extension of time should be given)	
(a) Wheter the rates allowed in the bill have been checked with the contract agreement ? (b) Wheter the rates for extra/supplemental items have been approved by the competent authority and the sanction communicated to the accounts Department together wiht rate analysis? If so,cite reference.	
Wheter deviations have been approved by the competent authority? If yes, give reference to the approval; if not, give reasons.	
Whether the rates of recovery of stores issued to the contractor which are not provided for in the Contract Agreement have been settled in counsultation with Finance?	
Whether discrepancies pointed out by the Accounts Department in the store statement have been reconciled and accepted by the Accounts Department?	

ANNEXURE C

QUESTIONNAIRE TO BE ANSWERED BY ENGINEER IN CHARGE AND SENIOR ENGINEER	
(Correct particulers and answers to be recorded)	
Whether materials issued to the contractor in excess of the theoretical requirements have been returned to the Stores Department and the no. and date of such retuened stores vouchers have been shown in stores statement? If not ,whether the cost of such excess material has been recovered at the prescribed rate? Whethre consumption statements in respect of materials chargeabale to the work have been attached to the bill?	
Whether consumption of materials shown has been technicaly checked by Senior Engineer?	
Whether materials isshued and used in the work is not less then that required for consumption in work accroding to our specification? If comsumption is less, whether necessary recovery has been made in the bill?	
Whether mesurments have been checked by the Engineer and Sr. Engineer to the extent required and certificates of check recorded in the mesurments books?	
Whether contractor has signed the bill and the mesurments books without reservations? If not; whether resones have been intimated to the Accounts Department?	
Whethet arithmatical calculations have been checked and certificate recorded in the mesurment books by a person other than the one who calculated initially	
Whether any work was done at the risk and cost of the contractor and whether such cost has been recovered from him? Give particulers.	
Whether all advance payments on running Accounts have been recovered?	
Whether tall the recovries due to services given to the contractor like rent of accommodation, water charges, electricity charges etc. have been recovered and wheather payments made by the company on behalf of the contractor have been adjusted?	
Whether the files containing abstracts from mesurments books/ standared mesurment books have been completed/ updated?	
Whether hire charges of tools and plant have been recovered and the statement of hire charges with full details attached?	

ANNEXURE C

QUESTIONNAIRE TO BE ANSWERED BY ENGINEER IN CHARGE AND SENIOR ENGINEER	
(Correct particulers and answers to be recorded)	
Whether the certificate of workmanship and completion of work according to specifications, drawings etc. is recorded by Engineer/ Sr. Engineer and whether recoveries have been made for defective works, if any?	
Whether all corrections in the bill/measurement books etc. have been neatly made and attasted and there are no overwriting?	
Whether final measurments have been taken as soon as possibal after completion of work and the cretificate of complition issued? If not, whether resons for delay have been recorded and communicated to Accounts?	
In respect of Quintites reduced in the final bill as compare to the running payment, whether adequate reasons have been recorded and communicated to Accounts	
Whether the Expeinditure has been classified correctly according to heads of Account recorded in the sanctioned estimate?	
Whether the work has been completed within the estimated cost? If not, what is the percentage of excess over thw sanctioned estimate/ addministrative approval? In case the excess is beyond the competency of Sr. Engineer, what action has been taken for the obtaining the approval of the authority complent to sanction the excess?	
(a) If the contractor has furnished bank guarantee in lieu of cash sequrity deposit towards proper exicuation of works and guarantee against defectsduring the maintenance period, whether the period of currency of the bank guarantee cover the entire maintenance period? (b) If not, whether sequrity deposite has been proposed to be recovred from the final bill?	
Whether all the previous audit objections raised on running Account bills have been settled? If so, cite refrence.	
Signature of Engineer in Charge	Signature of Engineer in Charge
Date:	Date:

Form No: F-14 (Rev 01)

PS-	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page **1** of **6**

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART- A: PLAN/ REVIEW OF WORK FOR THE MONTH OF ……..…….. Date of Plan/ Review……

SN.	Description of Work	Unit of Measur-ement	Unit Rate	Planned (QTY Planned for the month as per Part –C of last month)		Cumulative Shortfall attributable to contractor upto last month (Refer Note 1)		Achieved		Shortfall attributable to BHEL w.r.t Plan (as per Col. 3 of Part-D)		Cumulative Shortfall attributable to Contractor upto & including this month		REMARKS (Reasons for Shortfall attributable to Contractor. Supporting documents to be kept as record.)
(a)	(b)	(c)	(d)	A		B		C		D		E=A+B-C-D		
				Phy.	Financial	Phy	Financial	Phy.	Financial	Phy.	Financial	Phy.	Financial	
	Value of Other Items not mentioned above but planned to be executed in this month													
Total					ΣA		ΣB		ΣC		ΣD		ΣE	

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

PS-	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page **2** of **6**

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART- A: Contd…….

Note 1: **In addition to the work planned as per Col. 'A', Contractor shall also make full efforts to minimize the 'Cumulative shortfall attributable to contractor upto the month' as mentioned in Col. 'B' by enhancing its resources, so as to achieve the completion of activities as per agreed schedule. In case contractor is not able to execute the entire shortfall, then BHEL 'Engineer in-charge', shall decide the priority of work to be executed and it shall be binding on the contractor.**

Note 2: Percentage Shortfall attributable to contractor w.r.t. **"**Plan - Shortfall attributable to BHEL**"** for the month = [(ΣE-ΣB)/(ΣA-ΣD)]x100
In case, (ΣE-ΣB) is negative, then it shall be treated as zero percent."

Note 3: Form 14 should include all items being planned in the current month, and all items against which shortfall was attributable to contractor till previous month. However, for practical reason, if it is not possible to mention some of the items in Form-14 being planned to be executed in this month, then also value of such items shall necessarily be included in calculation of Total Value.

Note 4: In case reason for shortfall attributable to contractor is w.r.t. T&P and Manpower, it should be in conformity with Part B1 and B2.

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

Form No: F-14 (Rev 01)

PS-	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page **3** of **6**

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – B-1: PLAN/REVIEW OF DEPLOYMENT OF MAJOR T&Ps FOR THE MONTH OF ……..…….. Date of Plan/ Review……

CONTRACTOR'S SCOPE: -

SN.	PLAN				DEPLOYMENT STATUS			
	Major T&P to be deployed as per work planned for the month	QTY	Deployment Period (in days)	Weightage assigned to planned T&P (in fraction such that ΣC =1)	Actual Deployed Quantity	Actual Deployment Period (in days)	Weighted T&P Deployed	REMARKS (Works affected due to non-deployment of T&Ps)
		A	B	C	D	E	F=(C x D x E) / (A x B)	

Note: In case, E>B, it shall be considered as E=B. Similarly, in case D>A, it shall be considered as D=A.
Percentage of T&P Deployed = ΣF x 100

BHEL SCOPE: -

SN.	PLAN			DEPLOYMENT STATUS		
	Major T&P to be deployed as per work planned for the month	QTY	Deployment Period (in days)	Actual Deployed Quantity	Actual Deployment Period (in days)	REMARKS (Works affected due to non-deployment of T&Ps)

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

Form No: F-14 (Rev 01)

PS-	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page **4** of **6**

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – B-2: PLAN/ REVIEW OF DEPLOYMENT OF MANPOWER FOR THE MONTH OF ……..…….. Date of Plan/ Review……

CONTRACTOR'S SCOPE: -

SN.	Area of Work	Category of Labour	No. of Labour required as per category	Deployment Period (in days)	No. of Labour actually deployed	Actual Deployment Period (in days)	REMARKS **(**Works affected due to non-availability of labour)
			A	B	C	D	

Percentage of Manpower Deployed=100 x Σ(CxD)/Σ(AxB)

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

Form No: F-14 (Rev 01)

PS-	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page **5** of **6**

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – C: PLAN(PHYSICAL) FOR THE NEXT MONTH i.e. ……..…….. Date of Plan ……

SN.	Description of work	Original Planned Quantity	Planned Quantity (excluding shortfalls attributable to contractor till date)	Unit of Measu-rement	T&Ps Required				Manpower Required		REMARKS (Reasons for difference in Original Planned Quantity w.r.t. Planned quantity to be given)
					Contractor Scope		BHEL Scope				
					Major T&P to be deployed as per work planned for the month	Quantity	Major T&P to be deployed as per work planned for the month	Quantity	Category of Labour	No. of Labour required as per Category	

Note 1: Planned quantity should be based on available/ expected fronts/ inputs in the next month

Note 2: "Original Planned Quantity" shall be as per latest jointly agreed programme between BHEL and Contractor before commencement of work or at the time of latest Time Extension, as the case may be.

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

Form No: F-14 (Rev 01)

PS-	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page **6** of **6**

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – D: REASONS FOR SHORTFALL ATTRIBUTABLE TO BHEL IN RESPECT OF PLAN FOR THE MONTH……

SN.	Description of Work (from Part-A)	Quantities Affected		Reasons for Shortfall attributable to BHEL	Agency responsible for reasons for Shortfall	Remarks (Supporting Documents in respect of agency responsible)
		(Physical Quantity)	Unit of Measu-rement			
1	2	3	4	5	6	7

Note1: Reasons for shortfall shall include non-availability of fronts/ drawings/ materials/ T&P (BHEL Scope)/ clearances etc. and other hindrances for which contractor is not responsible.

Note2: Agency responsible may be BHEL Site/ MUs/ Design Centre/ BHEL Customer/ other Contractors etc.

BHEL
(Sign with name, designation and date)

BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its Unit at Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700091 having awarded to (Name of the Vendor / Contractor / Supplier) having its registered office at_____[1] hereinafter referred to as the 'Contractor/Supplier', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No……dated ……[2] valued at Rs……[2] (Rupees ----------)for <Nature of Work>[3] (hereinafter called the 'Contract') and the Contractor having agreed to provide a Contract Performance Guarantee, equivalent to ……% (…. Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

we, ……, (hereinafter referred to as the Bank), having registered/Head office at …….. and inter alia a branch at …… being the Guarantor under this Guarantee, hereby, irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer a maximum amount Rs ---------- ------- (Rupees ----------)[4] without any demur, immediately on a demand from the Employer, .

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____ _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor/ Supplier in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the contractors/supplier shall have no claim against us for making such payment.

We the ……bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

We …….. BANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Contractor/Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Contractor/Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall remain in force upto and including…….. [5] and shall be extended from time to time for such period as may be desired by Employer.
This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor/Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the ……[6] (3 months more than the present date of validity of Bank Guarantee) we shall be discharged from all liabilities under this guarantee thereafter.

We, …… BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.
Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed…… [7]

b) This Guarantee shall be valid up to ……[8]

c) Unless the Bank is served a written claim or demand on or before _____[9] (3 months more than the present date of validity of Bank Guarantee) all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Any claim or dispute arising under the terms of this document shall only be enforced or settled in the courts of at Kolkata only.

For and on behalf of
(Name of the Bank)

Dated…….

Place of Issue…….

[1] NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

[2] DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

[3] PROJECT/SUPPLY DETAILS

[4] BG AMOUNT IN FIGURES AND WORDS

[5] VALIDITY DATE

[6] DATE OF EXPIRY OF CLAIM PERIOD

[7] BG AMOUNT IN FIGURES AND WORDS.

[8] VALIDITY DATE

[9] DATE OF EXPIRY OF CLAIM PERIOD

Note:

1. **Units are advised that expiry of claim period may be kept 2/3 months after validity date.**

2. **In Case of Bank Guarantees submitted by Foreign Vendors-**

   a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.

b. From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)

b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

b.2 **In case, Foreign Vendors intend to provide BG from** Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.

b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.

b.4 The BG should clearly specify that the demand or other document can be presented in electronic form.

BANK GUARANTEE FOR SECURITY DEPOSIT CUM PERFORMANCE BANK GUARANTEE BOND

B.G. NO. Date

This deed of Guarantee made this ---------- day of ----------two thousand ----- by <Name and Address of Bank> hereinafter called the "The Guarantor" (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns) in favour of M/s Bharat Heavy Electrical Limited (A Govt. of India Undertaking) a company incorporated under the Companies Act, 1956, having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its unit at <**Address of Power Sector Region**[1]> hereinafter called "The Company" (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns)

WHEREAS < Contractor's Name and Address> (hereinafter referred to as the Contractor) have entered into a contract arising out of Letter of Intent no. < LOI REF & Date > (hereinafter referred to as "the contract") for < Name of Work > with the company.

AND WHEREAS the contract inter-alia provides that the contractor shall furnish to the company a sum of Rs.---------- (Rupees----------) towards security deposit for due and faithful performance of the contract in the form and manner specified therein.

AND WHEREAS the contractor has approached the Guarantor and in consideration of the arrangement arrived at between the contractor and the Guarantor, the Guarantor has agreed to give the Guarantee as hereinafter mentioned in favour of the company.

The Guarantor do hereby guarantee to the company the due and faithful performance, observance or discharge of the Contract by the contractor and further unconditionally and irrevocably undertake to pay to the Company without demur and merely on a demand, to the extent of Rs.----------(Rupees----------) against any claim by the company on them for any loss, damage, costs, charges and expenses caused to or suffered by the company by reasons of the contractor making any default in the performance, observance or discharge of the terms, conditions, stipulations or undertakings or any of them as contained in the contract.

The decision of the company whether any default has occurred or has been committed by the contractor in the performance, observance or discharge of any of the terms, conditions, stipulations or undertakings or any one of them as contained in the contract and / or as to the extent of loss, damage, costs, charges and expenses caused to or suffered by the company by reason of the contractor making any default in the performance, observance or discharge of any of the terms, conditions, stipulations or undertakings or any one of them shall be conclusive and binding on the Guarantor irrespective of the fact whether the contractor admits or denies the default or questions the correctness of any demand made by the company in any Court, Tribunal or Arbitration proceedings or before any other Authority.

The company shall have the fullest liberty without affecting in any way the liability of the Guarantor under this Guarantee, from time to time to vary any of the terms and conditions of the contract or extend time of performance by the contractor or to postpone for any time and from time to time any of the powers exercisable by it against the contractor and either enforce or forebear from enforcing any of the terms and conditions governing the contract or securities available to the company and the Guarantor shall not be released from its liability under these presents by any exercise by the company of the liberty with reference to the matters aforesaid or by reasons of time being given to the contractor or any other forbearance, act or commission on the part of the company or any indulgence by the company to the contractor or any other matter or thing whatsoever which under the law relating to sureties would, but for this provision have the effect of so releasing the Guarantor from its liability under this guarantee.

The Guarantor further agrees that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the contract and its claim satisfied or discharged and till the company certifies that the terms and conditions of the contract have been fully and properly carried out by the contractor and accordingly discharges this Guarantee, subject however, that the company shall have no claim under this Guarantee after ---------- i.e. (3 months more than the present date of validity of Bank Guarantee unless the date of validity of this Bank Guarantee is further extended from time to time, as the case may be) unless a notice of the claim under this Guarantee has been served on the Guarantor before the expiry of the said period in which case the same shall be enforceable against the Guarantor not withstanding the fact that the same is enforced after the expiry of the said period.

BANK GUARANTEE FOR SECURITY DEPOSIT CUM PERFORMANCE BANK GUARANTEE BOND

The Guarantor undertakes not to revoke this Guarantee during the period it is in force except with the previous consent of the Company in writing and agrees that any liquidation or winding up or insolvency or dissolution or any change in the constitution of the contractor or the Guarantor shall not discharge the Guarantor's liability hereunder.

It shall not be necessary for the company to proceed against the contractor before proceeding against the Guarantor and the Guarantee herein contained shall be enforceable against them notwithstanding any security which the Company may have obtained or obtain from the Contractor shall at the time when proceedings are taken against the Guarantor hereunder be outstanding or unrealized.

Notwithstanding anything contained herein before, our liability under the Guarantee is restricted to Rs.---------- (Rupees----------). Our guarantee shall remain inforce until ----------, i.e. (the present date of validity of Bank Guarantee unless the date of validity of this Bank Guarantee is further extended from time to time) unless a claim or demand under this guarantee is made against us on or before ---------- (3 Months more than the validity date) we shall be discharged from our liabilities under this Guarantee thereafter.

Any claim or dispute arising under the terms of this documents shall only be enforced or settled in the courts of at < **Name of place[2]** > only.

The Guarantor hereby declares that it has power to execute this guarantee and the executant has full powers to do so on behalf of the Guarantor.

IN WITNESS whereof the ---------- (Bank) has hereunto set and subscribed its hand the day, month and year first, above written.

(Name of the Bank)

Signed for and on behalf of the Bank
(Designation of the Authorized Person Signing the Guarantee)

(Signatory No.----------)

DATED:

SEAL

==========

Notes :

1. **Address of Power Sector Regions (inviting the Tender)** is as below:
   - PSNR : Bharat Heavy Electricals Limited, Power Sector Northern Region, HRDI & PSNR Complex, Plot No 25, Sector 16-A, Noida – 201 301 (Uttar Pradesh)
   - PSER : Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700 091
   - PSWR: Bharat Heavy Electricals Limited, Power Sector Western Region, Shree Mohini Complex, 345 Kingsway, Nagpur 440 001
   - PSSR: Bharat Heavy Electricals Limited, Power Sector Southern Region, 690, Anna Salai, Nandanam, Chennai 600 035

2. **Name of place (for jurisdiction of Courts)** is as below:
   - PSNR : Delhi
   - PSER : Kolkata
   - PSWR: Nagpur
   - PSSR : Chennai

3. The BG shall be executed on non-judicial stamp papers of adequate value procured in the name of the Bank in the State where the Bank is located.

4. The BG is required to be sent by the executing Bank directly to BHEL at the address where tender is submitted / accepted under sealed cover.

BANK GUARANTEE FOR RELEASE OF AMOUNTS WITHHED/LIQUIDATED DAMAGES AMOUNT

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited [1](hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its Unit at Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700091 having awarded to (Name of the Vendor / Contractor / Supplier) incorporated under the ……..having its registered office at_____ [1](hereinafter referred to as the 'Contractor', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No……dated ……..[2]valued at Rs……(Rupees ----------) for <Nature of Work>[3](hereinafter called the 'Contract')

The Contractor as per Contract should have completed the work/ supplies under the contract by……..(date). As per terms and conditions of the Contract, the Employer is entitled to levy Liquidated Damages (LD) for delays and the Employer has withheld an amount of Rs ……..by way of LD as per the Contract. Now, on the request of the Contractor, the Employer having agreed to release the amount of Rs……..withheld from the Contractor's invoices as Liquidated damages under the terms and conditions of the Contract on production of a Bank Guarantee for Rs._____ (Rupees……only) [4]

We, ……, (hereinafter referred to as the Bank), having registered/Head office at …….. and inter alia a branch at ……. being the Guarantor under this Guarantee, hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer a maximum amount of Rs ---------- (Rupees ----------) without any demur, merely on a demand from the Employer

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor/ Supplier in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the contractors/supplier shall have no claim against us for making such payment.

We the ……bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

We …….. BANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Contractor/Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Contractor/Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.
The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's/ Supplier's liabilities.

This Guarantee shall remain in force upto and including…….. [5] and shall be extended from time to time for such period as may be desired by Employer.
This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor/Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writingon or before the ……[6] (3 months more than the present date of validity of Bank Guarantee) we shall be discharged from all liabilities under this guarantee thereafter.

We, …… BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed…… [7]
b) This Guarantee shall be valid up to ……[8]
c) Unless the Bank is served a written claim or demand on or before _____[9] (3 months more than the present date of validity of Bank Guarantee) all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Any claim or dispute arising under the terms of this document shall only be enforced or settled in the courts of at Kolkata only.

For and on behalf of
(Name of the Bank)

Dated…….

Place of Issue…….

[1] *NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.*

[2] *DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE*

[3] *PROJECT/SUPPLY DETAILS*

[4] *BG AMOUNT IN FIGURES AND WORDS*

[5] *VALIDITY DATE*

[6] *DATE OF EXPIRY OF CLAIM PERIOD*

[7] *BG AMOUNT IN FIGURES AND WORDS.*

[8] *VALIDITY DATE*

[9] *DATE OF EXPIRY OF CLAIM PERIOD*

Note:

1. **Units are advised that expiry of claim period may be kept 2/3 months after validity date.**

2. **In Case of Bank Guarantees submitted by Foreign Vendors-**

   a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.

   b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**

   b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

   b.2 **In case, Foreign Vendors intend to provide BG from** Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.

   b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.

   b.4 The BG should clearly specify that the demand or other document can be presented in electronic form.

BANK GUARANTEE FOR SUPPLY FREE ISSUE MATERIAL.

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its Unit at Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700091 having awarded to (Name of the Vendor / Contractor / Supplier).having its registered office at_____ [1] (hereinafter referred to as the 'Contractor/Supplier/Fabricator' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref. No.……dated ……[2] valued at Rs.……(Rupees ----------) for <Nature of Work>[3] (hereinafter called the 'Contract')

and, the Employer having agreed as per the terms and conditions of the Contract to supply free issue material costing Rs._____ for the manufacture/fabrication of the equipment at the Contractor's site on on furnishing a Bank Guarantee for Rs._____ (Rupees……..)[4] in the manner hereinafter specified for the due safeguard of the free issue material,

we, ……, (hereinafter referred to as the Bank), having registered/Head office at …… and inter alia a branch at …… being the Guarantor under this Guarantee, hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer a maximum amount of Rs ---------- (Rupees ----------) without any demur, merely on a demand from the Employer, .

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor/ Supplier in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment hereunder and the Contractors/Supplier shall have no claim against us for making such payment.

We the ……Bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

We …….. Bank further agree that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Contractor/Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Contractor/Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor/Supplier/ Fabricator and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's/Supplier's/ Fabricator's liabilities.

This Guarantee shall remain in force upto and including…….. [5] and shall be extended from time to time for such period as may be desired by Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor/ Supplier/ Fabricator but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the ……[6] (3 months more than the present date of validity of Bank Guarantee) we shall be discharged from all liabilities under this guarantee thereafter.

We, …… BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed…… [7]
b) This Guarantee shall be valid up to ……[8]
c) Unless the Bank is served a written claim or demand on or before _____[9] (3 months more than the present date of validity of Bank Guarantee) all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Any claim or dispute arising under the terms of this document shall only be enforced or settled in the courts of at Kolkata only.

For and on behalf of
(Name of the Bank)

Dated…….

Place of Issue…….

[1] NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER .

[2] DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

[3] PROJECT/SUPPLY DETAILS

[4] BG AMOUNT IN FIGURES AND WORDS

[5] VALIDITY DATE

[6] DATE OF EXPIRY OF CLAIM PERIOD

[7] BG AMOUNT IN FIGURES AND WORDS.

[8] VALIDITY DATE

[9] DATE OF EXPIRY OF CLAIM PERIOD

Note:

1. **Units are advised that expiry of claim period may be kept 2/3 months after validity date.**

2. **In Case of Bank Guarantees submitted by Foreign Vendors-**

   a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.

   b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**

   b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

   b.2 **In case, Foreign Vendors intend to provide BG from** Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.

   b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.

   b.4 The BG should clearly specify that the demand or other document can be presented in electronic form.

PROFORMA OF BANK GUARANTEE FOR EARNEST MONEY
(On non-Judicial paper of appropriate value)

Bank Guarantee No……..

Date……..

To

(Employer's Name and Address)
……..

Dear Sirs,

In accordance with the terms and conditions of your Invitation for Bids/Notice Inviting Tender No……[1](Tender Conditions) M/s. ……. having its registered office at ……[2] (hereinafter referred to as the '**Tenderer**'), is submitting its bid for the work of**……..** for……[3]. at Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700091.[4](name of the Employer)
The Tender Conditions provide that the **Tenderer** shall pay a sum of Rs **……** as Earnest Money Deposit in the form therein mentioned. The form of payment of Earnest Money Deposit includes Bank Guarantee executed by a Scheduled Bank.

In lieu of the stipulations contained in the aforesaid Tender Conditions that an irrevocable and unconditional Bank Guarantee against Earnest Money Deposit for an amount of .....[5] ..... is required to be submitted by the Tenderer as a condition precedent for participation in the said Tender and the Tenderer having approached us for giving the said Guarantee,,

we, the .....*[Name & address of the Bank]* ..... having our Head Office at ……..(hereinafter referred to as the Bank) being the Guarantor under this Guarantee, hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer without any demur, merely on your first demand any sum or sums of Rs. [5] .....(*).....without any reservation, protest, and recourse and without the beneficiary needing to prove or demonstrate reasons for its such demand. Any such demand made by the 'Employer' shall be

conclusive and binding on us irrespective of any dispute or difference raised by the Tenderer.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment hereunder and the Tenderer shall have no claim against us for making such payment.

We …….. Bank further agree that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Tender or to extend the time of submission of bids from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Tenderer and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Tendered or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Tenderer or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Tenderer and notwithstanding any security or other guarantee that the Employer may have in relation to the Tenderer's liabilities.

This Guarantee shall be irrevocable and shall remain in force upto and including……..[6] and shall be extended from time to time for such period as may be desired by the Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Tenderer but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms hereof. However, unless a demand or claim under this Guarantee is made on us in writing on or before the ……[7] we shall be discharged from all liabilities under this Guarantee.

We, ……. Bank lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed……[5]…..

b) This Guarantee shall be valid up to ……[6]

c) Unless the Bank is served a written claim or demand on or before _____[7] all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of

(Name of the Bank)

Date……

Place of Issue……

[1] *Details of the Invitation to Bid/Notice Inviting Tender*

[2] *Name and Address of the Tenderer*

[3] *Details of the Work*

[4] *Name and Address of BHEL Unit/Division/Region (Already filled up)*

[5] *BG Amount in words and Figures*

[6] *Validity Date*

[7] *Date of Expiry of Claim Period*

Note:

1. **Units are advised that expiry of claim period may be kept 2/3 months after validity date. As per Works Policy, the Bank Guarantee shall be valid for at least six months.**

2. **In Case of Bank Guarantees submitted by Foreign Vendors-**

a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.

b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**

b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter-Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

b.2 **In case, Foreign Vendors intend to provide BG from** Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.

b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.

b.4 The BG should clearly specify that the demand or other document can be presented in electronic form.

RTGS DETAILS OF BHEL

Form for getting payment through RTGS (Real Time Gross Settlement)

01.	*Name of Vendor*	BHARAT HEAVY ELECTRICALS LTD.
02.	*Address*	~~BHEL~~ BHEL HOUSE, SIRI FORT, N.DELHI
03.	*Vendors Bank A/c Name*	BHARAT HEAVY ELECTRICALS LTD.
04.	*Vendors Bank A/c No.*	11107800029
05.	*Name of Bank*	STATE BANK OF INDIA
06.	*Name of Branch*	COMMERCIAL BR., SALT LAKE, SECTOR-V KOLKATA
07.	*Branch Phone No.*	033-23575666
08.	*City*	KOLKATA
09.	*IFSC Code of the Branch*	SBIN 0004289

The charges if any for payment through RTGS may be recovered from the Bill submitted by us.

Signature of Authorised Representative of Vendor with office seal

के. के. कोआरी / K. K. Coari
उप महाप्रबंधक (वित्त)/Dy. General Manager (Fin)
बी. एच. ई. एल. : पी.एस.ई.आर : कोलकाता -700 091
BHEL:PSER / Kolkata-700 091

Confirmation by Banker with office seal

State Bank of India ★ SALT LAKE ★ Commercial Branch 4289

Note : Incorrect information will create Accounting complications and payment will be delayed

APPROVED
Checked and Approved.

Date: 23-Apr-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

FIELD QUALITY PLAN
FOR
DRY TYPE TRANSFORMER

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED

OWNER'S CONSULTANT

FICHTNER

Fichtner GmbH & Co. KG, Germany

BIFPCL DOC. NO. : MAITREE-00-BFT-QA-300030-PSE, REV. NO. : 1

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-EL-52
REV No.: 1

APPROVED
Checked and Approved.

Date: 23-Apr-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

FIELD QUALITY PLAN
FOR
DRY TYPE TRANSFORMER

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-BFT-QA-300030-PSE, REV. NO. : 1

PREPARED BY	 DE/QLY, BHEL- PSER	APPROVED BY	 HEAD / QLY, BHEL-PSER

FQP NO.	**QPE-MTE-660-EL-52**
ORIGINAL DATE OF ISSUE	01/02/2018
REVISION NO. & DATE	1, Dt. 18/04/2018
COPY NO.	
ISSUED TO	I
DATE OF ISSUE	
PURPOSE :	
ISSUED BY (SIGNATURE & DESIGNATION)	DE/QLY, BHEL, PSER

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

APPROVED
Checked and Approved.

Date: 23-Apr-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

PSER	FIELD QUALITY PLAN FOR DRY TYPE TRANSFORMER	FQP NO: MAITREE-00-BFT-QA-300030-PSE BHEL Doc. No. : QPE-MTE-660-EL-52
		Rev. No. : 1
		SHEET 1 / 1 SHEETS

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APPROVED
Checked and Approved.

Date: 23-Apr-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

PSER	FIELD QUALITY PLAN FOR DRY TYPE TRANSFORMER	FQP NO: MAITREE-00-BFT-QA-300030-PSE BHEL Doc. No. : QPE-MTE-660-EL-52
		Rev. No. : 1
		SHEET 1 / 1 SHEETS

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 01.02.18	Document prepared as per the owner's specifications
02	-	1, Dtd.: 18.04.18	As per the comments dated 21.02.18 from BIFPCL/OE, the document is aligned to NTPC approved FQP No. 4410-001-215-QVE-G-001, Rev-0: FQP Dry Type Transformer for NTPC - North Karanpura STPP (3x660MW) with additional tests as per the requirement of FTS.

APPROVED
Checked and Approved.

Date: 23-Apr-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

PSER

AUTHORISATION FOR DIFFERENT CATEGORY OF CONSTRUCTION/ ERECTION CHECKS & NONCONFORMITY DISPOSITION

Category of Check	Inspection Authority	Witness Authority	Nonconformity (if any) Disposition Authority	Accepting Authority
'A' (Customer Hold Point)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'B' (Formal intimation shall be forwarded by BHEL. Check shall commence at notified time whether parties show-up or not)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'C'	BHEL Engineer	BHEL Engineer	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BHEL HOS

Abbreviations used:

HOS – Head of Section

Note:

1. Nonconformity Disposition authority for all categories of checks shall be as under:

   Product nonconformities: BHEL Engineering Centre.

   Process/System nonconformities: Head (Quality): BHEL, PS ER.

2. Wherever log sheet is not called for, suitable record shall be maintained in protocol / Site register.

3. In case of nonconformity, accepting authority will consider the solution for the nonconformity as proposed by the Nonconformity Disposition Authority before acceptance, and such solution shall be reflected in the log sheets/protocols.

4. Owner's Engineer is authorized to carry out surveillance in any of B & C category of checks at his discretion.

5. Concerned agencies shall ensure that instruments having valid calibration are only used for measurements.

6. Quantum of check shall be 100% for all characteristics unless otherwise mentioned specifically in Field Quality Plan/ reference documents.

7. Only authorised persons with proper safety gears to enter construction area

APPROVED
Checked and Approved.

Date: 23-Apr-2018

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PSER	FIELD QUALITY PLAN FOR DRY TYPE TRANSFORMER	FQP NO: MAITREE-00-BFT-QA-300030-PSE BHEL Doc. No. : QPE-MTE-660-EL-52
		Rev. No. : 1
		SHEET 01 / 05 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	POWER TRANSFORMER
Sub-system :	DRY TYPE TRANSFORMER
Area :	ERECTION & TESTING

NOTES :

1. As an evidence of having carried out the work satisfactorily, a general purpose log sheet, L-00 shall be maintained for all the checks.
2. Abbreviations used:

   R – Record Verification

   V – Visual Check

   P – Physical Check

   M – Measurement

   T – Test

   MTC – Manufacturer's Test Certificate

   SR – Site Register

   MDR – Material Discrepancy Report

   MDCC – Material Dispatch Clearance Certificate

3. Latest revision of Standards & Specification shall apply

APPROVED
Checked and Approved.
Date: 23-Apr-2026
*Approval does not absolve the EPC contractor of its responsibility as specified in the Contract

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLH-E2060.20 FIELD QUALITY PLAN FOR **DRY TYPE TRANSFORMER** STATEMENT OF CHECKS	FQP NO: **MAITREE-00-BFT-QA-300030-PSE** BHEL Doc. No. : QPE-MTE-660-EL-52 REV.NO.: 1 SHEET 02 / 05 SHEETS
SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: DRY TYPE TRANSFORMERS	AREA: ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
A	**GENERAL REQUIREMENTS**								
A.01	Ensure availability of requisite equipment in good working condition well before commencement of concerned activity. All MMRs in the field shall be calibrated before commencement of tests and then at interval as per manufacturer's recommendations and as per direction of BIFPCL / OE.	P & R	-	A	Once prior to start of work and thereof monthly OR immediately after an Instrument Damaging incident	Technical Specifications & Drawing	The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	SR	- Functioning of MMRs in proper working condition to be verified on monthly basis. - calibration of MMRs shall be done by approved lab and the report shall be submitted to BIFPCL/ OE. - Wherever practical, a label shall be affixed on the Instrument, indicating the validity of Calibration
A.02	Ensure availability of approved drawings	R	-	A	100% for each type transformer before start of activity	List of Latest Revision of Approved Drawings	Owner's Technical Specifications	SR	
B	**MATERIAL RECEIPT, STORAGE & PRESERVATION**								
B.01	Check that transformer is lifted using the lifting arrangement provided on the transformer for lifting the complete transformer as per lifting instruction plate.	P	-	C	100%	OEM Instruction Manual & Method statement	Compliance to Col. No. 2	Logbook	
B.02	Check that proper unloading tools & tackles are used and ensure safe unloading of material	V	-	C	100%	OEM Instruction Manual & Method statement	Compliance to Col. No. 2	-	
B.03	Ensure that transformer is stored indoor to prevent ingress of rain & moisture	P	-	B	100%	OEM Instruction Manual	Compliance to Col. No. 2	Logbook	
B.04	Check condition of packages	V	-	B	100%	Packing List	Material should be free from damages	Logbook	
B.05	Check materials for completeness, correctness, and shortages / excesses as per Bill of Materials / Dispatch documents / Packing slip.	V	-	B	100%	Dispatch documents & Packing List	MDCC	Stock Register	
B.06	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	Work instructions for site Operations	Work instructions for site Operations	MDR	
B.07	Check for shorty supply, if any AND report to supplier for rectification / replenishment.	V	-	C	Once at receipt	Dispatch documents & Packing List	MDCC	MDR	

APPROVED
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Date: 23-Apr-2018
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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLH-E2060.20 FIELD QUALITY PLAN FOR **DRY TYPE TRANSFORMER** STATEMENT OF CHECKS	FQP NO: **MAITREE-00-BFT-QA-300030-PSE** BHEL Doc. No. : QPE-MTE-660-EL-52 REV.NO.: 1 SHEET 03 / 05 SHEETS
SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: DRY TYPE TRANSFORMERS	AREA: ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
C	**PRE-ERECTION CHECKS**								
C.01	Check that the transformer plinth is properly levelled and it is as per drawing & check for size & location of duct / cable entry openings.	M	Water level, tape & Piano wire	B	Once before erection	Foundation Plan	OGA Drawing	Logbook	
C.02	Check that exact location and centreline of roller assembly has been marked on plinth	V	As required	B	Once before erection	Foundation Plan	OGA Drawing	Logbook	
C.03	Check availability of proper tools & tackles including special handling equipment & suitable locking arrangement for carrying out erection and wheels are kept locked when transformer is not rolled.	V	-	C	Once before erection	Approved Method statement	OEM's Instruction Manual	Logbook	
C.04	Check that AC / DC supplies have been made available for marshalling box.	P	-	C	100%	Wiring schematic diagram	Wiring schematic diagram	Logbook	
C.05	Check CT polarity, turn ratio, knee point voltage, winding resistance & IR before erection, as applicable.	M	As required	B	100%	OGA Drawing	IEC 61869-2	Logbook	
C.06	Check that instruments are mounted intact and are working properly.	P	-	B	100%	OGA Drawing	No defective instruments	Logbook	
C.07	Check that transformer is kept clean and free from dust, foreign material & loose parts.	V	-	B	100%	OEM Instruction Manual	OEM Instruction Manual	Logbook	
C.08	Check terminal markings	V	-	B	100%	OGA Drawing	Approved datasheet	Logbook	
D	**ERECTION CHECKS**								
D.01	Check for foundation readiness as per layout drawing	M	Water level, tape & Piano wire	B	100%	OGA Drawing	OGA Drawing	Logbook	
D.02	Ensure proper erection & alignment of all accessories & Locking of transformer in position.	V	-	B	100%	OGA Drawing & method statement	OEM Instruction Manual	Logbook	
D.03	Check that all hardware used in transformer are tightened properly	P	As required	B	100%	OGA Drawing & data sheet	OEM Instruction Manual	Logbook	
D.04	Check that cables are terminated inside the cable box	P	-	B	100%	OGA Drawing	OGA Drawing	Logbook	

APPROVED
Checked and Approved.
Date: 23-Apr-2018
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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLH-E2060.20 FIELD QUALITY PLAN FOR **DRY TYPE TRANSFORMER** STATEMENT OF CHECKS	FQP NO: **MAITREE-00-BFT-QA-300030-PSE** BHEL Doc. No. : QPE-MTE-660-EL-52 REV.NO.: 1 SHEET 04 / 05 SHEETS
SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: DRY TYPE TRANSFORMERS	AREA: ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
D.05	Check that control wiring are terminated on terminal block inside marshalling box as per wiring diagram	P	-	B	100%	OGA Drawing	Wiring Schematic Diagram	Logbook	
D.06	Ensure feruling of cables at both end for identification	P & V	-	C	100%	OGA Drawing	OGA Drawing	Logbook	
D.07	Neutral Termination arrangement and all earthing points of transformer enclosure	P	As required	B	100%	OGA Drawing	Proper grounding	Logbook	
D.08	Check that all clearances inside the enclosure are maintained	P	As required	A	100%	OGA Drawing	IEC 60076-11	Logbook	
D.09	Perform functional checks of all alarms and trips	V	-	B	100%	OGA Drawing	IEC 60076-11	Logbook	
D.10	Check wiring for temperature supervision & door switches	V	-	B	100%	OEM's Instruction Manual	OEM's Instruction Manual	Logbook	
D.11	Check that limit switch in enclosure door is functioning properly, if provided	V	-	C	100%	OGA Drawing	OGA Drawing	Logbook	
D.12	Tap links are on same position in all three phases.	V	-	B	100%	Instruction Manual & IEC 60076-11	Shop protocols	Logbook	
D.13	Touch-up painting to be carried out, wherever necessary	P	-	C	100%	Owner's Technical Specifications	Approved painting schedule	Logbook	
D.14	Check completeness of erection.	P	As required	C	100%	OGA Drawing & data sheet	OEM's Instruction Manual	Joint Protocol	
E	**ELECTRICAL TESTS**								
E.01	Vector group test.	M	Multimeter	A	Once after erection	OEM's Instruction Manual & IEC 60076-11	Should match rating plate drg.	L-02	
E.02	Ratio Test at all taps.	M	Multimeter	A	Once	OEM's Instruction Manual & IEC 60076-11	Shop protocols	L-01	

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Date: 23-Apr-2018
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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLH-E2060.20 FIELD QUALITY PLAN FOR **DRY TYPE TRANSFORMER** STATEMENT OF CHECKS	FQP NO: **MAITREE-00-BFT-QA-300030-PSE** BHEL Doc. No. : QPE-MTE-660-EL-52 REV.NO.: 1 SHEET 05 / 05 SHEETS
SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: DRY TYPE TRANSFORMERS	AREA: ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
E.03	Measurement of magnetising current & magnetic balance	M	Multimeter & clamp meter	A	Once 100%	OEM's Instruction Manual & IEC 60076-11	Shop protocols	L-01	
E.04	Check phase sequence	M	Sequence tester	B	Once	OEM's Instruction Manual & IEC 60076-11	Shop protocols	L-01	
E.05	Winding resistance at first, normal and last taps.	M	Micro-ohmmeter	A	-do-	OEM's Instruction Manual & IEC 60076-11	Shop protocols	L-01	
E.06	Setting of protection relays.	M	Calibrator	B	100%	OEM's Instruction Manual & IEC 60076-11	Shop protocols	Logbook	
E.07	Check the value and continuity of the winding RTD	M	Multimeter	A	100%	OEM's Instruction Manual & IEC 60076-11	Shop protocols	Logbook	
E.08	Functioning of Temperature surveillance unit for alarm and tripping.	M	Thermometer	B	100%	OEM's Instruction Manual & IEC 60076-11	Shop protocols	Logbook	
E.09	Check the power supply for the surveillance unit	M	Multimeter	B	100%	OEM's Instruction Manual & IEC 60076-11	Shop protocols	Logbook	
E.10	Final IR values of the transformer.	M	1 / 2.5 KV IR Tester	A	100%	OEM's Instruction Manual & IEC 60076-11	Shop protocols	L-03	
E.11	Measurement of Earth pit Resistance	M	Earth Resistance Tester	B	100%	IEEE 81	Acceptable value is < 1 Ω	Logbook	
E.12	Handing over for commissioning	R	-	A	100%	Drawings & erection Logsheets	Drawings & erection Logsheets	Joint Protocol	Review of all Log Sheets, protocols and disposition status of NCRs (if any)

APPROVED
Checked and Approved.

Date: 23-Apr-2018

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PSER

RECORD OF QUALITY CHECKS

SHEET NO. OF FQP	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	INSPECTED BY SIGN. & DATE	CLEARED BY SIGN. & DATE	REMARKS

Note : Any protocol made is to be numbered & mentioned in "Format of Record" column.

		SYSTEM	SUB-SYSTEM	AREA	FQP NO.: QPE-MTE-660-EL-52
PROJECT					REV. NO. : 1
UNIT NO.					LOG SHEET NO. L-00
RATING	250MW				SHEET / SHEETS

APPROVED
Checked and Approved.

Date: 23-Apr-2018

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PSER	INSTRUMENT REG. NO./TAG. NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

Service of the transformer :

Magnetising Current in mA :

For HV Side : _____ mA (As per O&M Manual)

For LV Side : _____ mA (As per O&M Manual)

Sl. No.	HV Side				LV Side			
	Phase	Voltage Applied (volts)	Phase	Current measured (Amp)	Phase	Voltage Applied (volts)	Phase	Current measured (Amp)
1.	A-B		A		a-b		a	
2.	B-C		B		b-c		b	
3.	C-A		C		c-a		c	

Winding Resistance :

Winding	Tap No.	Phase a	Phase b	Phase c	Temp	Remarks
HV Winding	Tap no. 1 Highest Tap					
LV Winding						

IR Values:

Date : **Time :** **Temperature** :

1.	Main winding : Between	1000 V or 2500 V Megger	IR Values:	PI Value:	Acceptance Criterion
a)	HV & E + LV				
b)	LV & E + HV				
c)	HV & LV				
2.	LV Busduct:				
	Between LV & E				

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-52
PROJECT		CHECKED BY			REV. NO. : 1
UNIT NO.		ACCEPTED BY			LOG SHEET NO. L-01
RATING	250 MW	CUSTOMER			SHEET 1 / 2 SHEETS

APPROVED
Checked and Approved.

Date: 23-Apr-2018

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PSER	INSTRUMENT REG. NO./TAG. NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

RATIO TEST ON TRANSFORMER

Tap Position No.	Voltage applied			Voltage Measured			Ratio Obtained			Remarks
							a	b	c	

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-52
PROJECT		CHECKED BY			REV. NO. 1
UNIT NO.		ACCEPTED BY			LOG SHEET NO. L-01
RATING	250 MW	CUSTOMER			SHEET 2 / 2 SHEETS

APPROVED
Checked and Approved.

Date: 23-Apr-2018

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PSER	INSTRUMENT REG. NO./TAG. NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

VECTOR GROUP CHECK ON TRANSFORMER

Vector Group	Diagram of connections as required	Diagram of connections as connected for test

VOLTAGE SUPPLIED

Phase A				Phase B				Phase C				Remarks
A-a	B-b	C-c	A-n	A-a	B-b	C-c	A-n	A-a	B-b	C-c	A-n	

Conditions to be proved :

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-52
PROJECT		CHECKED BY			REV. NO. : 1
UNIT NO.		ACCEPTED BY			LOG SHEET NO. L-02
RATING	250 MW	CUSTOMER			SHEET 1 / 1 SHEETS

APPROVED
Checked and Approved.

Date: 23-Apr-2018

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PSER	INSTRUMENT REG. NO./TAG. NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

FINAL IR VALUES CHECK

The megger readings finally after the transformer is connected to the system .

DATE : _____ TIME : _____ TEMP : _____

Between Windings	Megger used	Values obtained (in Mohms)	PI Values	Criterion for acceptance	Remarks
HV & E + LV LV & HV + E HV & LV					

PROTECTION & ALARMS (as applicable)

Sl. No.	Device	Settings Required		Operations Proved		Remarks
		Alarm	Trip	Alarm	Trip	
1.	Excessive winding temperature					
2.	Overcurrent Relay					
3.	Earth fault (REF) Relay					
4.	Inter-trip relay ,if any					

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-52
PROJECT		CHECKED BY			REV. NO. : 1
UNIT NO.		ACCEPTED BY			LOG SHEET NO. L-03
RATING	250 MW	CUSTOMER			SHEET 1 / 1 SHEETS

APPROVED
Checked and Approved.

Date: 23-Apr-2018

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PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

			NAME	SIGNATURE & DATE	FQP NO.: QPE-MTE-660-EL-52
PROJECT		INSPECTED BY			REV. NO. 1
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

FIELD QUALITY PLAN
FOR
LOW VOLTAGE CABLING

(POWER, CONTROL & INSTRUMENTATION CABLES & ACCESSORIES)

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

FOR TENDER PURPOSE

BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED

OWNER'S CONSULTANT

FICHTNER

Fichtner GmbH & Co. KG, Germany

BIFPCL DOC. NO. : MAITREE-00-BHS-QA-300038-PSE, REV. NO. : 1

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-EL-61B
REV. NO. : 1

FIELD QUALITY PLAN
FOR
LOW VOLTAGE CABLING

(POWER, CONTROL & INSTRUMENTATION CABLES & ACCESSORIES)

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-BHS-QA-300038-PSE, REV. NO. : 1

PREPARED BY	ENGR./QLY, BHEL-PSER	APPROVED BY	HEAD / QLY, BHEL-PSER

FQP NO.	**QPE-MTE-660-EL-61B**
ORIGINAL DATE OF ISSUE	04/01/2019
REVISION NO. & DATE	1, Dt. 04/07/2019
COPY NO.	01
ISSUED TO	BIFPCL / FICHTNER
DATE OF ISSUE	04/07/2019
PURPOSE :	FOR REVIEW & COMMENTS / APPROVAL
ISSUED BY (SIGNATURE & DESIGNATION)	ENGR./QLY, BHEL-PSER

FOR TENDER PURPOSE

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

PSER	FIELD QUALITY PLAN FOR LOW VOLTAGE CABLING (POWER, CONTROL & INSTRUMENTATION CABLES & ACCESSORIES)	FQP NO: MAITREE-00-BHS-QA-300038-PSE BHEL Doc. No. : QIPE-MTE-660-EL-61B
		REV. NO. : 1
		SHEET 1 / 1 SHEET

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3.0	Authorization for checks and nonconformity disposition	01
4.0	Statement of Checks	06
5.0	Annex-I (Field Handling and Installation Manual for Cable)	03
6.0	Annex-II (Field Handling and Installation Manual for Cabling Accessories)	08
7.0	Log Sheets	02

FOR TENDER PURPOSE

PSER	FIELD QUALITY PLAN FOR LOW VOLTAGE CABLING (POWER, CONTROL & INSTRUMENTATION CABLES & ACCESSORIES)	FQP NO: MAITREE-00-BHS-QA-300038-PSE BHEL Doc. No. : QPE-MTE-660-EL-61B
		REV. NO. : 1
		SHEET 1 / 1 SHEET

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 04/01/2019	The document is similar to NTPC-approved FQP No. 4410-001-215-QVE-G-066A, Rev-00 for NTPC-NKSTPP (3x660MW) & relevant portion of NTPC SFQP no. 0000-999-QOE-T-008/ R-0
02	Sheet 06 of Statement of Checks	1, Dtd.: 04/07/2019	The FQP has been revised in line with the comments dated 09/02/2019 from BIFPCL/OE. The document is similar to NTPC-approved FQP No. 4410-001-215-QVE-G-066A, Rev-01 for NTPC-NKSTPP (3x660MW) & relevant portion of NTPC SFQP no. 0000-999-QOE-T-008/ R-0

FOR TENDER PURPOSE

PSER

AUTHORISATION FOR DIFFERENT CATEGORY OF CONSTRUCTION/ ERECTION CHECKS & NONCONFORMITY DISPOSITION

Category of Check	Inspection Authority	Witness Authority	Nonconformity (if any) Disposition Authority	Accepting Authority
'A' (Customer Hold Point)	BHEL Engineer	BIFPCL FQA / CONSULTANT FQA	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BIFPCL HEAD-FQA / CONSULTANT FQA
'B' (Formal intimation shall be forwarded by BHEL. Check shall commence at notified time whether parties show-up or not)	BHEL Engineer	BIFPCL Erection Engineer/ CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BIFPCL Erection Engineer/ CONSULTANT
'C'	BHEL Engineer	BHEL Engineer	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BHEL HOS

Abbreviations used:

HOS – Head of Section

Note:

1. Nonconformity Disposition authority for all categories of checks shall be as under:

   Product nonconformities: BHEL Engineering Centre.

   Process/System nonconformities: Head (Quality): BHEL, PS ER.

2. Wherever log sheet is not called for, suitable record shall be maintained in protocol / Site register.

3. In case of nonconformity, accepting authority will consider the solution for the nonconformity as proposed by the Nonconformity Disposition Authority before acceptance, and such solution shall be reflected in the log sheets/protocols.

4. Owner's Engineer is authorized to carry out surveillance in any of B & C category of checks at his discretion.

5. Quantum of check shall be 100% for all characteristics unless otherwise mentioned specifically in Field Quality Plan/ reference documents.

6. Only authorised persons with proper safety gears to enter construction area

FOR TENDER PURPOSE

PSER	FIELD QUALITY PLAN FOR LOW VOLTAGE CABLING (POWER, CONTROL & INSTRUMENTATION CABLES & ACCESSORIES)	FQP NO: MAITREE-00-BHS-QA-300038-PSE BHEL Doc. No. : QPE-MTE-660-EL-61B
		REV. NO. : 1
		SHEET 01 / 06 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	CABLING
Sub-system :	LOW VOLTAGE CABLING (POWER, CONTROL & INSTRUMENTATION CABLES & ACCESSORIES)
Area :	STORAGE, ERECTION & TESTING

NOTES :

1. As an evidence of having carried out the work satisfactorily, a general purpose log sheet, L-00 shall be maintained for all the checks.
2. Abbreviations used:
   - R – Record Verification
   - V – Visual Check
   - P – Physical Check
   - M – Measurement
   - T – Test
   - MTC – Manufacturers Test Certificate
   - SR – Site Register
   - MDR – material Discrepancy Report
3. Latest revision of Standards & Specification shall apply.
4. Materials (including welding consumables) shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
5. Unless noted otherwise in the FQP, welding shall be carried out by Qualified Welders, with traceable WPQR, in line with approved WPS and Qualified PQR, as per ASME Section IX
6. Procedure shall be established and followed, for Storage, Issue and Control of Welding Consumables.
7. NDT shall be carried out by Qualified Personnel with compliance to Approved NDT procedures and Acceptance Norms, as per ASME Section V.
8. Field Radiography shall be carried out in compliance with Local Statutory requirements and safety precautions by Approved Agency and Radiography Source handling and control procedure shall be established as per Local Statutory requirements and complied.
9. Preheating and Post Weld Heat treatment shall be in compliance with Approved Procedures.
10. Gauges and measuring Instruments, with valid calibration only shall be used
11. Cleaning, preservation and Painting of products shall be carried out as per Approved Painting Schedule.
12. Format of record identified with “tick” (√) mark in column no. ‘D*’ shall be essentially included in QA documentation.

FOR TENDER PURPOSE

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT-KLN-E2060.20 FIELD QUALITY PLAN FOR **LOW VOLTAGE CABLING** **(POWER, CONTROL & INSTRUMENTATION CABLES & ACCESSORIES)** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-BHS-QA-300038-PSE BHEL Doc. No. : QPE-MTE-660-EL-61B REV.NO.: 1 SHEET 02 OF 06
SYSTEM: POWER CABLING	SUB-SYSTEM: LOW VOLTAGE CABLING	AREA: STORAGE, ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	D*	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*		*10*
A	**GENERAL REQUIREMENTS**									
A.01	Ensure availability of requisite equipment in good working condition well before commencement of concerned activity. Note: All MMRs in the field shall be calibrated before commencement of tests and then annually or immediately after an MMR damaging incident	P & R	-	A	Once prior to start of work and thereof monthly	Owner's Technical Specifications & Equipment (MMR) manufacturer's literature / manual	The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	MMR List & Calibration Report	√	- Calibration of MMRs shall be done by approved lab/agency and the report shall be submitted to BIFPCL/ OE. - Wherever practical, a label shall be affixed on the Instrument, indicating the validity of Calibration
A.02	Ensure availability of layout drawing and approved cable schedule, as applicable.	R	-	A	100% for each system before start of activity	Latest Master Document List	Latest revision of documents & drawings should be available	SR		
B	**MATERIAL RECEIPT**									
B.01	Receiving inspection for: (i) Completeness of documents (shipping list/ packing list/ loading advice/ delivery challan/Despatch clearance/ MDCC etc.) (ii) Cables are received as per MDCC (iii) Straight through joints & termination kit (iv) Trays & supports	R & V	Records	B	100%	Packing slip / Delivery challan	MDCC & Approved BBU	Stock Register		
B.02	Ensure visual examination for - (i) Damages to drums & trays (ii) Theft / pilferage	V	-	C	100%	Drums should not be damaged	Drums should not be damaged	Stock Register		Damage / theft to be suitably reported
B.03	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	Work instructions for site Operations	Work instructions for site Operations	MDR		
B.04	Control of receipt and issue of all components	V	-	C	100%	Work instructions for site Operations	Work instructions for site Operations	Stock Register		
C	**MATERIAL HANDLING & STORAGE**									
C.01	Ensure proper storage	V	-	B		BS 8512, Annex-I & Annex-II	BS 8512, Annex-I & Annex-II	Checklist		
C.02	Ensure safe handling & transportation to erection site	V	-	B		BS 8512, Annex-I & Annex-II	BS 8512, Annex-I & Annex-II	Checklist		fork lift or crane of adequate capacity to be deployed

FOR TENDER PURPOSE

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN TENDER NO. PSER:SCT-KLN-E2060.20 FOR **LOW VOLTAGE CABLING** **(POWER, CONTROL & INSTRUMENTATION CABLES & ACCESSORIES)** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-BHS-QA-300038-PSE BHEL Doc. No. : QPE-MTE-660-EL-61B REV.NO.: 1 SHEET 03 OF 06
SYSTEM: POWER CABLING	SUB-SYSTEM: LOW VOLTAGE CABLING	AREA: STORAGE, ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	D*	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*		*10*
D	**CABLE TRAYS & SUPPORT SYSTEM**									
D.01	PRE-ERECTION CHECKS									
D.01A	Drawing Layout	V		B	100%	Approved drawing & support	Approved drawing & support	Logbook		
D.01B	Ensure availability of Qualification of welder & qualified WPS as per ASME Sec-IX	R & T	-	A	100%	WPS & ASME Sec.-IX	WPS & ASME Sec.-IX	Logbook		
D.01C	Ensure supports erection for straight runs	V	-	B	100%	Approved layout drawings	Approved layout drawings	Logbook		
D.02	INSTALLATION									
D.02A	Ensure tray installation as per drawing NOTE: Ensure that there is no sharp corners, burns & edges	V	-	B	100%	Approved layout drawings & Annex-II	IEEE 576 & Clause no. B0.6.18.12 of Technical Specifications	Checklist		
D.02B	Check alignment & tier spacing of trays & spacing between parallel routes of cable trays.	V & M	Measuring tape	B	100%	Approved layout drawings & Annex-II	IEEE 576 & Clause no. B0.6.18.12 of Technical Specifications	Checklist		
D.02C	Check tightness of clamps, couplers / fish plates	V & P	Spanner	B	100%	Approved layout drawings & Annex-II	Complete tightness	Checklist		
D.02D	Ensure earthing of trays	V & M	As required	B	100%	Approved Drawing & earthing procedure	IEEE 576 & Clause no. B0.6.18.12 of Technical Specifications	Checklist		Ensure connection of earth clamps to earthing strips
D.02E	Ensure tray numbering & identification	V	-	B	100%	Approved layout drawings, cable schedule & Annex-II	Sequence & visibility	Checklist		
E	**JUNCTION BOXES**									
E.01	PRE-ERECTION CHECKS									
E.01A	Ensure area clearance for Junction box erection	V	-	C	100%	Approved drawing	As per drawing	Checklist		

FOR TENDER PURPOSE

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT-KLN-E2060.20 FIELD QUALITY PLAN FOR **LOW VOLTAGE CABLING** **(POWER, CONTROL & INSTRUMENTATION CABLES & ACCESSORIES)** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-BHS-QA-300038-PSE BHEL Doc. No. : QPE-MTE-660-EL-61B	
		REV.NO.: 1	
		SHEET 04 OF 06	
SYSTEM: POWER CABLING	SUB-SYSTEM: LOW VOLTAGE CABLING	AREA: STORAGE, ERECTION & TESTING	

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD		REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*D**	*10*
E.02	INSTALLATION									
E.02A	Installation & alignment of mounting supports & painting as per approved schedule	V & M	Measuring tape, spirit level	B	100%	Approved drawing	As per drawing	Checklist		
E.02B	Installation & alignment of Junction Box	V & M	Measuring tape, spirit level	B	100%	Approved drawing	As per drawing	Checklist		
E.02C	Ensure earthing of Junction Boxes	V & M	As required	B	100%	Approved Drawing & earthing procedure	Approved Drawing & earthing procedure	Checklist		
E.02D	Sealing of dummy plates	V	-	C	100%	Approved Drawing & procedure	Complete sealing	Checklist		
E.02E	Tightness of bolts & nuts and earthing	V & P	Spanner	B	100%	Approved Drawing & procedure	Complete tightness	Checklist		
E.02F	Welding, as applicable & painting touch-up	V	-	C	100%	WPS	WPS	Checklist		
E.02G	Tagging of JVs for identification	V	-	B	Random	Approved drawing	Proper & permanent marking	Checklist		If noncompliance is found in any case, 100% shall be cheked
F	**CABLE LAYING**									
F.01	Check size of cable & route length	V	-	B	100%	Approved cable schedule & Annex-I	Approved cable schedule	Checklist		
F.02	Check marking identification on cable drums	V	-	C	100%	Packing list & Annex-I	Should match with packing list	Checklist		
F.03	Removal of wooden planks from cable drum	V	-	C	100%	Use proper tools & Annex-I	Cables are not damaged	Checklist		
F.04	Cable drums are kept elevated from the ground with the help of cable drum jacks	V	Cable drum jack	C	100%	BS 8512 & Annex-I	BS 8512	Checklist		
F.05	Check & ensure proper cables pulling tension	V	-	C	100%	IEEE Std 1185:2010 & Annex-I	IEEE Std 1185:2010 & Annex-I	Checklist		Consult the cable manufacturer for maximum allowable/recommended pulling tension
F.06	Ensure that cable is properly supported during pulling	V	-	C	100%	IEEE Std 1185:2010 & Annex-I	IEEE Std 1185:2010	Checklist		

FOR TENDER PURPOSE

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT-KLN-E2060.20 FIELD QUALITY PLAN FOR **LOW VOLTAGE CABLING** **(POWER, CONTROL & INSTRUMENTATION CABLES & ACCESSORIES)** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-BHS-QA-300038-PSE BHEL Doc. No. : QPE-MTE-660-EL-61B	
		REV.NO.: 1	
		SHEET 05 OF 06	
SYSTEM: POWER CABLING	SUB-SYSTEM: LOW VOLTAGE CABLING	AREA: STORAGE, ERECTION & TESTING	

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD		REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*D**	*10*
F.07	Ensure that adequate length is kept too enable straight through joints	V	-	C	100%	Clause 13 of IEEE Std 576-2000 & Annex-I	Clause 13 of IEEE Std 576-2000	Checklist		In each cable run some extra length to be kept to enable cable jointing in case of failure/cable fault in future.
F.08	Check insulation resistance of cables before laying	T	IR Tester	B	100%	IEEE Std 1185 :2010 & Annex-I	IEEE Std 1185 :2010	Logsheet	√	
F.09	Ensure proper laying/ installation of cables	V	-	C	100%	Approved Cable schedule, Layout drawing & IEEE Std 1185:2010 & Annex-I	Approved Cable schedule, Layout drawing, Clause no. B0.6.18.12 of Technical Specifications & IEEE Std 1185:2010	Checklist		- Ground rollers shall be used at every 2 meter interval.Cable should not be pulled from end without having intermediate pushing arrangement. - Ensure that laying of control cables & power cables in different layers of tray
F.10	Ensure cables are properly secured NOTE: 1. Power & control cables shall be secured fixed to trays / support with self-locking type nylon cable trays type straps with de-interlinking facilities. 2. Control cables shall be bound to trays / supports by aluminium strips at every five meter interval & at every bend	V	-	B	100%	Approved Cable schedule, Layout drawing & IEEE Std 1185:2010 & Annex-I	Approved Cable schedule, Layout drawing & IEEE Std 1185:2010	Checklist		- For horizontal tray arrangements, multi power cables & control cables shall be secured at every five meter interval - For vertical tray arrangement, individual multicore power cables and control cables shall be secured at every one meter by nylon cable strap.
F.11	Check that the cables are protected on road crossing	V	-	C	100%	Approved Cable schedule, Layout drawing, IEEE Std 1185:2010& Annex-I	Approved Cable schedule, Layout drawing & IEEE Std 1185:2010	Checklist		
F.12	Check cable joints & termination	V	-	B	100%	Clause 13 & 14 of IEEE Std 576-2000 & Annex-I	Clause 13 & 14 of IEEE Std 576-2000	Checklist		Contractor shall furnish documentory evidance / experience reports of the jointers to be deployed at site for review of BIFPCL FQA
F.13	Check insulation resistance & continuity of cables after laying	T	IR Tester, Continuity tester	A	100%	IEEE Std 1185:2010 & Annex-I	IEEE Std 1185:2010	Logsheet	√	
F.14	DC HV test on field jointed cables Note: the test voltage shall be at maintenance level only	R	HV Test kit	A	100%	IEEE Std 1185:2010	IEEE Std 1185:2010	Protocol	√	
F.15	Ensure proper earthing & bonding NOTE: Metal sheathing, metal screening and armour should be earthed at both ends	V	-	B	100%	Drawing	Clause no.B0.6.18.6, B0.6.18.12 & B7.3.9.2 of Tech. Specifications	Checklist		

FOR TENDER PURPOSE

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN TENDER NO. PSER:SCT:KLN-E2060:20 FOR **LOW VOLTAGE CABLING** **(POWER, CONTROL & INSTRUMENTATION CABLES & ACCESSORIES)** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-BHS-QA-300038-PSE BHEL Doc. No. : QPE-MTE-660-EL-61B REV.NO.: 1 SHEET 06 OF 06
SYSTEM: POWER CABLING	SUB-SYSTEM: LOW VOLTAGE CABLING	AREA: STORAGE, ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	D*	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*D**	*10*
F.15	Check cable identification tag	V	-	B	100%	Approved cable schedule & IEEE Std 1185:2010& Annex-I	Approved cable schedule & IEEE Std 1185:2010	Checklist		
F.16	Ensure cleaning of trenches and covering the cable trenches	V	-	C	100%	Drawing & clause no. B0.6.18.12 of Technical Specifications & Annex-I	Drawing & clause no. B0.6.18.12 of Technical Specifications	Checklist		Cables shall not be laid in trenches with fuel pipe work.
F.17	Ensure laying of sand, bricks / slab for buried cables	V	-	C	100%	Drawing & clause no. B0.6.18.12 of Technical Specifications & Annex-I	Drawing & clause no. B0.6.18.12 of Technical Specifications	Checklist		Refer to FQP for civil works for checks of sand filling, brick laying / slab concreting
G	**CONDUIT** △1									
G.01	Conduits Laying & Supporting	V	-	C	100%	Appd lay out drawing	Using metallic saddles clamp secured to nylon rawl plugs with screws to the structure at an interval of not more than one meter	Check List		-Either side of couplers or bends or similar fitting. - Saddles clamps shall be fixed at a distance of 30cm from the centre of such fitting
G.02	Pull out Boxes for long conduits	V	-	C	100%	Appd lay out drawing	Appd lay out drawing	Check List		Pull out boxes shall be provided at suitable intervals not exceeding 6mtrs
G.03	Metal Conduits Earthing	V	-	C*	100%	Approved Drawing & earthing procedure	Approved Drawing & earthing procedure	Check List		* Random surveilance by FQA
G.04	Sealing of Conduits	V	-	C	100%	Cement Motar / Putty / Glass wool sealing after pulling of cables	Cement Motar / Putty / Glass wool sealing after pulling of cables	Check List		
G.05	Designation of Conduits Note: Shall be by means of painting for each run of conduits at each end where conduits terminate at Panels, Junction boxes or other enclosure,	V	-	C*	100%	Appd lay out drawing	Proper marking	Check List		- The designation shall also be painted on the inside of enclosure adjacent to conduits * Random surveilance by FQA

FOR EARTHING - REFER SEPARATE FQP (MAITREE-00-BAU-QA-300041-PSE)

FOR TENDER PURPOSE

FIELD HANDLING & INSTALLATION MANUAL OF CABLES

Document No: PE-EC-999-507-E001

FOR TENDER PURPOSE

BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

NOIDA

FIELD HANDLING & INSTALLATION MANUAL

1. CABLE HANDLING/ OPERATION/ MAINTENANCE INSTRUCTIONS:-

i) The Cable Drum should not be dropped or pushed through from railway wagons or trucks during unloading operations as the shock may cause serious damage to cable. A ramp or crane may be used for unloading cable drums. If neither of these is available, a temporary ramp with inclination 1:3 to 1:4 approximately should be constructed.The cable drum should be rolled over the ramp by means of ropes and winches. Additionally a sand bed at the foot of the ramp may be made to brake the rolling of cable drum.

ii) Cable should not be dragged along the earth surface.

iii) Cable ends should always be sealed by means of suitable sealing materials to prevent moisturisation of cores and armour.

iv) There is an arrow painted on the flanges of the drum which indicate the direction in which the drum should be rolled. The cable will unwind and become loose if the drum is rolled in the opposite direction.

2. CABLE STORAGE INSTRUCTIONS:-

i) All the drums should be stored in such a manner as to leave sufficient space between them for air circulation. It is desirable for the drums to stand on battens placed directly under the flanges. During storage, the drum should be rolled to an angle of 90° once every three months.

ii) In no case should the drums be stored 'on the flat' i.e. with flange horizontal.

iii) Cable should be stored in a dry covered place to prevent exposure to climatic conditions and wear and tear of wooden drums and it should be preferably on a concrete surface/ firm surface which will not cause the drums to sink and thus lead to flange rot and extreme difficulty in moving drums.

iv) Overhead covering is not essential unless the storage is for a very long period. The cable should, however, be protected from direct rays of the sun by leaving the battens on or by providing some form of sun shielding.

v) End caps of cable shall not be removed to avoid ingress of moisture/ water during storage.

3. CABLE LAYING / INSTALLATION INSTRUCTIONS:-

i) For laying of cable special care is to be taken to prevent bending, kinking, and twisting.

ii) Cable should be unwound from drum by proper mounting the cable drum on a cable wheel making sure the spindle is strong enough to carry the weight without bending and that it is lying horizontally in the bearings so as to prevent the drum creeping to one side or the other while it is rotating.

FOR TENDER PURPOSE

iii) When for any reason, it is necessary to rewind a cable on to another drum; the barrel of the drum should have a diameter not less than that of the original drum.

iv) Cable drum should be rolled in direction of arrow marked on the drum.

v) Cable must not be pulled across hard & sharp objects to avoid the damage to covering & insulation.

vi) If the cables are buried directly in ground standard code of practice is to be followed.

vii) Termination and jointing of cables shall be done by means of compression/ ring tongue/ reducer pin type terminal lug can be used to suit the purpose.

4. REFERENCE DOCUMENTS AS UNDER TO BE REFERRED:

i) IS: 1255 (CODE OF PRACTICE FOR INSTALLATION AND MAINTENANCE OF POWER CABLES UP TO AND INCLUDING 33 KV RATING).

Above standard covers the following in detail:

a) Packing, Transport & storage of cables, cable drums etc.
b) Guidelines for layout & Installation of cables.
c) Testing of cable Installation.
d) Termination & Jointing of cables.
e) Maintenance & Testing of cables

ii) Project specific cable erection philosophy.

iii) Cable Drum cutting schedule.

5. SPECIAL INSTRUCTIONS:

i) Site shall maintain area wise/ drawing/ cable schedule wise record of consumption of earthing material and inform about the same to PEM on regular basis before any major milestone.

ii) In case of any major change in BOQ/ engineering philosophy while installation w.r.t. PEM drawing; the same has to be informed to PEM for record/ information.

FOR TENDER PURPOSE

FIELD HANDLING & INSTALLATION MANUAL

FOR

CABLING ITEMS

FOR TENDER PURPOSE

Document No: PE-EC-999-507-E002



BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

NOIDA

PACKAGE: CABLE TRAYS & ACCESSORIES

A) AT THE TIME OF RECEIPT:

The following shall be checked.

i) Quantity of the items including coupler plates, nuts & bolts as per packing list/purchase order.
ii) Correctness of sizes as per packing list/purchase order.
iii) Cable trays are in good condition, damages if any.
iv) Check list of items cleared by BHEL as per MDCC.
v) It shall be ensured that galvanized items are in good condition and there is no damage to galvanizing.

B) STORAGE:

The following shall be checked

i) Cable trays shall be stored in such a way, that it does not come in contact with soil/water and shall be re-checked again once in month.
ii) It shall be ensured that cable trays are stored in systematic manner for easy removal.

C) Pre-erection:

i) Availability of approved drawings/documents for cable trays & accessories shall be ensured.
ii) Clearance from piping/ducting agencies shall be obtained so that piping/ducting is not taken in the way of cable trays.

FOR TENDER PURPOSE

D) Erection:

i) Ladder& perforated type cable tray shall be used as per approved cable erection philosophy/ drawing.

ii) Cable tray numbering & marking shall be provided as per approved cable erection philosophy/ drawing.

iii) Alignment of cable tray, tightening of fasteners & neatness shall be ensured.

iv) All cable trays and risers shall be marked for identification. Minimum height of letter should be 70 mm.

D) General:

i) Misuse of cable trays as ladder, temporary structure, and temporary rooms/walls shall be avoided.

ii) Quantity of site fabricated bends/cross/tees shall be informed for proper reconciliation of cable trays.

E) Special Instructions:-

iii) Site shall maintain area wise/ drawing wise record of consumption of cable trays & accessories and inform about the same to PEM on regular basis before any major milestone.

iv) In case of any major change in BOQ/ engineering philosophy while installation w.r.t. PEM drawing; the same has to be informed to PEM for record/ information.

FOR TENDER PURPOSE

PACKAGE: CABLE TRAY SUPPORT SYSTEM

A) AT THE TIME OF RECEIPT:

The following shall be checked.

i) Quantity of the items as per packing list/purchase order.
ii) Correctness of sizes as per packing list/purchase order.
iii) Cable tray support materials are in good condition, damages if any.
iv) Check list of items cleared by bhel as per mdcc.
v) It shall be ensured that galvanized items are in good condition and there is no damage to galvanizing.

B) Storage :

The following shall be followed.

i) Cable tray support materials shall be stored in such a way, that it does not come in direct contact with soil/water and shall be re-checked again once in month.
ii) It shall be ensured that cable tray support material is stored in such a way that there is no damage to the galvanizing during removal.

FOR TENDER PURPOSE

C) Pre erection :

i) Availability of approved drawings/documents for cable tray support system shall be ensured.
ii) Clearance from piping/ducting agencies shall be obtained so that piping/ducting is not taken in the way of cable tray support system.

D) Erection :

i) Angles& channels for supporting cable tray shall be used as per approved drawing for installation details for cable tray support system.

ii) Alignment of cable tray support system & neatness shall be ensured.

iii) The cantilever arm shall be positioned on the main support channel with a minimum vertical spacing of 300mm.

iv) Accessories for boltable type cable tray support system shall be used as per approved drawing "installation details for cable tray support system".

E) Special Instructions:-

v) Site shall maintain area wise/ drawing wise record of consumption of cable tray support material and inform about the same to PEM on regular basis before any major milestone.

vi) In case of any major change in BOQ/ engineering philosophy while installation w.r.t. PEM drawing; the same has to be informed to PEM for record/ information.

FOR TENDER PURPOSE

PACKAGE: CABLE TERMINATION& JOINTING KITS

A) AT THE TIME OF RECEIPT:

The following shall be checked.

i) Quantity of the items as per packing list.
ii) Correctness of sizes as per packing list.
iii) Kits are in good condition, damages if any.
iv) Check list of items cleared by BHEL as per MDCC.
v) Type of duty i.e. indoor/outdoor
vi) Material of lugs shall be checked as per specification.
vii) Bimetallic washers if applicable shall be checked.

B)STORAGE:

The following shall be checked

i) Termination kits shall be stored inside the store as per manufacturer's recommendation & shall be checked once in a month.
ii) It shall be ensured that identification marks are kept intact for easy identification.

FOR TENDER PURPOSE

c) Erection:

i) Cable termination kits shall be installed by BHEL approved jointer.
ii) Cable termination & jointing kits shall be installed as per IS 1255.

E) Special Instructions:-

Site shall maintain record of consumption of Termination & Jointing kits and inform about any fault of the termination kits the same to PEM on regular basis before any major milestone.

PACKAGE: - TREFOIL CLAMPS

A) AT THE TIME OF RECEIPT:

The following shall be checked.

i) Quantity of the items including hardwares as per packing list/purchase order.

ii) Correctness of sizes as per packing list/purchase order.

iii) Clamps are in good condition, damages if any.

iv) Check list of items cleared by BHEL as per MDCC.

B) STORAGE:

The following shall be checked

i) Trefoil clamps to be stocked on rack.

ii) Trefoil clamps to be stocked separately as per sizes.

iii) Trefoil clamps to be stocked separately and should not mix up with heavy weight items to avoid damages.

C) ERECTION:

i) Clamps shall be fixed to tray properly.

ii) Spacing between two clamps to be maintained as per approved cable erection philosophy.

iii) Clamps shall be placed staggered adjacent to another run of cable.

iv) All power cables to be clamped individually. Avoid over tightening to avoid damage to the insulation.

v) It is to be ensured that all trefoil clamps are tightened properly.

vi) Balance loose clamps and bolts shall not be kept on ground after completion of work at site. It should be brought back to store.

FOR TENDER PURPOSE

E) Special Instructions:-

vii) Site shall maintain area wise/ drawing wise record of consumption of trefoil clamps and inform about the same to PEM on regular basis before any major milestone.

viii) In case of any major change in BOQ/ engineering philosophy while installation w.r.t. PEM drawing; the same has to be informed to PEM for record/ information.

FOR TENDER PURPOSE

PSER

RECORD OF QUALITY CHECKS

SHEET NO. OF FQP	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	INSPECTED BY SIGN. & DATE	CLEARED BY SIGN. & DATE	REMARKS

Note: Any protocol made is to be numbered & mentioned in “Format of Record” column.

		SYSTEM	SUB-SYSTEM	AREA	FQP NO.: QPE-MTE-660-EL-61B
PROJECT					REV. NO. : **1**
UNIT NO.					LOG SHEET NO. : **L- 00**
RATING					PAGE **1** OF **1**

FOR TENDER PURPOSE

PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

FOR TENDER PURPOSE

			NAME	SIGNATURE & DATE	FQP NO.: QPE-MTE-660-EL-61B
PROJECT		INSPECTED BY			REV NO. 1
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

APPROVED
Checked and Approved.

Date: 16-May-2019

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

FIELD QUALITY PLAN
FOR
LOW VOLTAGE BUSDUCT

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED

OWNER'S CONSULTANT

FICHTNER

Fichtner GmbH & Co. KG, Germany

BIFPCL DOC. NO. : MAITREE-00-BHS-QA-300040-PSE, REV. NO. : 1

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-EL-65
REV. NO. : 1

APPROVED
Checked and Approved.

Date: 16-May-2019

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

FIELD QUALITY PLAN
FOR
LOW VOLTAGE BUSDUCT

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-BHS-QA-300040-PSE, REV. NO. : 1

PREPARED BY	BHEL, PSER KOL-91 QUALITY DEPT. ENGR./QLY, BHEL-PSER	APPROVED BY	HEAD / QLY, BHEL-PSER

FQP NO.	**QPE-MTE-660-EL-65**
ORIGINAL DATE OF ISSUE	05/01/2019
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PURPOSE :	FOR REVIEW & COMMENTS / APPROVAL
ISSUED BY (SIGNATURE & DESIGNATION)	ENGR./QLY, BHEL-PSER

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
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PSER

FIELD QUALITY PLAN FOR LOW VOLTAGE BUSDUCT

FQP NO: MAITREE-00-BHS-QA-300040-PSE
BHEL Doc. No. : QIPE-MTE-660-EL-65

REV. NO. : 1

SHEET 1 / 1 SHEET

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PSER	FIELD QUALITY PLAN FOR LOW VOLTAGE BUSDUCT	FQP NO: MAITREE-00-BHS-QA-300040-PSE BHEL Doc. No. : QPE-MTE-660-EL-65
		REV. NO. : 1
		SHEET 1 / 1 SHEET

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 05/01/2019	The document is similar to relevant portion of NTPC SFQP no. 0000-999-QOE-T-008/ R-0
01	Sheet 04 of 04	1, Dtd.: 22/04/2019	The FQP has been revised as per the comments dated 09/02/19. Checks are similar to relevant portion of NTPC SFQP no. 0000-999-QOE-T-008/ R-0

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AUTHORISATION FOR DIFFERENT CATEGORY OF CONSTRUCTION/ ERECTION CHECKS & NONCONFORMITY DISPOSITION

Category of Check	Inspection Authority	Witness Authority	Nonconformity (if any) Disposition Authority	Accepting Authority
'A' (Customer Hold Point)	BHEL Engineer	BIFPCL FQA / CONSULTANT FQA	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BIFPCL HEAD-FQA / CONSULTANT FQA
'B' (Formal intimation shall be forwarded by BHEL. Check shall commence at notified time whether parties show-up or not)	BHEL Engineer	BIFPCL Erection Engineer/ CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BIFPCL Erection Engineer/ CONSULTANT
'C'	BHEL Engineer	BHEL Engineer	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BHEL HOS

Abbreviations used:

HOS – Head of Section

Note:

1. Nonconformity Disposition authority for all categories of checks shall be as under:

   Product nonconformities: BHEL Engineering Centre.

   Process/System nonconformities: Head (Quality): BHEL, PS ER.

2. Wherever log sheet is not called for, suitable record shall be maintained in protocol / Site register.

3. In case of nonconformity, accepting authority will consider the solution for the nonconformity as proposed by the Nonconformity Disposition Authority before acceptance, and such solution shall be reflected in the log sheets/protocols.

4. Owner's Engineer is authorized to carry out surveillance in any of B & C category of checks at his discretion.

5. Quantum of check shall be 100% for all characteristics unless otherwise mentioned specifically in Field Quality Plan/ reference documents.

6. Only authorised persons with proper safety gears to enter construction area

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		REV. NO. : 1
		SHEET 01 / 04 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	ELECTRICAL
Sub-system :	LOW VOLTAGE BUSDUCT
Area :	STORAGE, ERECTION & TESTING

NOTES :

1. As an evidence of having carried out the work satisfactorily, a general purpose log sheet, L-00 shall be maintained for all the checks.
2. Abbreviations used:
   R – Record Verification, V – Visual Check, P – Physical Check, M – Measurement, T – Test, MTC – Manufacturers Test Certificate, SR – Site Register, MDR – material Discrepancy Report
3. Latest revision of Standards & Specification shall apply.
4. Materials (including welding consumables) shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
5. Unless noted otherwise in the FQP, welding shall be carried out by Qualified Welders, with traceable WPQR, in line with approved WPS and Qualified PQR, as per ASME Section IX
6. NDT shall be carried out by Qualified Personnel with compliance to Approved NDT procedures and Acceptance Norms, as per ASME Section V.
7. Field Radiography shall be carried out in compliance with Local Statutory requirements and safety precautions by Approved Agency and Radiography Source handling and control procedure shall be established as per Local Statutory requirements and complied.
8. Preheating and Post Weld Heat treatment shall be in compliance with Approved Procedures.
9. Gauges and measuring Instruments, with valid calibration only shall be used
10. Cleaning, preservation and Painting of products shall be carried out as per Approved Painting Schedule.
11. Prior to despatch of first lot of Materials, confirmation regarding availability of storage facility as per Storage Instruction / Procedure shall be obtained through BIFPCL FQA.
12. All items identified in Contract shall be received with proper dispatch clearance (i.e. either with MDCC, in case of BBU or with CHP clearing dispatch) from BIFPCL.
13. Correlation will be established between received Materials & MDCC/ CHP/ MTC/ HEAT No etc., as applicable. ·
14. Dispositioning of Non-conforming / Rejected materials shall be done with intimation to NTPC FQA.
15. Before release of any Material Receipt Certificate (MRC). FQA clearance shall be obtained w.r.t. proper Storage & Preservation of Materials as per Manufacturer recommendations.
16. Format of record identified with "tick" (√) mark in column no. 'D*' shall be essentially included in QA documentation.

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER-SCT-KLN-E2060-20 FIELD QUALITY PLAN FOR **LOW VOLTAGE BUSDUCT** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-BHS-QA-300040-PSE BHEL Doc. No. : QPE-MTE-660-EL-65 REV.NO.: 1 SHEET 02 OF 04
SYSTEM: ELECTRICAL	SUB-SYSTEM: LOW VOLTAGE BUSDUCT	AREA: STORAGE, ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	D*	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*		*10*
A	**GENERAL REQUIREMENTS**									
A.01	Ensure availability of requisite equipment in good working condition well before commencement of concerned activity. <u>Note:</u> All MMRs in the field shall be calibrated before commencement of tests and then annually or immediately after an MMR damaging incident	P & R	-	A	Once prior to start of work and thereof monthly	Owner's Technical Specifications & Equipment (MMR) manufacturer's literature / manual	The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	MMR List & Calibration Report	√	- Calibration of MMRs shall be done by approved lab/agency and the report shall be submitted to BIFPCL/ OE. - Wherever practical, a label shall be affixed on the Instrument, indicating the validity of Calibration
A.02	Ensure availability of approved drawing and O&M Manual, as applicable.	R	-	A	100% for each system before start of activity	Latest Master Document List	Latest revision of documents & drawings should be available	Log Book		
A.03	Availability of Storage / Preservation Instructions/ procedure for Material at site.	Verify	-	A	100%	-	Availability of the document before receipt of material at site	Log Book		
A.04	Site Preparation for Storage e.g Leveling, Raised platform/ availability of wooden planks/ suitable support, preparation of covered shed/ Storage	Physical		A	100%	Storage & Preservation Instruction from OEM (Annex-I)	Storage & Preservation Instruction from OEM	Log Book		Refer Note 11 in Sheet 01 of Statement of Checks
B	**MATERIAL RECEIPT**									
B.01	Check for the availability of document :- Shipping List/ Packing list/ Loading Advice Slip / Delivery Challan/ LR / RR / MDCC / CHP	R	-	B	1	Packing Slip, Delivery Challan,Approved BBU/CHP/MDCC/LR/RR		SR		Refer Note 12 in Sheet 01 of Statement of Checks
B.02	Verify the Packing & Material received against the following:- a) Project/ Package No. b) Work order no./BBU No.etc. c) Item no./part No./DU No.etc. d) Identification of Material	V & R	-	B	100%	Packing Slip, Delivery Challan,Approved BBU/CHP/MDCC/LR/RR	Should be properly correlated	SR		
B.03	Check the Material / Item on receipt for the following a) Packing condition b)Physical damage c)Quantity of components/ Any Shortage or Excess of quantity d)Correlation with identification as per CHP/MDCC, if any e)Painting condition (as applicable)	V & R	-	B	100%	Packing Slip, Delivery Challan,Approved BBU/ CHP/MDCC/ LR/RR	No Damage & Shortage of Quantity as per challan/ CHP report / MDCC	SR		Refer Note 13 in Sheet 01 of Statement of Checks

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SYSTEM: ELECTRICAL	SUB-SYSTEM: LOW VOLTAGE BUSDUCT	AREA: STORAGE, ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD		REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*D**	*10*
B.04	Ensure non-conforming / Damaged & rejected components are identified & stored separately and reported to Main Contractor / Manufacturer.	V & R	-	A	100%	Storage & Preservation Instruction /Procedure & CHP/MDCC	Storage & Preservation Instruction /Procedure	SR		Refer Note 14 in Sheet 01 of Statement of Checks
B.05	Issuing of Material Receipt Certificate (MRC)	R	-	B	100%	Packing Slip, Delivery Challan,Approved BBU/CHP/MDCC/LR/RR	Packing Slip, Delivery Challan,Approved BBU/CHP/MDCC	MRC		Refer Note 15 in Sheet 01 of Statement of Checks
B.06	Control of receipt and issue of all components	V	-		100%	Work instructions for site Operations	Work instructions for site Operations	Stock Register		
C	**MATERIAL HANDLING & STORAGE**									
C.01	Check for proper Storage, Shelf life, Preservation etc.	V	-	A	100% after receipt	Storage & Preservation Instruction from OEM (Annex-I)	Storage & Preservation Instruction from OEM (Annex-I)	Checklist		
C.02	Periodic Inspection of Stored Items for their condition & Preservation	V		B	As per OEM's Guidelines	Storage & Preservation Instruction from OEM (Annex-I)	Storage & Preservation Instruction from OEM (Annex-I)			
C.03	Ensure safe handling & transportation to erection site	V	-	C	100%	OEM's Recommendation	OEM's Recommendation	-		Trailor, fork lift or crane of adequate capacity to be deployed
D	**PRE-ERECTION CHECKS**									
D.01	Check civil foundation	V & M	Measuring Tape	C	100%	Approved Drawings	Approved Drawings	Logbook		
D.02	Check embedment level of channels / plates / bolts	V & M	Measuring Tape, spirit level & water level	C	100%	Approved layout drawings	Approved layout drawings	Logbook		
D.03	Transport sequence & transportability of section / pannels	R & V	-	C	100%	Assy. Drg., Packing list	Assy. Drg., Packing list	HIRA		
D.04	Availability of tools & erection hardware	V	-	C	100%	O&M Manual (Annex-I)	O&M Manual (Annex-I)	Logbook		

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SYSTEM: ELECTRICAL	SUB-SYSTEM: LOW VOLTAGE BUSDUCT	AREA: STORAGE, ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	D*	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*		*10*
E	**ERECTION & TESTING**									
E.01	Check alignment & accuracy of placement	V	-	B	100%	Approved drawing, O & M Manual (Annex-I)	Approved drawing, O & M Manual (Annex-I)	Logbook		- Supporting intervals for horizontal run should not exceed as mentioned in drawing. - Vertical risers of Bus duct shall be supported adequately with spring hangers at each floor. Intermediate support shall be provided if the floor to floor distance exceed as per applicable drawing. 1
E.02	Check tightness of bolted joints, bus bar joints, other joints & enclosures' sealing	P	Torque wrench	A	100%	Approved drawing, O & M Manual (Annex-I)	Approved drawing, O & M Manual (Annex-I)	Logbook	√	
E.03	Check enclosures' sealing & Installation of rain hood at joints, as applicable	V	-	B	100%	Approved drawing, O & M Manual (Annex-I)	Approved drawing, O & M Manual (Annex-I)	Logbook		Minimum clearance between Bus duct, wall, floor and others to be maintained 1
E.04	Check for name plate, label, caution plate etc.	V	-	B	100%	Approved drawing, O & M Manual (Annex-I)	Approved drawing, O & M Manual (Annex-I)	Logbook		
E.05	Align chequered plate & rubber mats to cover trench / openings	V	-	C	100%	Approved drawing, O & M Manual (Annex-I)	Approved drawing, O & M Manual (Annex-I)	Logbook		
E.06	Correctness, tightness of bus duct entry connections	V	-	B	100%	Approved drawing, O & M Manual (Annex-I)	Approved drawing, O & M Manual (Annex-I)	Logbook		
E.07	Check panel earthing - interconnections	V	-	A	100%	Approved drawing, O & M Manual (Annex-I)	Approved drawing, O & M Manual (Annex-I)	Logbook		
E.08	IR Test	T	1KV IR Tester	A	100%	Approved drawing, O & M Manual (Annex-I)	Approved drawing, O & M Manual (Annex-I)	Logbook	√	
E.09	Die-electric Test or High Voltage Test 1	T	As required	A	100%	Approved drawing, O & M Manual (Annex-I)	Approved drawing, O & M Manual (Annex-I)	Logbook	√	

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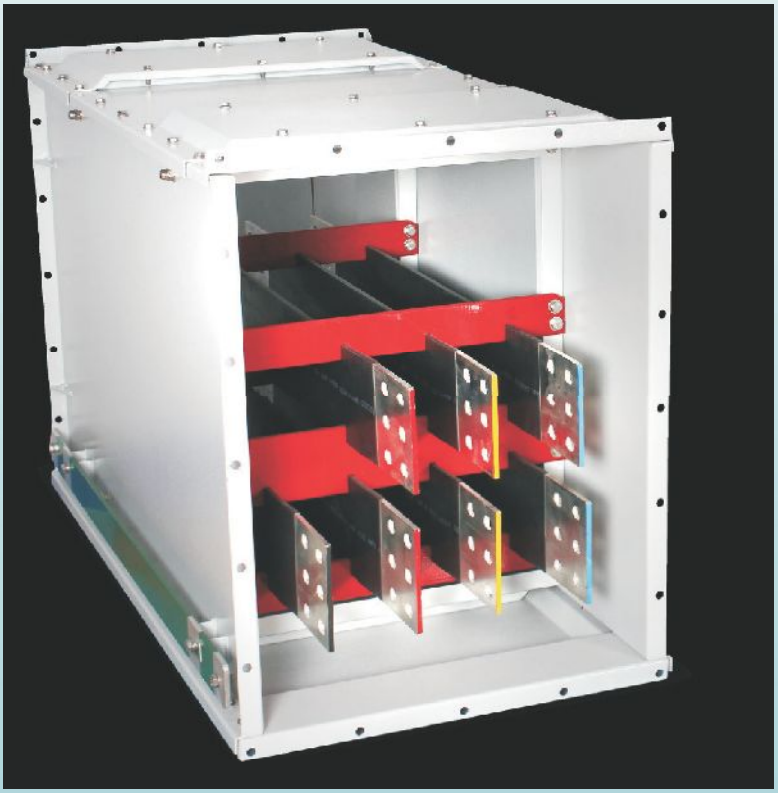
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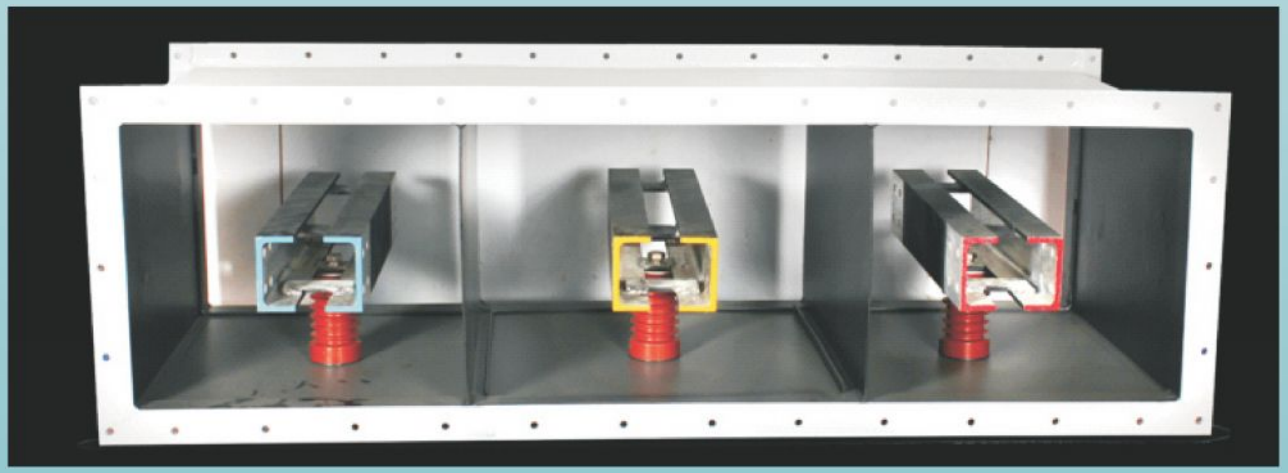
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TENDER NO. PSER:SCT:KLN-E2060:20

Stardrive

Storage, Erection, Operation & Maintenance Manual for Busduct



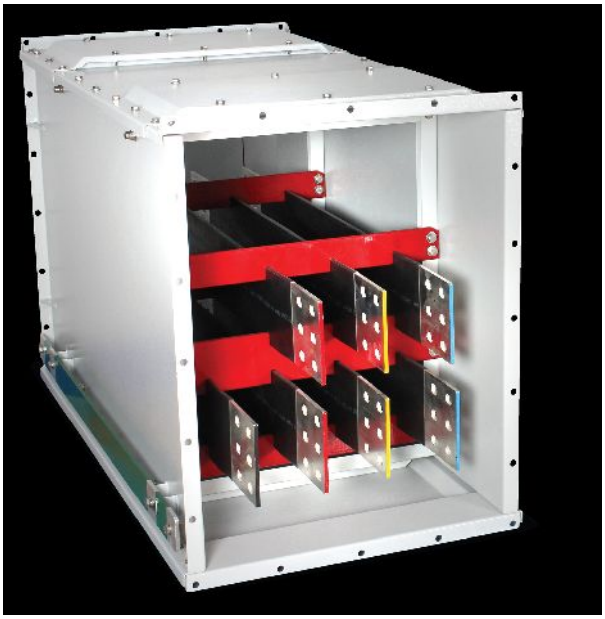


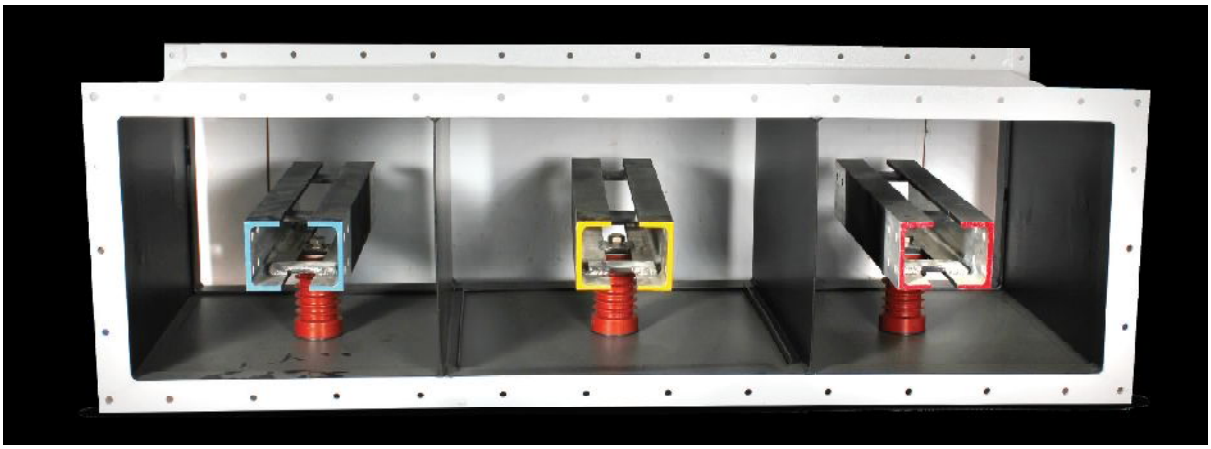
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Storage, Erection, Operation &Maintenance Manual for Busduct





STARDRIVE BUSUDCTS LIMITED

(Formerly KGS Engineering Ltd.)
No. 63 Kamar Avenue 1st Street
Adyar, Chennai - 600 020
Phone: +91 044-2442 3027 / 28
www.stardrive.in

An ISO 9001 Company with over three decades of experience in design & manufacture of LT & HT Busduct up to 33 KV-5000 A

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Contents

I. Introduction

II. Safety

III. Description

IV. Receiving, Unpacking, Handling and Storage

- Receiving
- Unpacking
- Handling
- Storage

V. Installation

- *Alignment of Apparatus*
- *Installation Checklist*
- *Preliminary Steps*
- *Busduct Erection*
- *Steel Support Erection*
- *Field Tests*

VI. Maintenance

Figures

Figure 1 - Typical Cross Section of LT Busduct with FRP Supports

Figure 2 - Typical Cross Section of HT Busduct with Epoxy Standoff Supports

Figure 3- Busduct Section End, Showing Matching Alignment Numbers and Heater Wiring Connections

Figure 4- Typical Busduct Wall Section with Air Barrier

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I. INTRODUCTION

Before installing the busduct, study this manual and the drawings furnished with the busduct. Because busduct is highly variable equipment, custom designed for the particular application, these instructions nor the drawings are complete without reference to the other. Follow the recommended procedure for putting into service.

This manual contains:

- Safety Rules.
- A general description of the busduct.
- Instructions for putting into service.
- Instructions for maintenance.

These instructions do not purport to cover all details or variations of busduct, nor to provide for every possible contingency or hazard to be met in connection with further information be desired or should particular problems arise which are not covered sufficiently for the user's purposes, the matter should be referred to STARDRIVE BUSDUCTS LTD. (SBL).

II. SAFETY

The busduct described in this manual, when in service, will be energized by voltages which will cause severe injury or death if contacted. To insure the safety of personnel associated with the installation, operation and maintenance of busduct, the following rules should be observed:

- Only qualified personnel trained in the installation, operation and maintenance of electrical power equipment should be allowed to work on this busduct.
- Do not work on an energized busduct.
- Do not climb on, walk on or sit on the busduct. It is not designed to support excessive weight.
- Do not use the busduct for support of other equipment. It is not designed to support this extra weight.
- For the safety of personnel performing maintenance operations on the busduct or on connected equipment, all components should be disconnected by means of a visible break and securely grounded.
- See additional safety precautions in the sections headed "HANDLING" and "INSTALLATION".

III. DESCRIPTION

The busduct covered by these instructions are non segregated phase busduct and segregated phase busduct designed, built and tested in accordance with IEC 61439 part-6 / IEC 62271-200.

Busduct is normally used to connect two pieces of electrical power equipment, such as two units of metal-enclosed switchgear, a transformer and a switchgear unit, a large rotating machine and a switchgear unit, or a large rotating machine and a transformer. The busduct may be located either indoors or outdoors, or a single run of busduct may pass from indoors to outdoors.

The conductors in SBL busduct are usually supported by glass-reinforced polyester laminate for LT busduct and epoxy or porcelain for MV busduct.

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Space heaters are provided when required. These heaters are designed to minimize condensation in the busduct by keeping the air inside the busduct at a temperature above the dew point. Special heaters designed to operate at a low surface temperature are provided to insure along life for the heater elements. These heaters are thermostatic control.

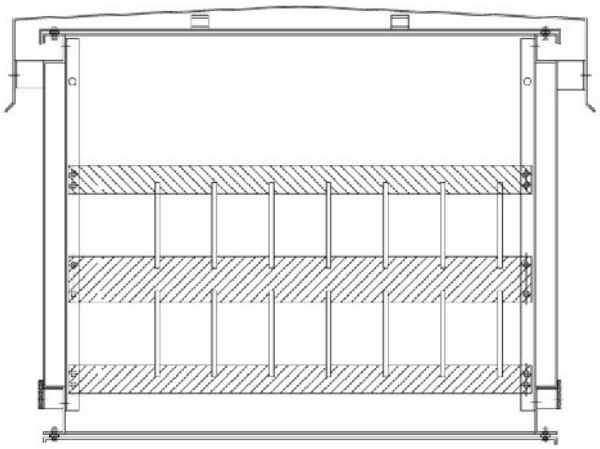


FIGURE - 1

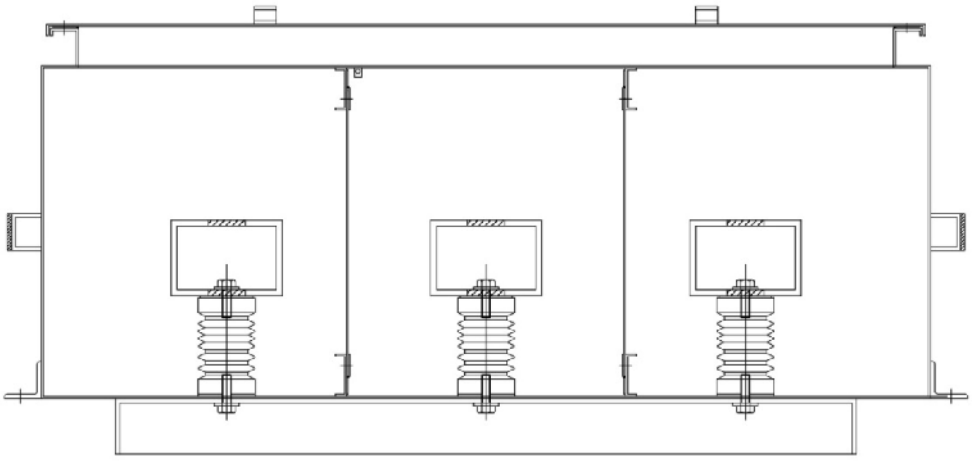


FIGURE - 2

Busducts are not self-supporting, but must be supported at installation. Indoor busducts are normally supported by hanging from the ceiling, but may also be supported from floors or walls or from other pieces of equipment, such as switchgear units. Outdoor busducts are normally supported from the ground. See the section headed "INSTALLATION" for further information on busduct supports.

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IV. RECEIVING, UNPACKING, HANDLING AND STORAGE

GENERAL

All busduct assemblies are packed in wooden crates, except some loose components like bolts and nuts, splice plates, flexibles etc. Loose items are packed in wooden boxes with necessary precautions.

- **RECEIVING**

- On receipt of the cases containing the busduct at site, examine for any physical damage that might have been sustained during transit. If injury or damage is suspected, report immediately with the particulars of the wooden crate number, nature of damage etc. for claiming insurance and replacement. All consignment should be verified along with the delivery documents. After the above checking, the goods can be taken to the storage yard. Loose items are packed in a wooden case. The case has been weighed and the weight marked. It should be checked before opening to ensure that there is no tampering. All items like hardware are in a polythene bag and duly marked with a tag. Ensure to keep them as such till materials are required for erection. Flexibles are also kept in sets, held together with banding wire. These to be kept as such till time of erection. Please ensure extra care is taken for copper flexibles in order to ensure their safety.

- After inspection, all the materials should be placed back duly protected until they are taken out for erection.

- **UNPACKING**

- Carefully unpack all sections of the busduct. To avoid damage to the busduct, band cutters should be used on all banding securing the packages and nail pullers should be used for unpacking wooden crates.

- Carefully remove any support blocks or other temporary fasteners which may have been used for shipping.

- If the busduct is not to be installed immediately, save all packing and wrapping materials for reuse while the busduct is in storage.

- **HANDLING**

To help avoid personal injury and equipment damage during handling, and to facilitate moving the busduct sections and fittings at the job site, follow these guidelines:

- Busduct sections are quite heavy, weighing up to several hundred kilo grams per section. To avoid personal injury, do not attempt to lift, carry, or otherwise move busduct sections by hand. Use appropriate mechanical means to handle busduct. Be sure that the handling equipment used is capable of safely handling the busduct sections.

- Handle busduct with care to avoid damage to internal components and the enclosure and its finish. Avoid subjecting busduct to twisting, denting, impact, and in general, rough handling. Avoiding damage to protruding objects such as flanges, drain and vent fittings, heater supply boxes, etc.

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- When setting busduct sections on the ground or on a floor, the main body of the duct enclosure should be set on a support to protect flanges and other protruding objects. A short length of 2"x4" or 4"x4" timber makes a good support.

- Do not drag busduct sections across the floor or the ground.

- Do not use bus bar ends for lifting busduct sections or fittings. Lift only the busduct enclosure, using support means such as slings or forklifts which extend under the full width of the enclosure.

- Keep the busduct enclosure level when lifting. Unsecured bus bar may slide out of its insulating sleeve or supports if the enclosure s tilted during lifting.

- If a section of busduct must be lifted vertically, be sure that the bus bars are secured to the housing to prevent sliding.

- Pallet trucks provide a simple method of moving busduct on one floor level if there is little or no incline. Balance the load carefully and secure it to the pallet.

- If a crane is used to install busduct, use nylon/other straps and distribute or balance the weight of each lift.

- If a fork lift or similar hoist is used, properly position the busduct enclosure on the forks to distribute its weight. Secure the load to the forks while lifting.

- **STORAGE**

- To prevent condensation, busduct sections and fittings which are not to be installed and energized immediately should be stored in a clean dry space having a moderate, uniform temperature, in the range of 20˚-40˚C.
  Preferably, busduct sections should be stored in a building having adequate air circulation, and protected from dirt, fumes, water and physical damage.

- Busduct sections should not be stored outdoors because of possible moisture damage. If busduct must be stored outdoors, it must be securely covered for protection from weather and dirt. Temporary electrical heating should be installed beneath the cover to prevent condensation. At least 200 watts per cubic metre is adequate for the average environment.

- Outdoor busduct must be treated exactly the same as indoor busduct until after it is installed. It is not weatherproof until completely and properly installed.

- Do not expose busduct sections and fittings to high concentrations of hydrocarbon-based solvent vapors. Such vapors may damage or destroy the bus bar insulation.

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DO's AND DON'T's ON THE BUSDUCT DURING RECEIVING, UNPACKING, HANDLING & STORAGE	
DO's	**DON'T's**
• Do check all the packings for possible damage during transit. • Do check material as per shipment list and report any shortage damage immediately. • Keep material in original packings unless required for erection. • Check the tightness of conductor with insulator while lifting the busduct assembly with conductor in position. • Ensure that insulators, wall bushings, gaskets and other moulded rubber items and flexible are stored indoor in well-ventilated area.	• Don't cause any scratches or hammer marks during unpacking. • Don't destroy any marking. • Don't drop any packing from a height. • Don't lay down unpacked material on the ground. • Don't cause damage or scratches by dropping and dragging etc., on fragile items such as insulators and rubber items etc.

V. INSTALLATION

ALIGNMENT OF APPARATUS

- Before installing a run of busduct, carefully check the location of the equipment to be connected by the busduct. The relative location of the two ends of the busduct run must be as shown on the busduct layout drawing for the busduct to fit properly. For a typical busduct run of about 10 Metre, the relative locations of the two end connections should not deviate from the busduct arrangement drawing by more than 10 mm in any direction, or by more than total. Location of walls which are penetrated by a busduct run should also be checked. The centre lines of the wall cut-out should not deviate from the centre lines of the busduct run by more than 10 mm and the location of the wall along the length of the busduct run should not deviate from its position on the busduct layout drawing by more than 6 mm of the thickness of the wall.

- If the terminal points of the busduct are not aligned within these limits, corrective action must be taken.

- If at all possible, the equipment to which the busduct connects should be moved so that the alignment is within limits. If this is not possible, contact SBL with all necessary dimensions, so that corrective action can be taken.

- Do not count on flexible connectors at the terminations of a busduct run to correct misalignment problems. Flexible connectors are furnished to limit stress on equipment terminations caused by thermal expansion and vibration, and to correct very minor (<5 mm) misalignments.

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- Busduct must have sufficient horizontal and vertical clearance from walls and ceilings to provide easy access to joints, both for original installation and for maintenance, including the possible removal of a section.

INSTALLATION CHECKLIST

- This checklist lists the steps necessary for installation of busduct in the order in which they should be performed. More detail about many of these steps is given in subsequent sections, which should be reviewed before doing the installation.

- Check the material received, including loose items such as hardware, splice plates, insulating material and gaskets, against the busduct drawings and shipping documents.

- Notify SBL of any discrepancies within one month of receipt of goods.

PRELIMINARY STEPS

- Before installing any section of busduct, the entire busduct run should be laid out on the ground in the same position as the final assembly. SBL busduct is marked with alignment numbers to allow for rapid matching and aligning of busduct sections. See figure 3. These alignment numbers are marked on the SBL arrangement drawings to show how and where each piece of busduct should be located. Refer to SBL arrangement drawings for the proper placement of busduct. Care should be taken inlaying out the busduct that the matching numbers are matched and that the layout matches the SBL arrangement drawings.

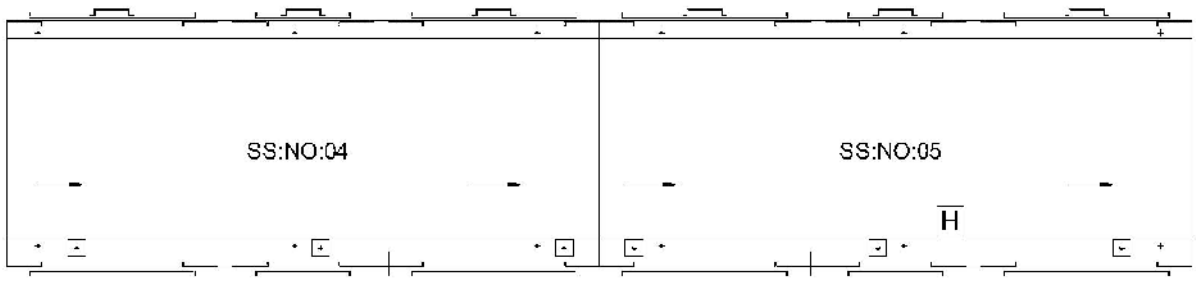


FIGURE - 3

- After the duct has been laid out on the ground the access covers should be removed.

- Gaskets are attached to one flange of all sections. Check if gaskets are clean and in position. If damaged, replace.

- Check for cleanliness of busduct. Ensure all insulation is thoroughly cleaned with a dry cloth. If not getting cleaned, use denatured alcohol on CTC to clean and dry the insulators.

- All individual bus sections should be meggered to check for the soundness of insulators before erecting.

BUSDUCT ERECTION

- Lift the enclosures to their respective location keeping the matching numbers marked at the ends as per layout drawing.

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- Check the alignment; see that there is no offset between adjacent section busbars where fishplates have to be used. Where the bars are for overlap joint, ensure the alignment is such as to give a proper joint free from tension. Prepare the joint for Aluminium busbar by scratch brushing the joint under petroleum jelly using a steel wire brush to remove oxide film and wipe the grease off with a clean dry cloth. Smear lightly a layer of fresh jelly. For tinned joints of copper or Aluminium busbars do not scratch brush. Only apply petroleum jelly after wiping clean with a dry cloth

- Ensure that the enclosures are properly aligned and all flange gaskets are in position. Bolt the enclosures together.

- Now fix the fish plates or flexibles in position as shown in the layout drawing and proceed to bolt with the correct size bolts and finger tighten the same. Check there is no tension in the bus bars. Tighten using the correct spanner.

- Use a torque wrench to check the correct torque for busbar bolts and adjust accordingly. The torque should be as given below:

BOLT DIA	RECOMMENDED TORQUE (MIN)	SPANNER LENGTH IN MM (APPROX.)
M10	3.5 KG/M	152 MM
M12	5.5 KG/M	152 MM
M16	5.5 KG/M	203 MM

- Ensure tightness of enclosure flange bolts. Connect heater wires between sections.

- Check all gaskets of covers for being in position place the covers and bolt.

- Now tighten the bolts holding the enclosure on the supporting structure.

- Connect heater supply to marshalling point.

- Connect all fishplates of earth bars taking due precaution as for busbar. Connect to Station earth.

STEEL SUPPORT ERECTION

Before keeping the columns/wall frames etc., in position, check up whether the embedded plates on the floor/wall/ceiling and the foundations are located as per the drawings. Also check up the level of the plates and foundations. If there are any changes, the matter should be immediately brought to the notice of the customer with a copy of the design office drawings available. Modifications can be done suggested by the design office or as mutually agreed by the customer. After ascertaining the accuracy of the plates/foundations stud welding shall be done if called for. Apply cold galvanizing where it may have come off due to welding. Suitable packing shall be provided if the elevations are found not uniform. After ascertaining the correctness of all the plates, the columns and inter connecting beams etc., should be erected. Check the level of the beams with the sprit level, tighten all the parts. Keep the transverse steel members in their position. Do not tighten the bolts.

- After the covers are removed the busduct should be lifted into place a section at a time. Each section should be properly supported during assembly and attached to the next piece by finger tightening the flange bolts. Connections of bus bars should not be made at this time.

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- Wall penetration sections containing fire barriers or air barriers must be positioned so that the barrier is within the thickness of the wall it passes through. See Figure 4.

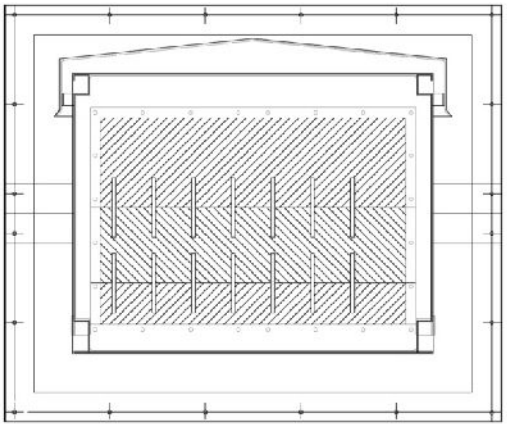


FIGURE - 4

DO's AND DON'T's DURING ERECTION AND COMMISSIONING	
DO's	**DON'T's**
• Remove the wooden blocks provided inside enclosure for the busbar support during transit. • Do carry out pre-layout survey to verify the position of various equipments to be connected, levels of floors and position of cutouts. • Do keep layout drawing & termination drawing etc., ready for reference. • Draw the material from stores as per suggested layout. • Ensure alignment and proper matching of various busduct. • Make the busbar joints as per the instructions. • Take care for proper sealing while jointing the busducts. • Do ensure proper insulation and earthing of enclosure and structures as specified. • Carryout insulation checks and other electrical tests. • Ensure that CT secondaries are shorted and grounded for HT test when fitted. • Make sure that all supplies and associate equipment are disconnected before carrying out HV test on busduct. • Clean the busduct and insulators thoroughly before final test.	• Don't allow accumulations of dirt or foreign material in the busduct during erection. • Do not over tight the bolts and adhere to the torque wrench as recommended. • Do not omit any insulation items specified for enclosure and structures. • Do not hammer the bolts etc while joining the busbars if the holes are not matching. • Do not walk over the busducts, these may get disturbed. • Don't leave any foreign material inside the enclosure.

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FIELD TESTS

- The following are the suggested field tests to be conducted on the busduct:

- After the completion of erection, tests as given below to be done. However if there is a long delay, remove all the inspection covers and check busbar joint bolts with the help of torque wrench. Ensure atleast 10% of the joint locations are checked.

Insulation check with 1000 Volts Megger

- Before the application of high voltage, check the insulation value of each phase by means of 1000 volts megger.

- A minimum value as listed below should be obtained.
  - For 400V – 0.24 Mega Ohms (Min)
  - For 690V – 0.66 Mega Ohms (Min)
  - For 3300V – 1.91 Mega Ohms (Min)
  - For 6600V – 3.81 Mega Ohms (Min)
  - For 11000V – 6.35 Mega Ohms (Min)
  - For 22000V – 12.7 Mega Ohms (Min)
  - For 33000V – 19.1 Mega Ohms (Min)

  However, during rainy season, the above value may fall down slightly, and hence the drying out is necessary before the test.

Die-electric Test or High Voltage Test

After the insulation check, power frequency withstand tests can be made in the field at 75% of the full value. These are shown below.

Nominal Voltage (KV RMS)	Power frequency withstand voltage KV RMS – 1 Minute - Dry
400 Volts	1.875 KV
690 Volts	3.5 kV
3.3 KV	7.5 KV
6.6 KV	15 KV
11 KV	21 KV

Procedure for conducting Power frequency/Insulation tests

- Disconnect all equipment terminations from the busbar.
- Keep a minimum of 150mm between busbars and disconnected equipment (for equipment upto 75 KVP impulse level).
- Ensure that all insulators and bushings shall be free from any dust, grease and moisture etc., before applying high voltage.

  The test voltage shall be applied between each phase busbar and enclosure, which shall be kept at ground potential. Finally, the test voltage shall be applied between phases.

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VI.MAINTENANCE

- Inspect busduct in normal service once each year or after any severe electrical fault. Busducts operating in severe environments, such as excessive dust, salt spray, chemical vapors, etc., may require more frequent inspection. Busducts operating in clean, dry, Indoor locations may need inspection less frequently.

- Remove the covers from the busduct and examine the interior for any moisture or signs of previous wetness. Replace or thoroughly dry and clean any insulating material which is damp or wet or shows accumulation of deposited material from previous wetting. For indoor busduct, eliminate the source of any dripping onto the busduct and any other source of moisture. For outdoor busduct, seal off any cracks or openings which have allowed moisture to enter the busduct or its connection boxes.
- Thoroughly clean any accumulation of dust and dirt by using a brush, vacuum cleaner, or clean lint freerags. If the main bus bars are insulated and foreign material cannot be removed by dusting or wiping with a dry rag, only denatured alcohol or isopropyl alcohol should be used as a solvent tore move materials from the insulation surface. **Do not use commercial cleaners or solvents to clean bus insulation. These materials may destroy the insulating sleeving.**

- Carefully inspect all visible electrical joints and terminals. Check tightness of hardware in accordance with Table II. If joints or terminations appear to be badly discoloured, corroded or pitted, or show evidence of having been subjected to high temperatures, the parts should be disassembled and replaced or cleaned. The plated surface can be cleaned with a good grade of silver polish. Take care not to remove plating on aluminum or copper parts in joints or terminations. Damaged aluminum or copper parts should be replaced.

- Check the insulation resistance prior to re-energizing the busduct, using the insulation resistance test described in Section VI. Keep a permanent record of resistance readings. If readings decrease appreciably with time, deterioration is taking place. If this occurs, find and correct the cause of the insulation deterioration before re-energizing the busduct.

- If the busduct is equipped with heaters, check them for proper operation as described in Section VI.
- Replace any heaters that are not functioning properly. The heaters used in busduct are long life, low surface temperature heaters. Replace them only with heaters of the same rating and catalogue number.

- Replace the covers and secure them properly. Reenergize the busduct, observing the precautions given in Section VII.

During Maintenance

- All precautions normally observed for high tension apparatus should be taken when inspecting busducts and associated equipments. Housings should never be opened unless the entire unit is shut down and the personnel working on the equipment assure themselves that the busduct is not alive.

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- The only reason for opening the bus housing should be to clean the insulators and bushings. The frequency of cleaning should be established from operating experience. The first time the unit is shut down, a set of inspection openings may be removed to determine the amount of dust collected. If amount of dust is found to be appreciable, further inspection should be made and insulators cleaned. If the insulators are clean, the interval of inspection can be lengthened. Normally the inspection would not have to be made often than yearly intervals. However, the frequency of inspection should be based on local conditions. Much longer intervals could safely be expected unless local atmosphere has a very large amount of suspended dust.

- The tightness of busbar joints should be checked, at the time of annual maintenance period with the help of torque wrench. Sufficient amount of no-oxide grease also should be applied at the jointing surfaces. The flexibles used at transformer terminations should also be checked for any abnormal temperature rise.
- As already stated, the frequency of inspection should be decided based on the amount of dust collection. Besides this, there is no need to have quarterly/half-yearly maintenance checks. But it is preferable to inspect all joints and the insulators atleast once in a year.

- Since the busbars are enclosed, no failure is expected often except failure of insulation. This will occur at support insulator/seal-off bushings, either due to dust collection and condensation or due to minute cracks. In such events, the bushings must be cleaned and the busbars to be hi-poted before commissioning. If insulator/bushings do not withstand the hi-pot, then replace them with new ones. Other than the above, there is no other specific operation or maintenance instruction for the busduct.

- In general the busduct is expected to give trouble free operation for a long time. However it is advisable, that should the circuit have cleared a major fault, normal discretion should be used before energizing as for Switchgear.

DO's	DON'T's
• Do check insulators for cleanliness if necessary clean and dry up by compressed air. • Do make sure that bolts are properly tightened while doing the joints. • Do ensure the proper sealing while replacing the covers. • Do carry out insulation check up as specified. • Do ensure no other foreign materials are inside the enclosure before putting the inspection covers.	• Don't re-do joints without proper cleaning and use of fresh quantity of petroleum jelly. • Don't use cracked or damaged gaskets while replacing the covers. • Don't use damaged flexibles. • Don't apply voltage beyond specified limit while checking.

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TENDER NO. PSER:SCT:KLN-E2060:20

STARDRIVE BUSDUCTS LIMITED

(Formerly KGS Engineering Ltd.)
34, Fourth Main Road. Gandhi Nagar, Adyar, Chennai - 600 020
Phone: +91 044-2442 3027 / 28 www.stardrive.in

An ISO 9001 Company with over three decades of experience in design & manufacture of LT & HT Busduct up to 33 KV-5000 A

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PSER

RECORD OF QUALITY CHECKS

SHEET NO. OF FQP	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	INSPECTED BY SIGN. & DATE	CLEARED BY SIGN. & DATE	REMARKS

Note: Any protocol made is to be numbered & mentioned in "Format of Record" column.

		SYSTEM	SUB-SYSTEM	AREA	FQP NO.: QPE-MTE-660-EL-65
PROJECT					REV. NO. : **1**
UNIT NO.					LOG SHEET NO. : **L- 00**
RATING					PAGE **1** OF **1**

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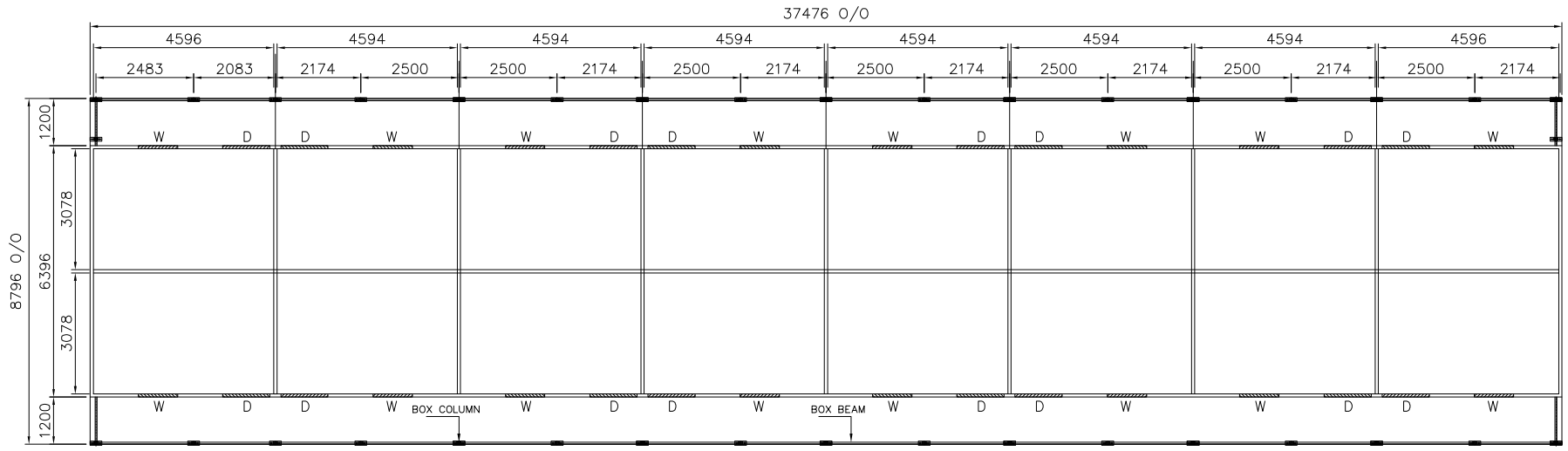
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PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

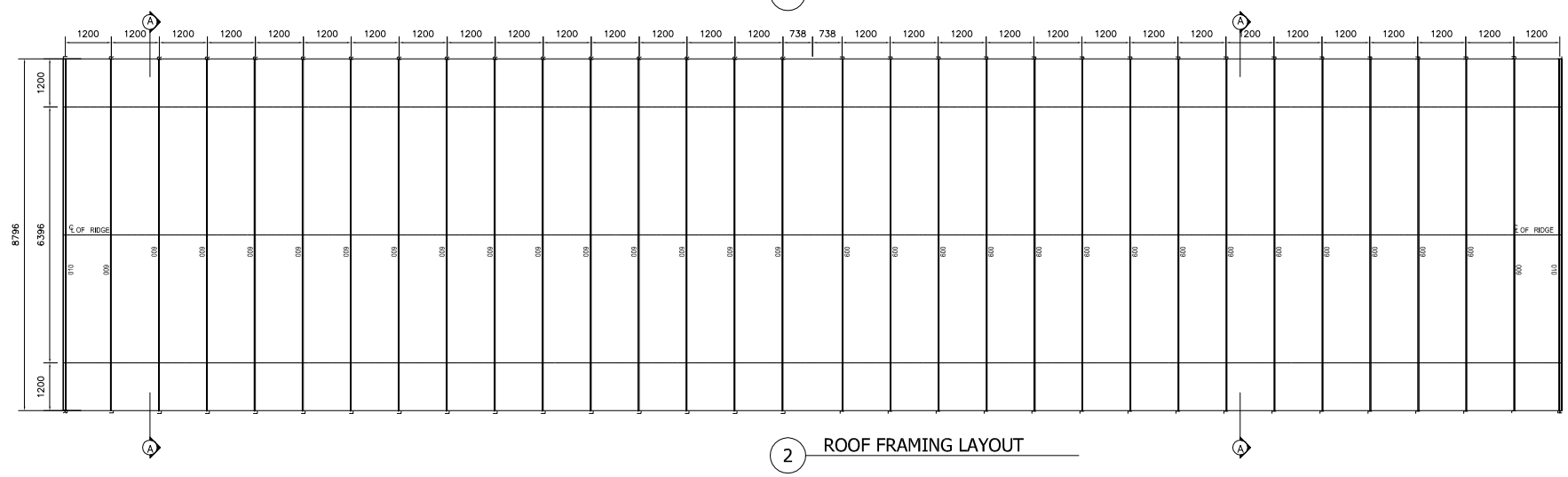
PROTOCOL

			NAME	SIGNATURE & DATE	FQP NO.: QPE-MTE-660-EL-65
PROJECT		INSPECTED BY			REV NO. 1
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

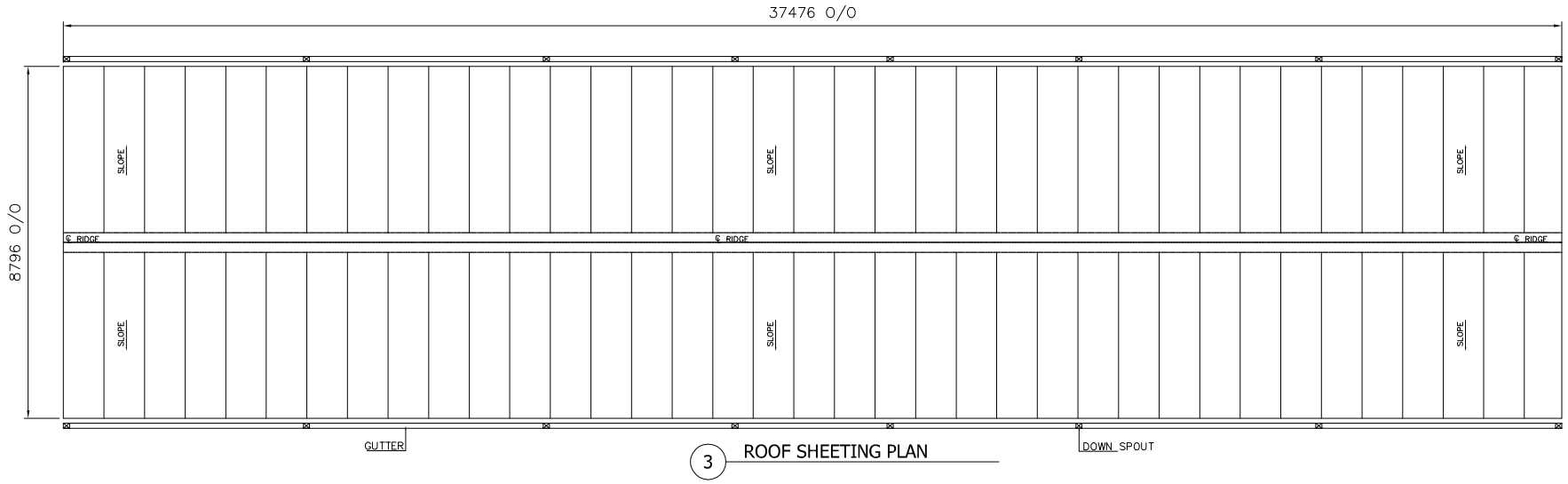
THIS DRAWING IS PURELY FOR APPROVAL PURPOSE ONLY AND NOT FOR CONSTRUCTION



1 WALL FRAME LAYOUT



2 ROOF FRAMING LAYOUT



3 ROOF SHEETING PLAN

NOTE :
THE BAY SPACING SHOWN IN THE PROPOSAL DRAWING ARE INDICATIVE & SUBJECTED TO CHANGE DEPENDING UPON FINAL DESIGN REQUIREMENT.

PRODUCT : PEB LITE

NOTE : FOR OTHER DETAILS REF. DESIGN DATA SHEET

EZYBUILD®

TATA BLUESCOPE BUILDING PRODUCTS

TATA Bluescope Steel Ltd.,
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Hinjewadi, Taluka Mulshi,
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Tel : +91 20 6674 2000
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LEGEND:
NSW – NEAR SIDE WALL ELEVATION
FSW – FAR SIDE WALL ELEVATION
LEW – LEFT END WALL ELEVATION
REW – RIGHT END WALL ELEVATION
DFO – DOOR FRAMED OPENING
RUD – ROLL UP DOOR
VFO – VENTILATOR FRAMED OPENING
WFO – WINDOW FRAMED OPENING
NBTBSL– NOT BY TBSL
RV – ROTARY VENT

NOTES:–
1. ALL DIMENSIONS ARE IN MM.

D1 : XXXX(W) X XXXX (H) (00 NOS)
D2 : XXXX(W) X XXXX (H) (00 NOS)
D : XXXX (W) X XXXX (H) (00 NOS)
EX. : XXXX(W) X XXXX (H) (00 NOS)
W : (W) X (H)

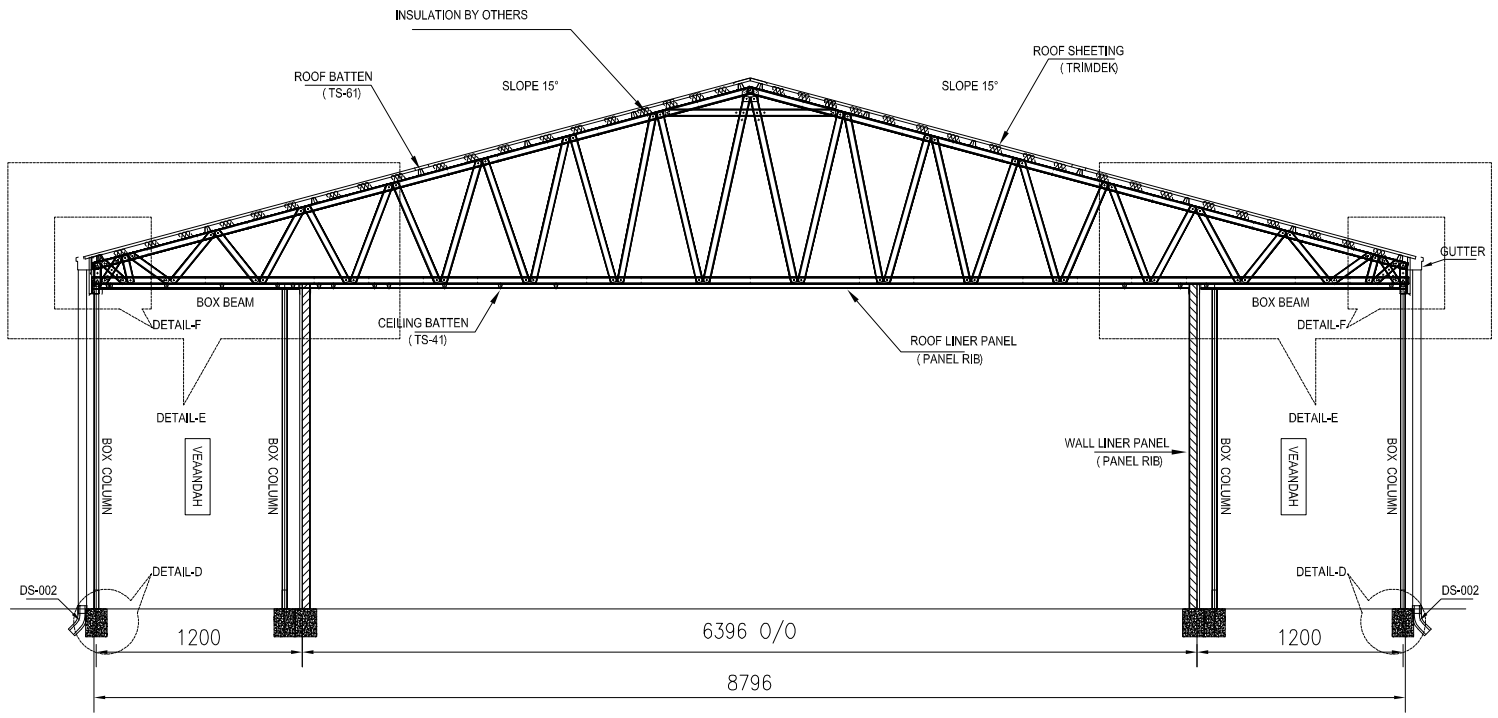
PROJECT NAME:
ROOMS for Labours-BHEL

DRAWING TITLE:
PROPOSAL DRAWING

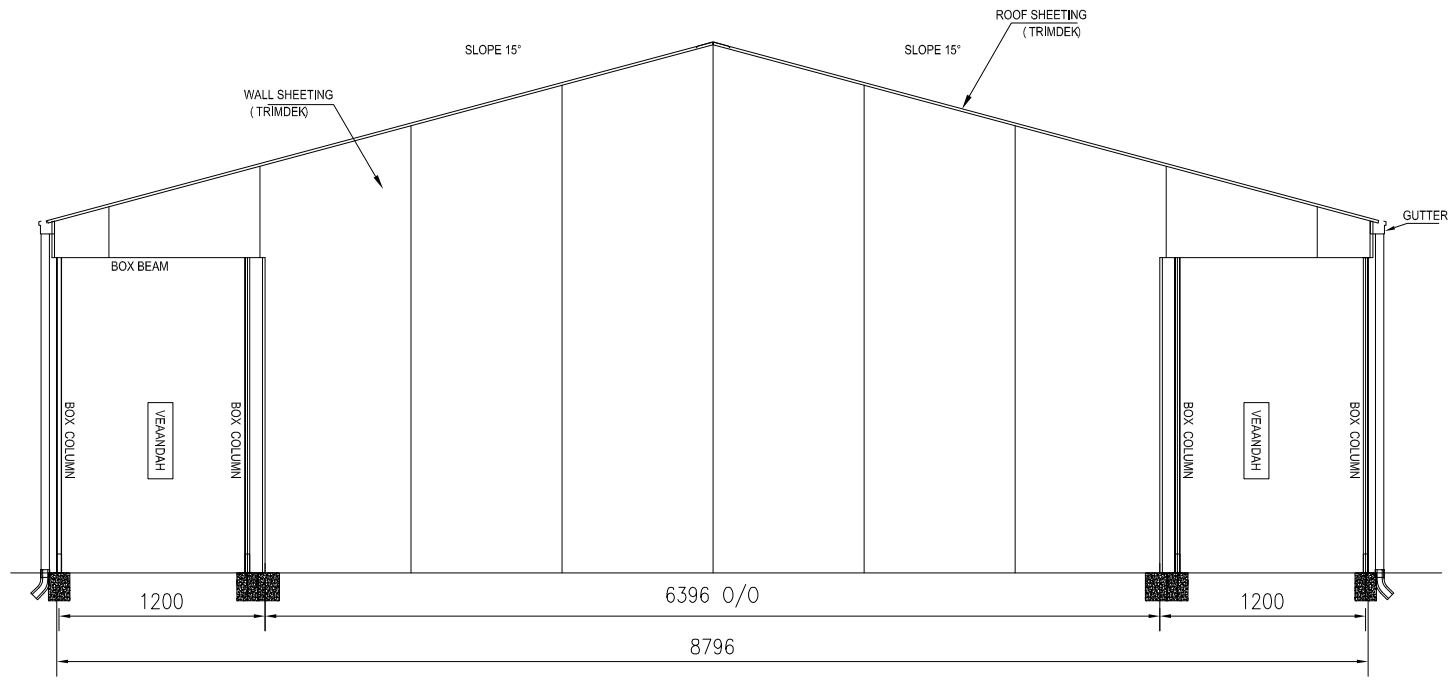
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DRN : NMT	DATE : 26.04.17	
CHK : NMT	REV DATE : 00.00.00	
DSN : WAQ	SENT ON : 26.04.17	A3

TBSL/BPD–ENGG/FORM/007(R1)

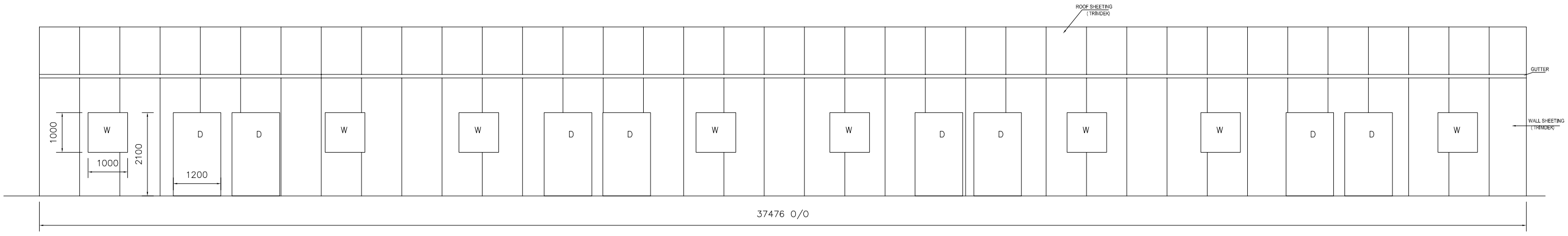
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4 TYPICAL CROSS SECTION A-A



5 GABLE SHEETING ELEVATION



6 SIDE WALL SHEETING ELEVATION

NOTE :
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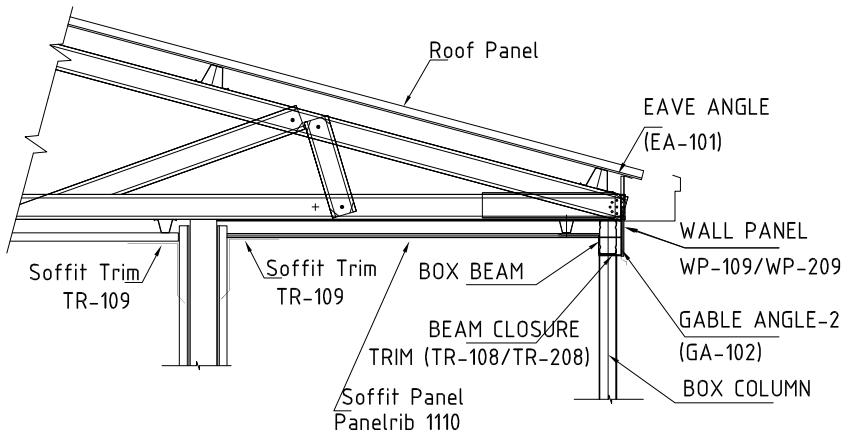
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D :	XXXX (W) X	XXXX (H)	(00 NOS)
EX. :	XXXX (W) X	XXXX (H)	(00 NOS)
W :	(W) X	(H)	

PROJECT NAME:
ROOMS for Labours-BHEL

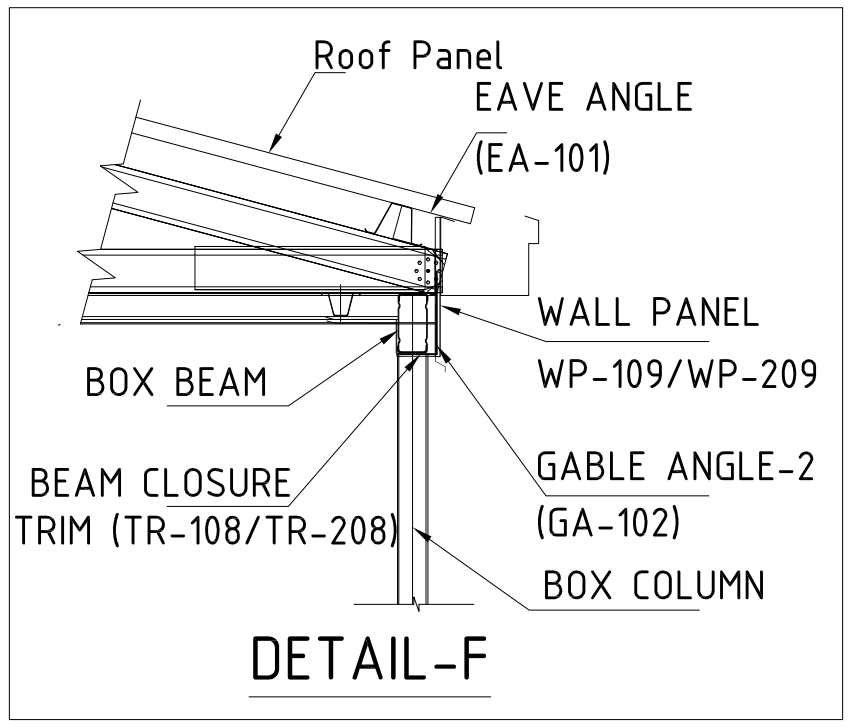
DRAWING TITLE:
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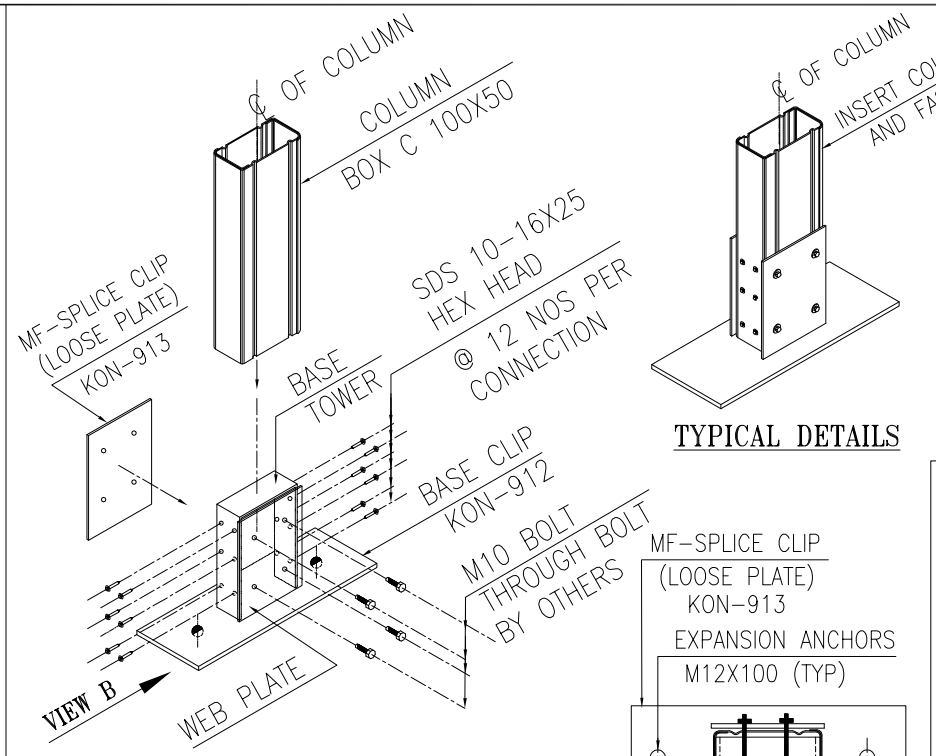
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VARANDH PORTION DETAIL-DETAIL-E

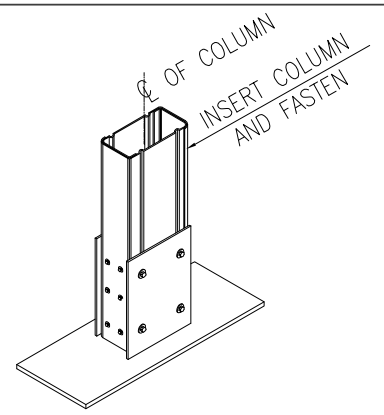


DETAIL-F

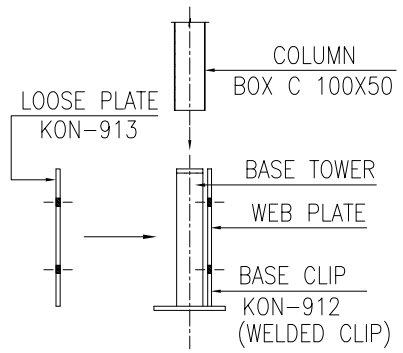


MAIN/END COLUMN BASE CLIP CONNECTION DETAILS

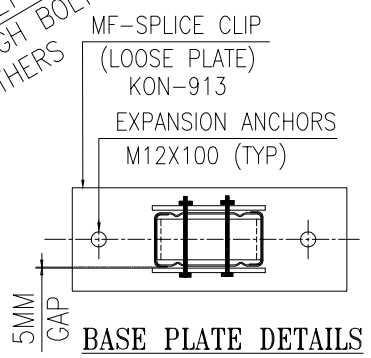
(DETAIL @ A)



TYPICAL DETAILS



VIEW @ B



BASE PLATE DETAILS

NOTES:-

STEP-1, INSERT THE COLUMN IN THE BASE TOWER

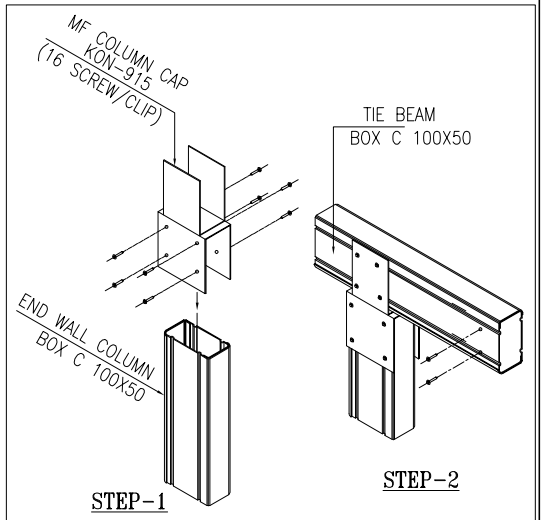
STEP-2, CHECK THE WATER LEVEL AT TOP OF THE COLUMN

STEP-3, SCREW FASTEN THE COLUMN TO BASE TOWER THROUGH FLANGE SIDE AS SHOWN

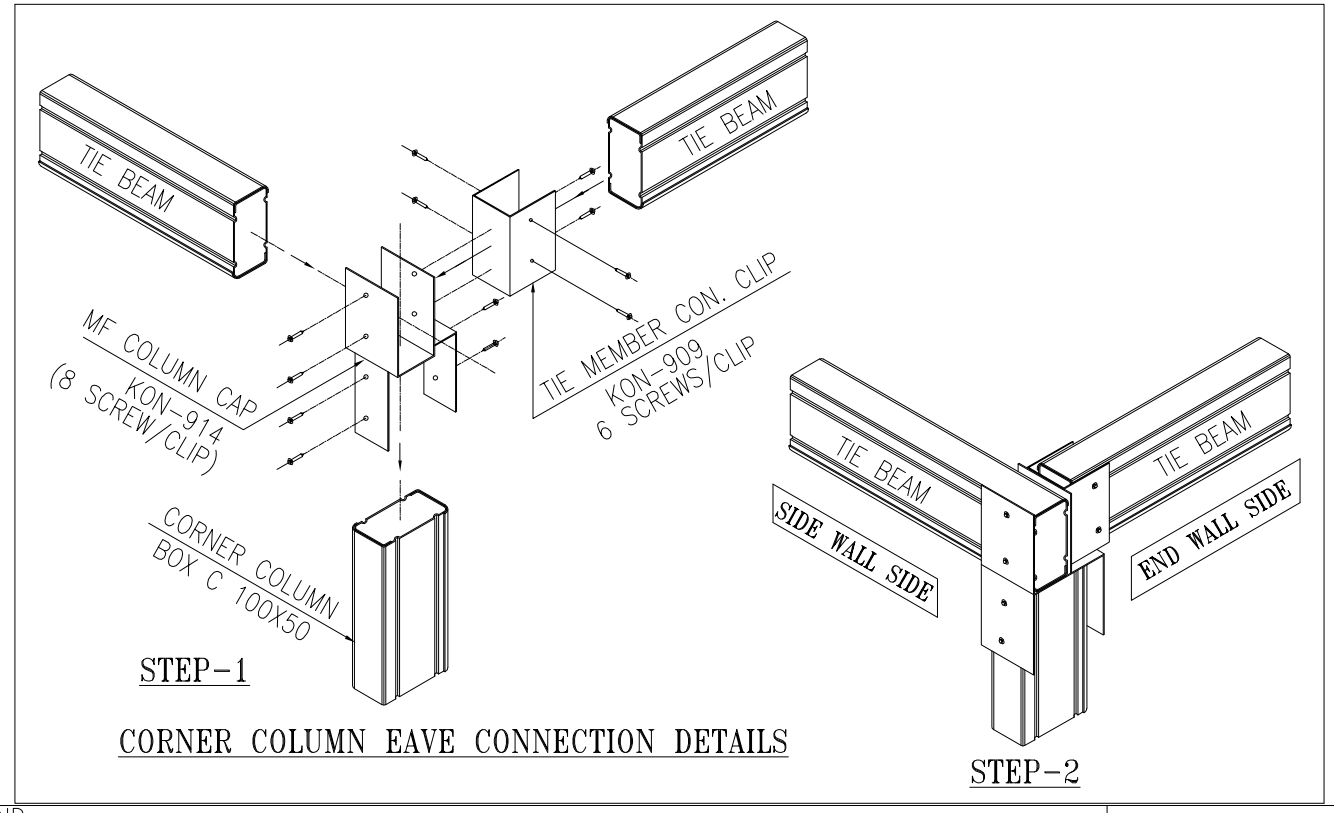
STEP-4, FIELD DRILL DIA 12MM HOLE TO COLUMN MATCHING THE WEB PLATE

STEP-5, INSERT M10 THROUGH BOLT FROM WEB PLATE AND PLACE THE LOOSE PLATE PART MARK KON-913 ON THE OTHER SIDE OF WEB PLATE AND THEN TIGHTEN THE BOLTS

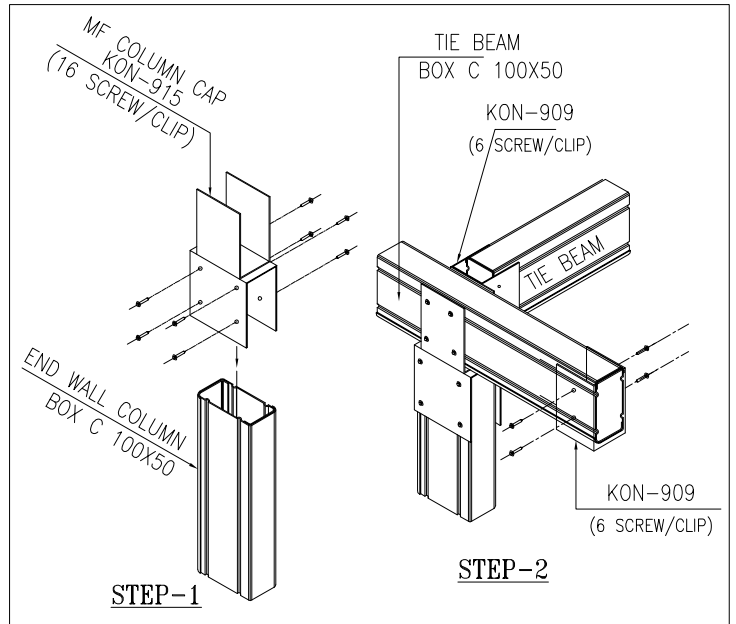
THIS DRAWING IS PURELY FOR APPROVAL PURPOSE ONLY AND NOT FOR CONSTRUCTION



COLUMN TO TIE BEAM CONNECTION



CORNER COLUMN EAVE CONNECTION DETAILS



COLUMN TO TIE BEAM CONNECTION

NOTE :
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PRODUCT : PEB LITE

NOTE : FOR OTHER DETAILS REF. DESIGN DATA SHEET

EZYBUILD®

TATA BLUESCOPE BUILDING PRODUCTS

TATA Bluescope Steel Ltd.,
Survey No. 247 & 250
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Pune – 411 057 (India)
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LEGEND:

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NBTBSL– NOT BY TBSL
RV – ROTARY VENT

NOTES:–
1. ALL DIMENSIONS ARE IN MM.

D1 : XXXX(W) X XXXX (H) (00 NOS)
D2 : XXXX(W) X XXXX (H) (00 NOS)
D : XXXX (W) X XXXX (H) (00 NOS)
EX. : XXXX(W) X XXXX (H) (00 NOS)
W : (W) X (H)

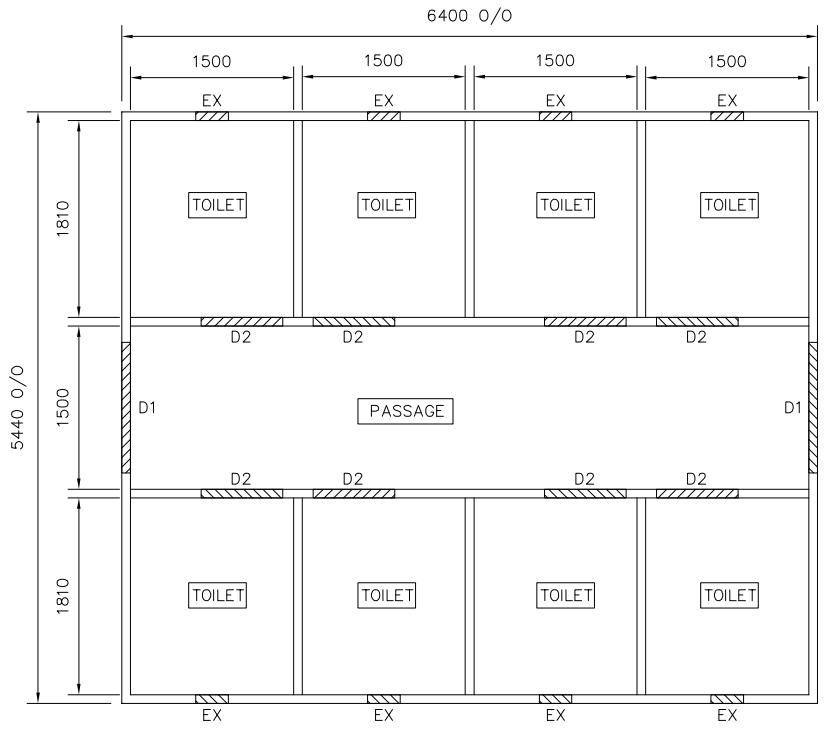
PROJECT NAME:
ROOMS for Labours-BHEL

DRAWING TITLE:
PROPOSAL DRAWING

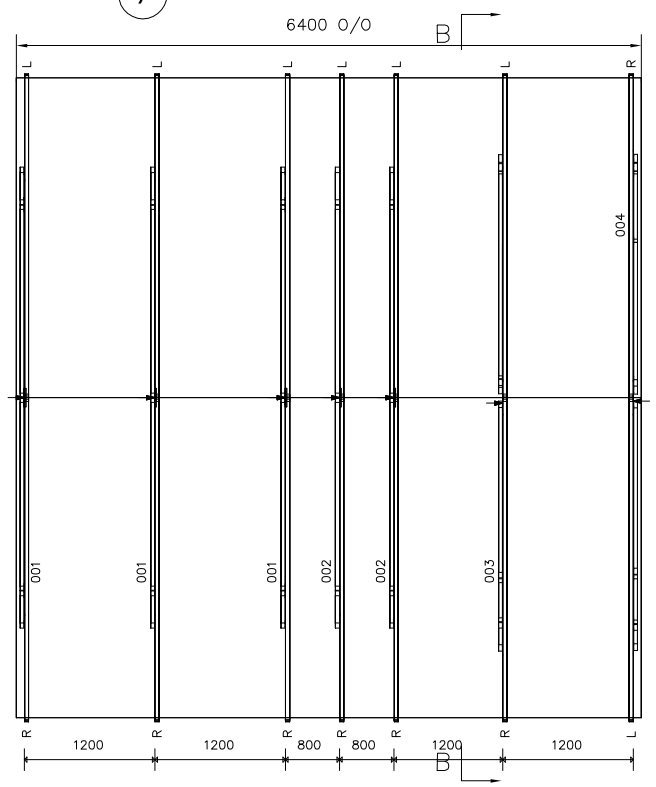
JOB SITE LOCATION : ENQ/WB/1735B		
QUOTE NO : Kolkata		REV: 0
DRG NO : E3	SCALE : NTS	
DRN : NMT	DATE : 26.04.17	
CHK : NMT	REV DATE : 00.00.00	
DSN : WAQ	SENT ON : 26.04.17	A3

TBSL/BPD–ENGG/FORM/007(R1)

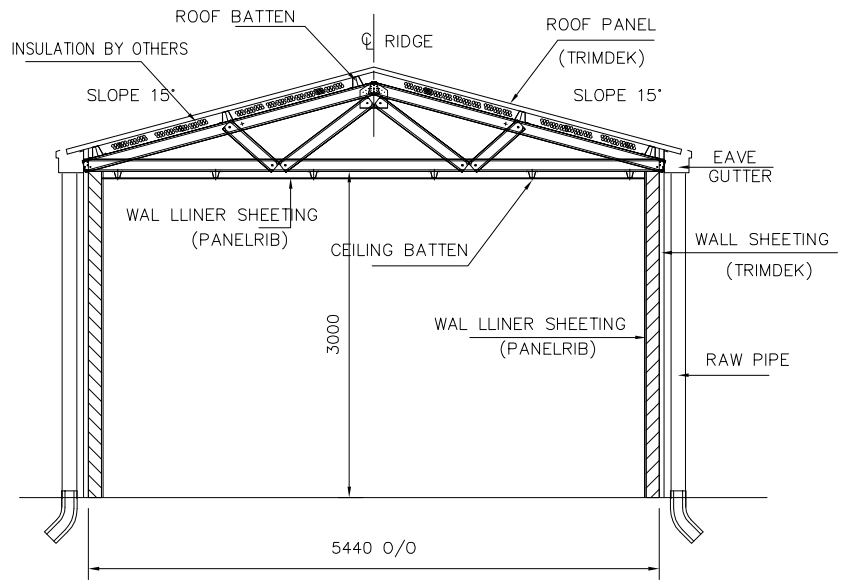
THIS DRAWING IS PURELY FOR APPROVAL PURPOSE ONLY AND NOT FOR CONSTRUCTION



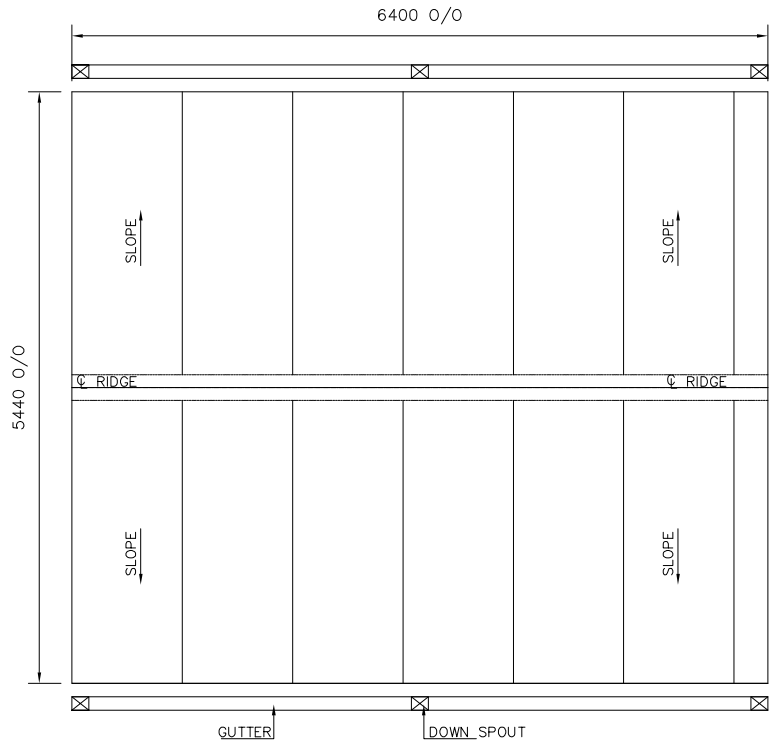
7 WALL FRAME LAYOUT



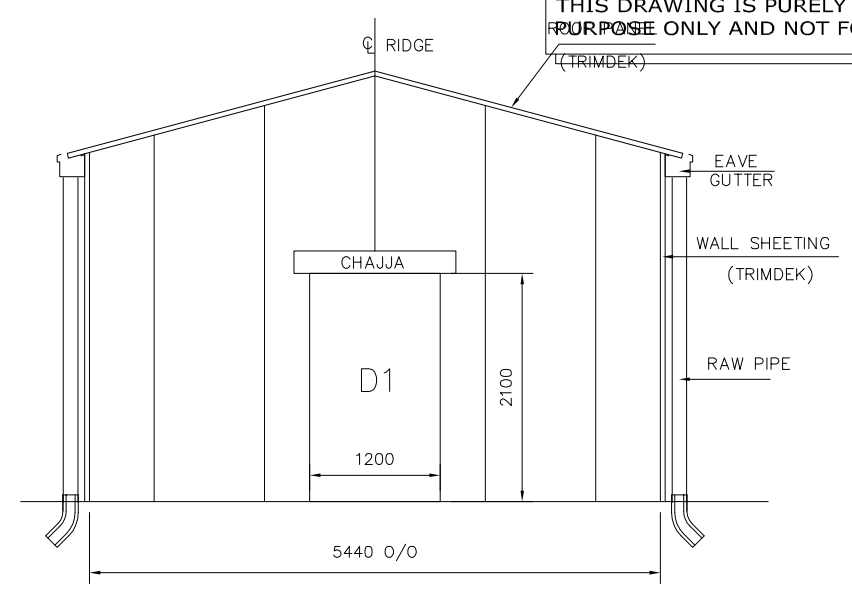
8 ROOF FRAMING LAYOUT



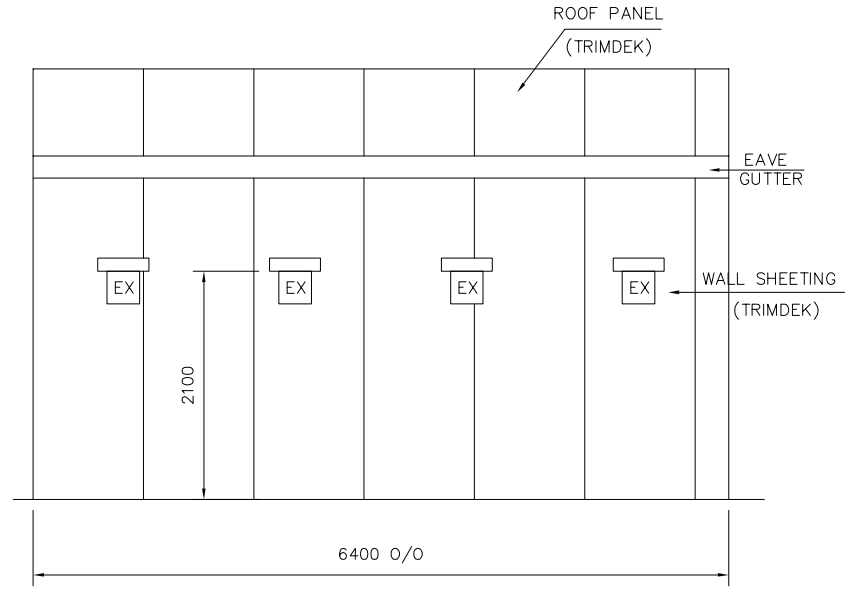
9 TYPICAL CROSS SECTION-B-B



10 ROOF SHEETING PLAN



11 GABLE SHEETING ELEVATION



12 SIDE WALL SHEETING ELEVATION

NOTE :
THE BAY SPACING SHOWN IN THE PROPOSAL DRAWING ARE INDICATIVE & SUBJECTED TO CHANGE DEPENDING UPON FINAL DESIGN REQUIREMENT.

PRODUCT : PEB LITE

NOTE : FOR OTHER DETAILS REF. DESIGN DATA SHEET

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RV – ROTARY VENT

NOTES:–
1. ALL DIMENSIONS ARE IN MM.

D1	:	1200(W) X	2100 (H)	(02 NOS)
D2	:	750 (W) X	2100 (H)	(08 NOS)
D	:	1200 (W) X	2100 (H)	(16 NOS)
EX.	:	300 (W) X	300 (H)	(08 NOS)
W	:	1000 (W) X	1000 (H)	(16 NOS)

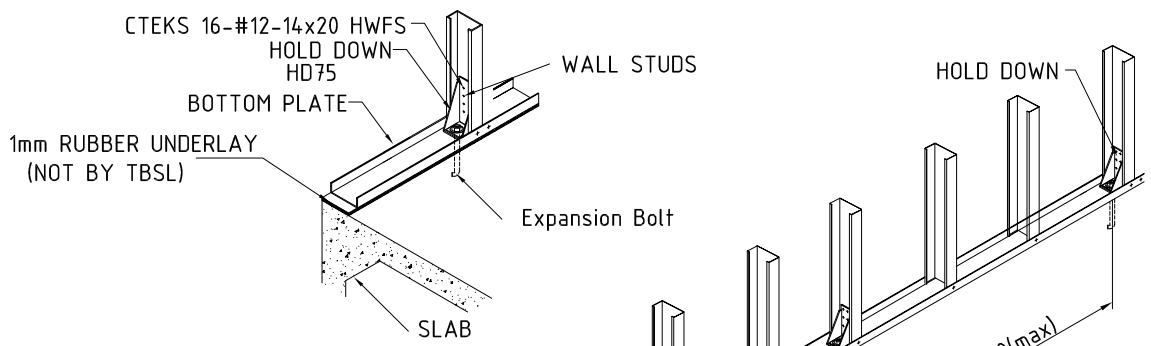
PROJECT NAME:
Toilet Block for Labours-BHEL

DRAWING TITLE:
PROPOSAL DRAWING

JOB SITE LOCATION : ENQ/WB/1735B		
QUOTE NO : Kolkata		REV: 0
DRG NO : E4	SCALE : NTS	
DRN : NMT	DATE : 26.04.17	
CHK : NMT	REV DATE : 00.00.00	
DSN : WAQ	SENT ON : 26.04.17	A3

TBSL/BPD–ENGG/FORM/007(R1)

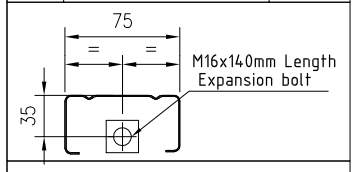
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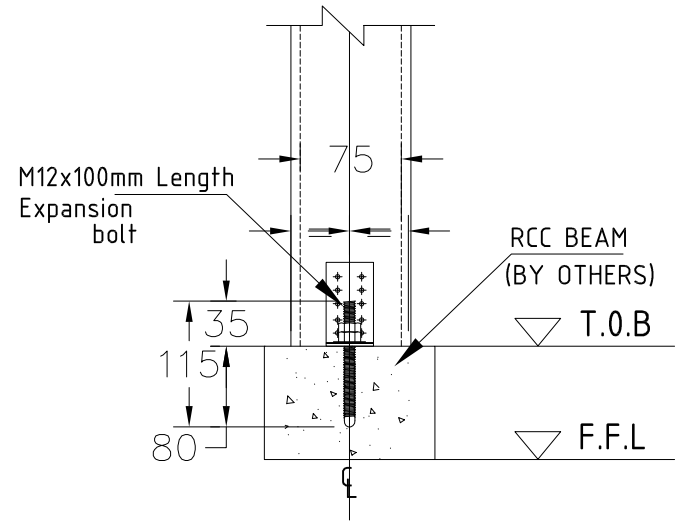
EXPANSION BOLT DETAIL

EXPANSION PLAN SKETCH

QTY.	DESCRIPTION	LENGTH
100	M16x140mm Length Expansion BOLT	140

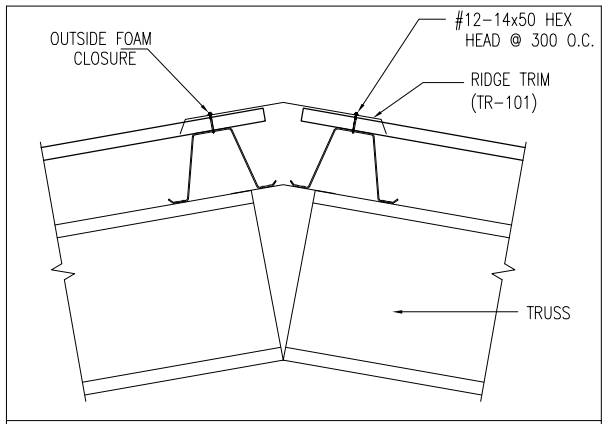


SECTION A-A

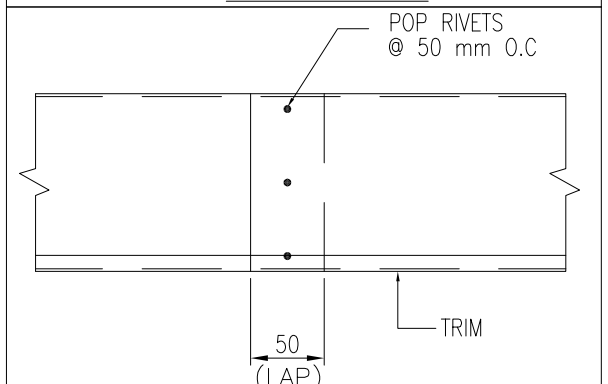


TO DESIGN RCC BEAM CONSIDERED 500 KG/M UDL

TYPICAL EXPANSION BOLT FIXING DETAILS

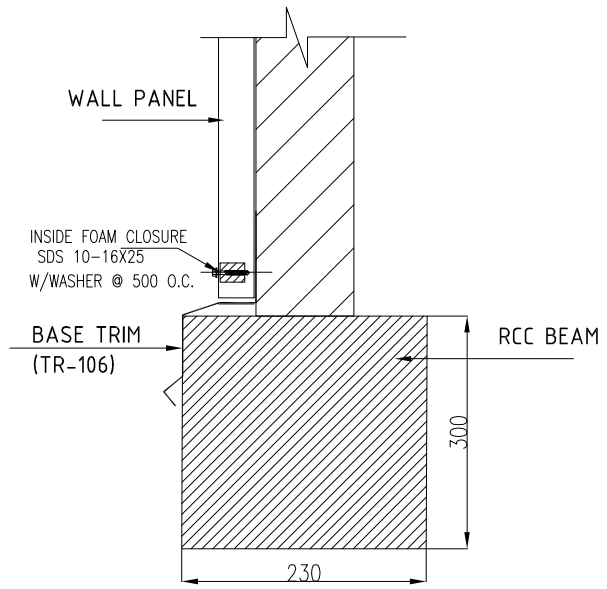


RIDGE DETAIL

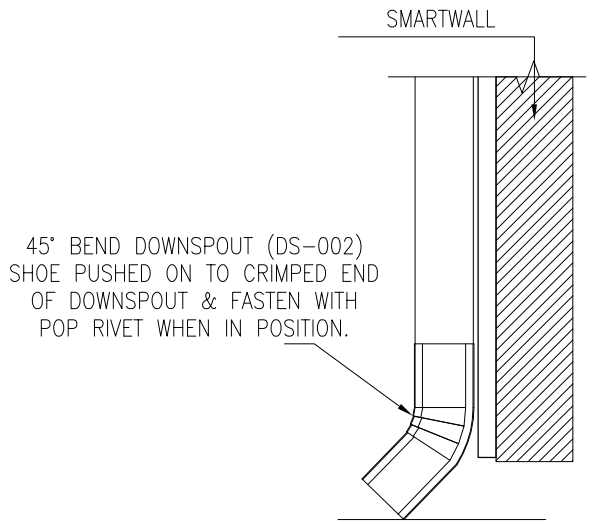


STANDARD LAP FOR TRIMS

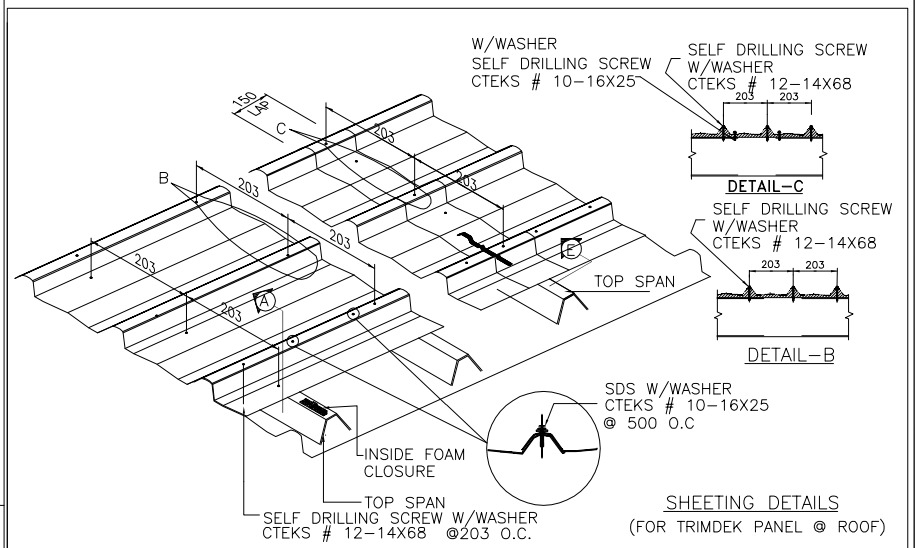
DETAIL-C (EAVE DETAIL)



BASE TRIM DETAIL-D



(D/S BOTTOM DETAIL)



SHEETING DETAILS @ ROOF (TRIMDEK)

NOTE :
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PRODUCT : PEB LITE

NOTE : FOR OTHER DETAILS REF. DESIGN DATA SHEET

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NOTES:–
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D2 :	XXXX(W) X	XXXX (H)	(00 NOS)
D :	XXXX (W) X	XXXX (H)	(00 NOS)
EX. :	XXXX (W) X	XXXX (H)	(00 NOS)
W :	(W) X	(H)	

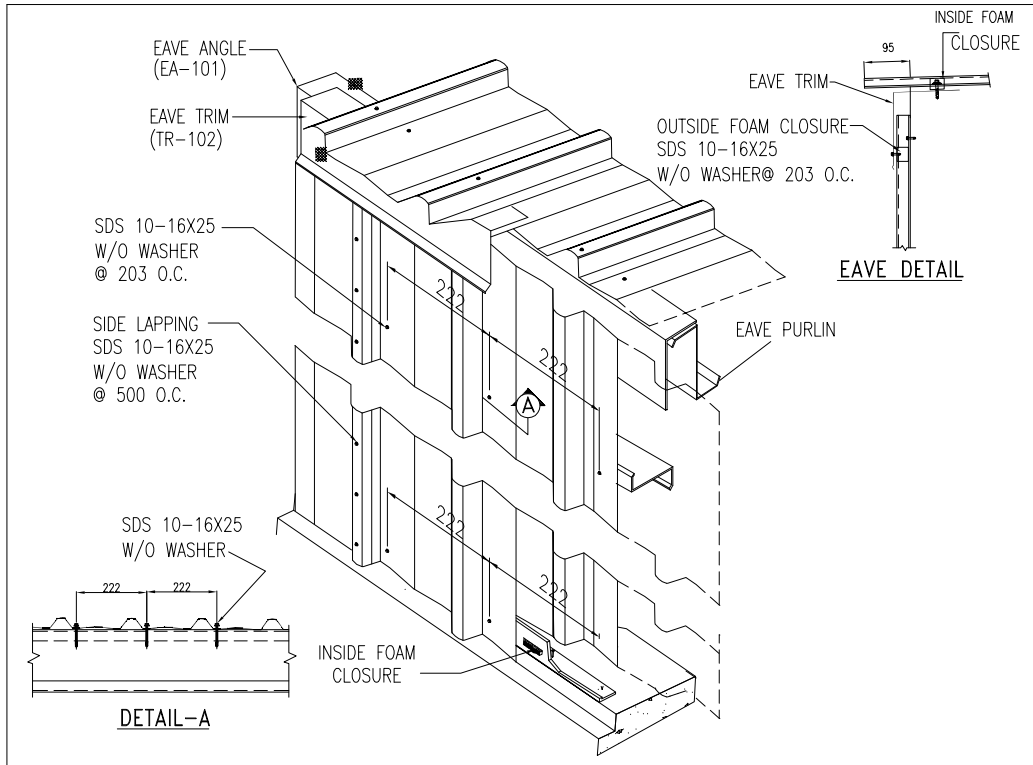
PROJECT NAME:
Toilet Block for Labours-BHEL

DRAWING TITLE:
PROPOSAL DRAWING

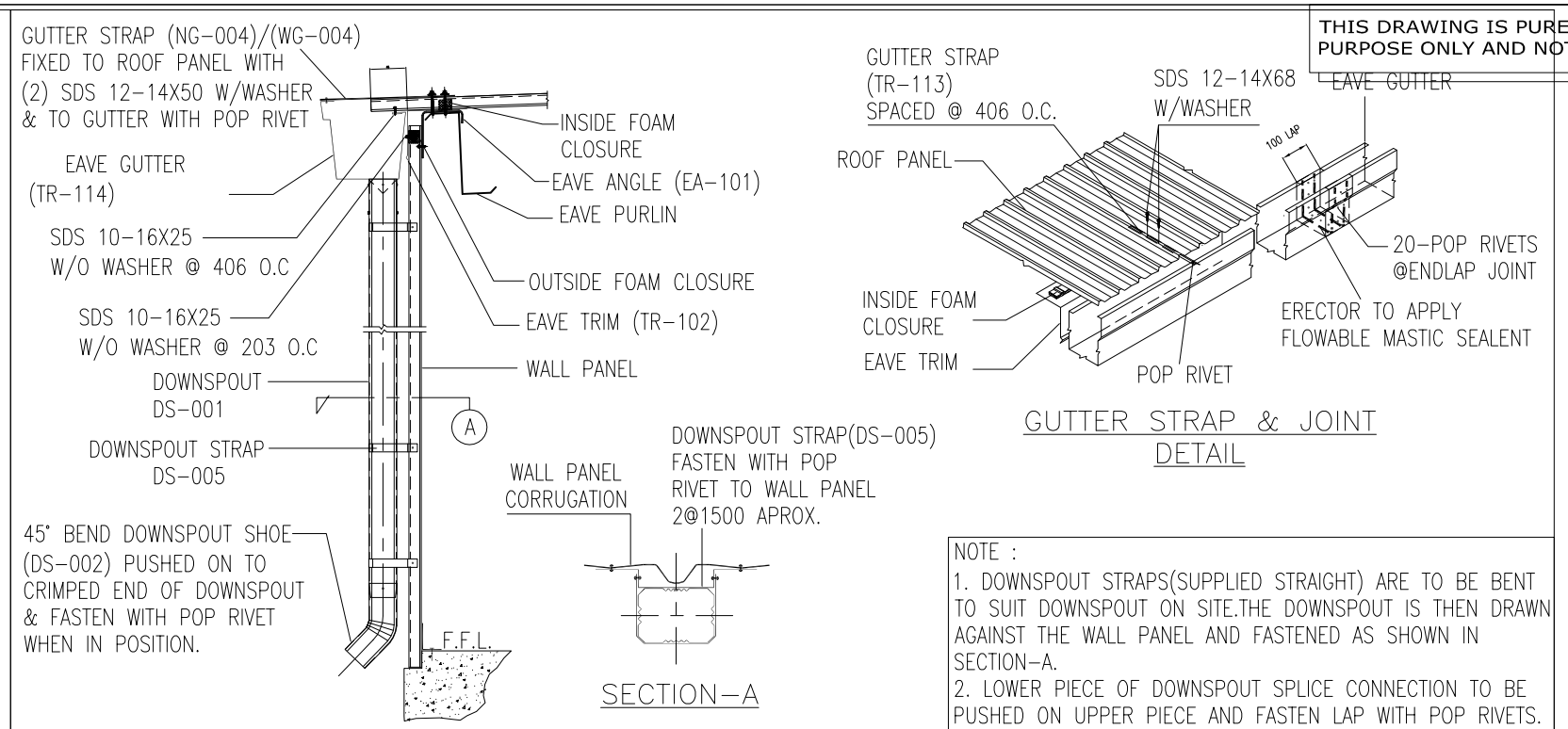
JOB SITE LOCATION : ENQ/WB/1735B		
QUOTE NO : Kolkata		REV: 0
DRG NO : E5	SCALE : NTS	
DRN : NMT	DATE : 26.04.17	
CHK : NMT	REV DATE : 00.00.00	
DSN : WAQ	SENT ON : 26.04.17	A3

TBSL/BPD-ENGG/FORM/007(R1)

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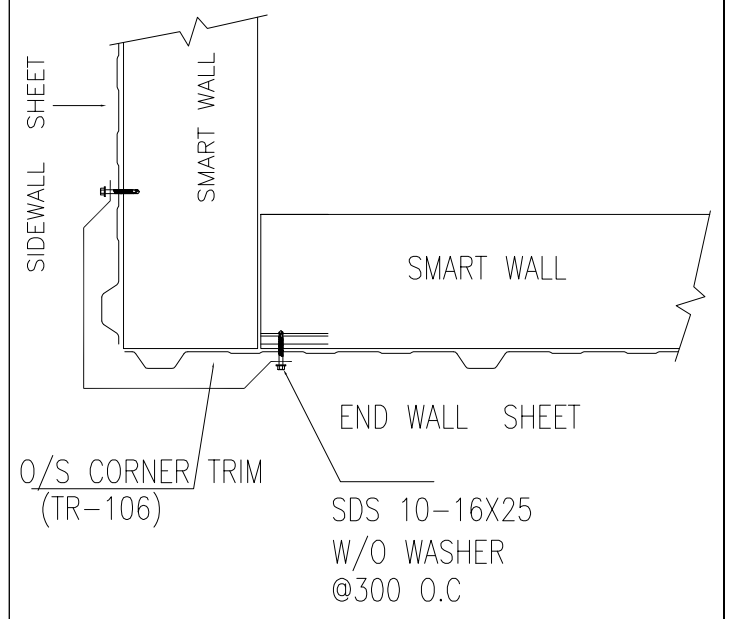


SHEETING DETAIL AT WALL

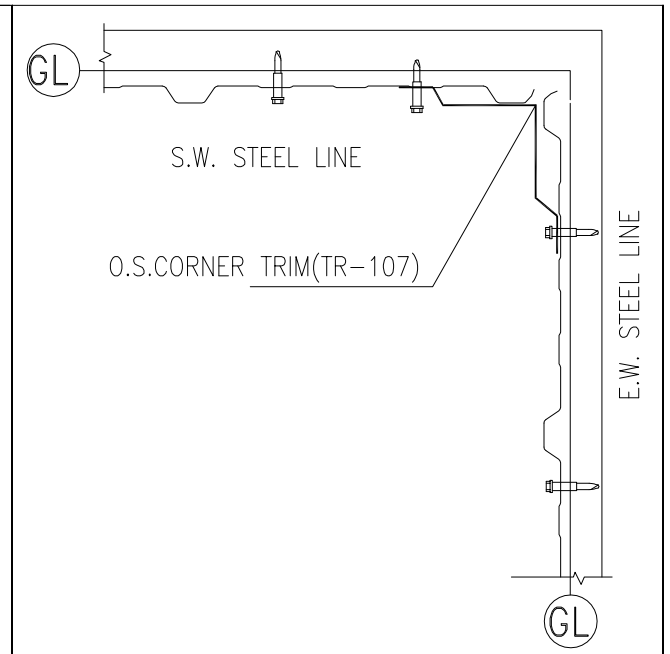


NOTE :
1. DOWNSPOUT STRAPS(SUPPLIED STRAIGHT) ARE TO BE BENT TO SUIT DOWNSPOUT ON SITE.THE DOWNSPOUT IS THEN DRAWN AGAINST THE WALL PANEL AND FASTENED AS SHOWN IN SECTION-A.
2. LOWER PIECE OF DOWNSPOUT SPLICE CONNECTION TO BE PUSHED ON UPPER PIECE AND FASTEN LAP WITH POP RIVETS.

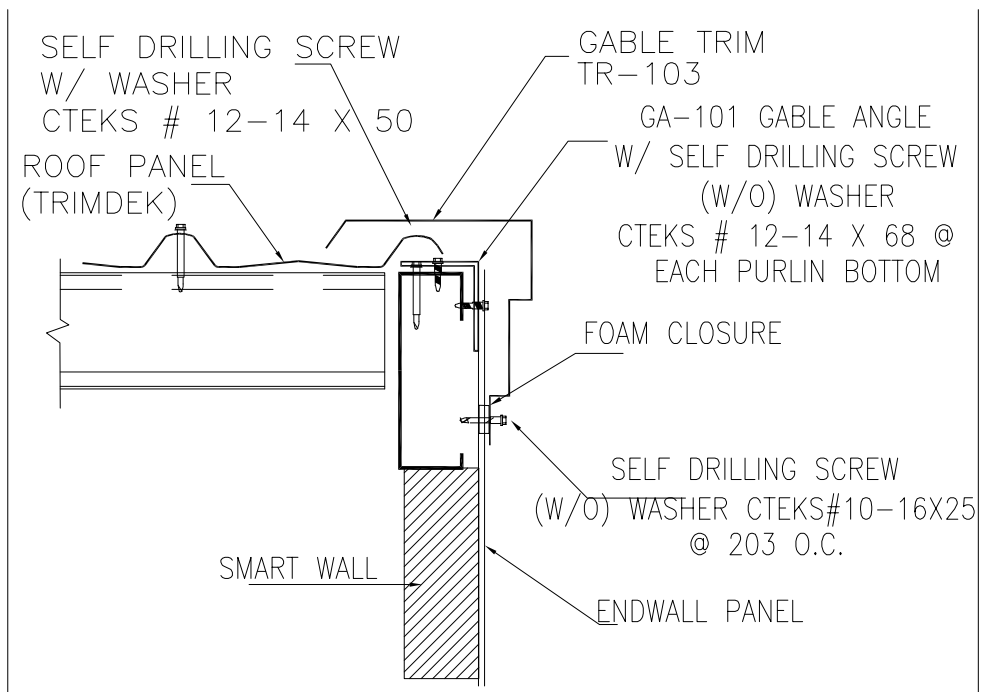
GUTTER & DOWNSPOUT INSTALLATION AT FULLY SHEETED SIDEWALL



O/S CORNER TRIM DETAIL



I.S.CORNER DETAIL



GABLE DETAIL

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D :	XXXX (W) X	XXXX (H)	(00 NOS)
EX. :	XXXX (W) X	XXXX (H)	(00 NOS)
W :	(W) X	(H)	

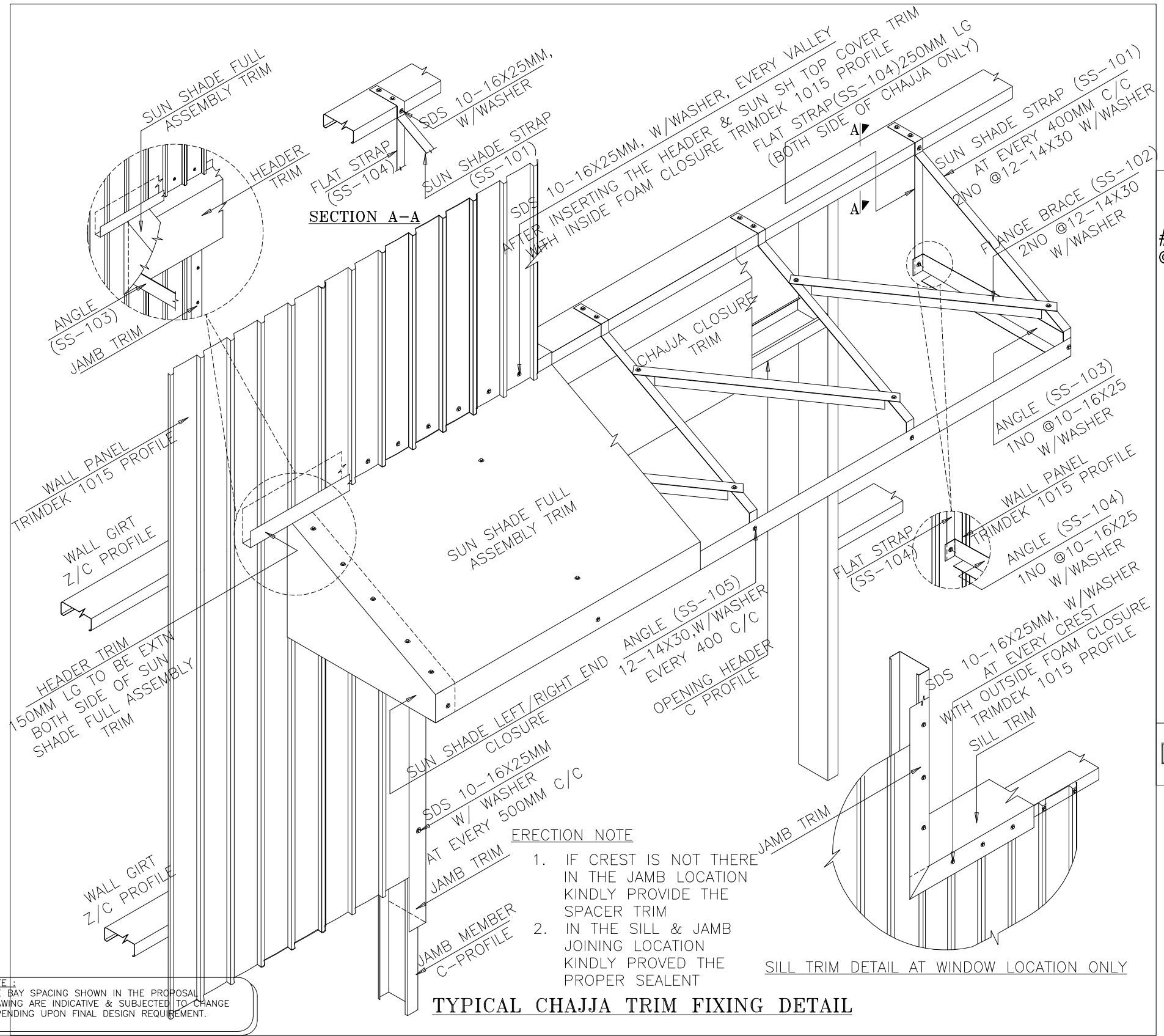
PROJECT NAME:
Toilet Block for Labours-BHEL

DRAWING TITLE:
PROPOSAL DRAWING

JOB SITE LOCATION : ENQ/WB/1735B		
QUOTE NO : Kolkata		REV: 0
DRG NO : E6	SCALE : NTS	
DRN : NMT	DATE : 26.04.17	
CHK : NMT	REV DATE : 00.00.00	
DSN : WAQ	SENT ON : 26.04.17	A3

TBSL/BPD–ENGG/FORM/007(R1)

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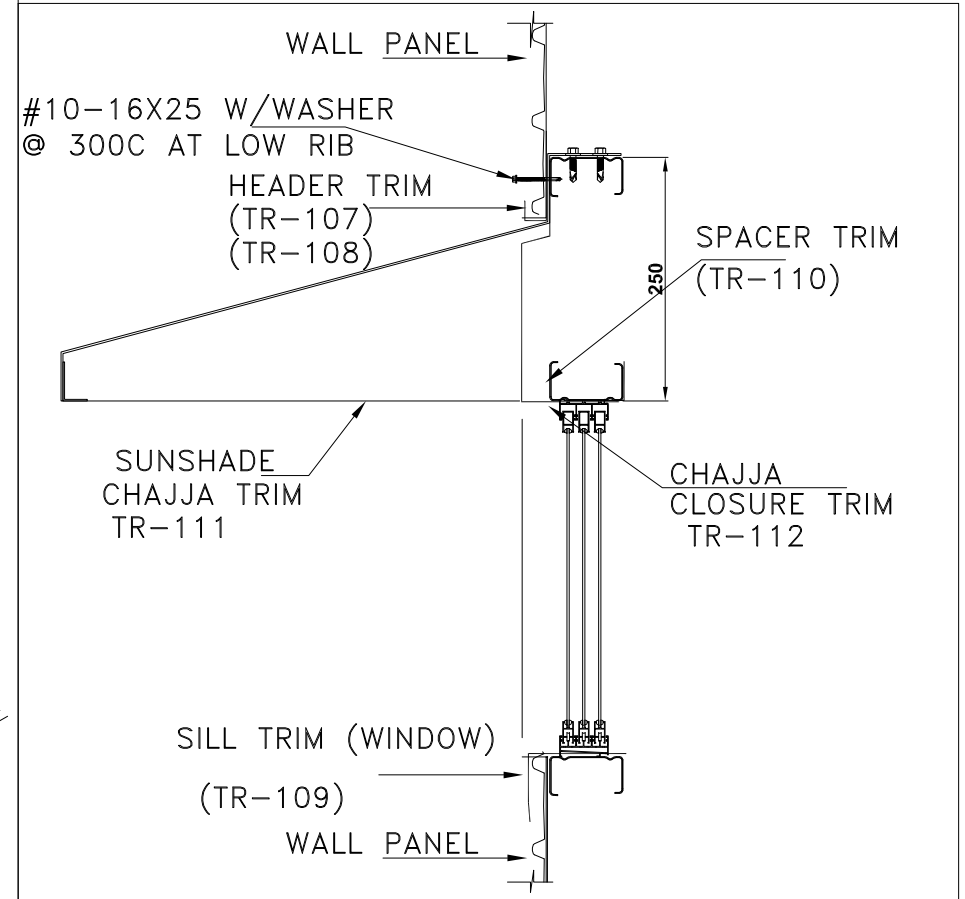
ERECTION NOTE

1. IF CREST IS NOT THERE IN THE JAMB LOCATION KINDLY PROVIDE THE SPACER TRIM
2. IN THE SILL & JAMB JOINING LOCATION KINDLY PROVED THE PROPER SEALENT

SILL TRIM DETAIL AT WINDOW LOCATION ONLY

TYPICAL CHAJJA TRIM FIXING DETAIL

NOTE :
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DOOR/WINDOW/LUV. CHAJJA DETAIL (TYP.)

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D :	XXXX (W) X	XXXX (H)	(00 NOS)
EX. :	XXXX (W) X	XXXX (H)	(00 NOS)
W :	(W) X	(H)	

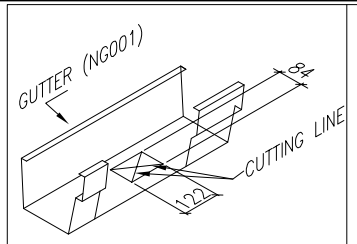
PROJECT NAME:
Toilet Block for Labours-BHEL

DRAWING TITLE:
PROPOSAL DRAWING

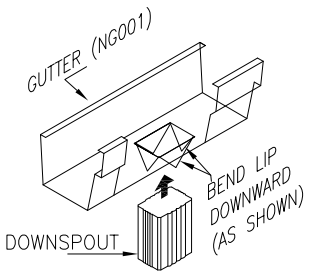
JOB SITE LOCATION : ENQ/WB/1735B		
QUOTE NO : Kolkata		REV: 0
DRG NO : E7	SCALE : NTS	
DRN : NMT	DATE : 26.04.17	
CHK : NMT	REV DATE : 00.00.00	
DSN : WAQ	SENT ON : 26.04.17	A3

TBSL/BPD–ENGG/FORM/007(R1)

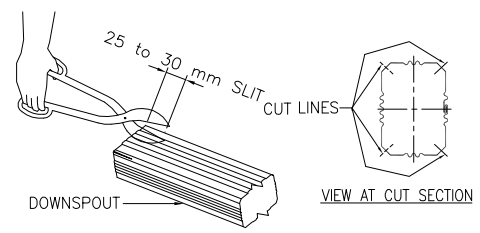
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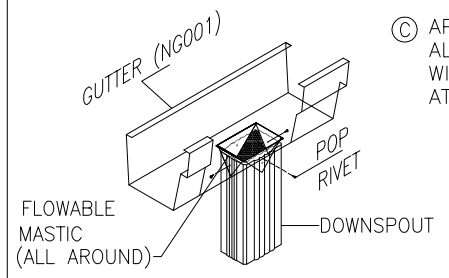
Ⓐ CUT EAVE GUTTER AS SHOWN.



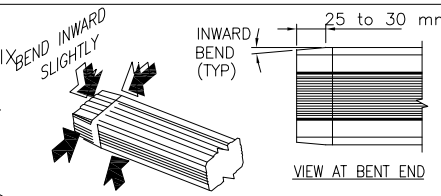
Ⓑ INSERT THE DOWNSPOUT TO THE GUTTER.



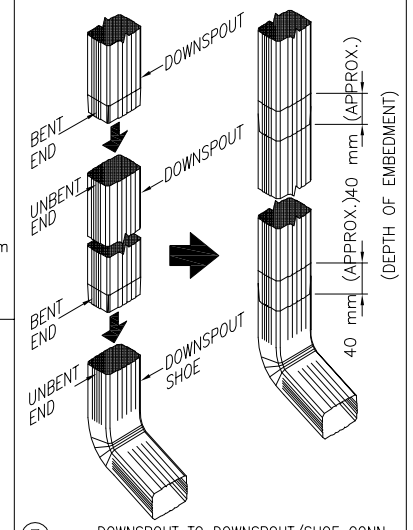
① SLIT AT FOUR CORNERS OF THE DOWNSPOUT UP TO 30mm AS SHOWN ABOVE.



Ⓒ APPLY FLOWABLE MASTIC ALL AROUND AND ALSO FIX WITH ONE POP RIVET AT EACH SIDE AS SHOWN.

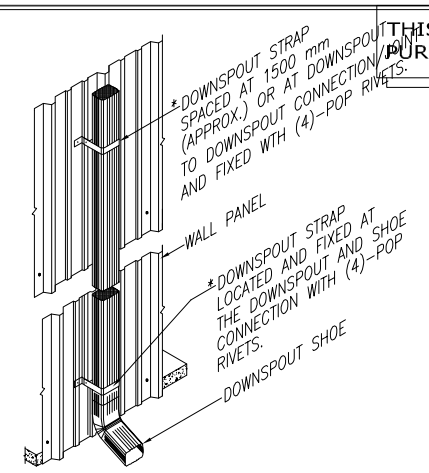


② SLIGHTLY BEND INWARD ALL FOUR SIDES OF THE SLITTED END AT AN APPROPRIATE ANGLE JUST ENOUGH FOR THE DOWNSPOUT TO SLIDE INTO ANOTHER DOWNSPOUT OR DOWNSPOUT SHOE AS SHOWN IN FIGURE 3.



③ DOWNSPOUT TO DOWNSPOUT/SHOE CONN.

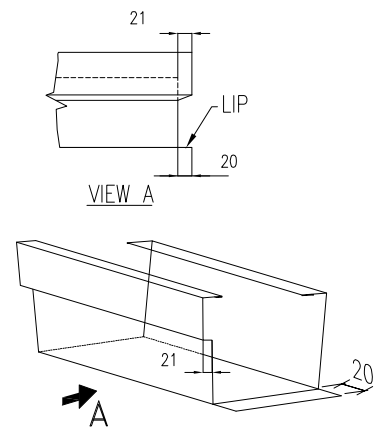
INSERT THE DOWNSPOUT INTO THE DOWNSPOUT AND/OR DOWNSPOUT SHOE.



④ THE ASSEMBLED DOWNSPOUT IS FIXED TO THE WALL PANEL USING DOWNSPOUT STRAP.

*FOR FIXING DOWNSPOUT STRAP TO WALL PANEL AND FOR QUANTITY OF POP RIVETS TO BE USE, SEE GUTTER AND DOWNSPOUT DETAIL.

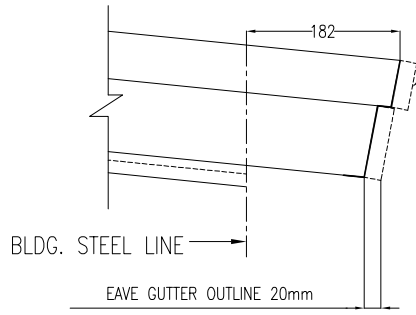
GUTTER AND DOWNSPOUT CONNECTION DETAIL



① CUT EAVE GUTTER AS SHOWN.

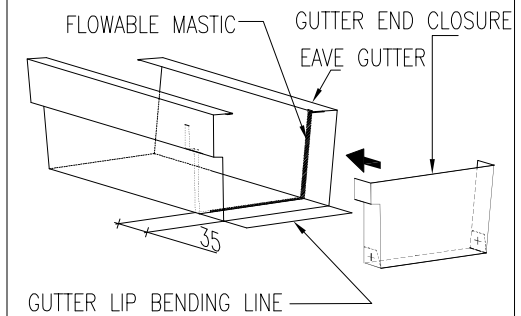
NOTES:

–DIMENSION SHOWN IS FOR 1:10 SLOPE & FOR NARROW GUTTER FOR OTHER SLOPES,–DIMENSION TO BE ADJUSTED.

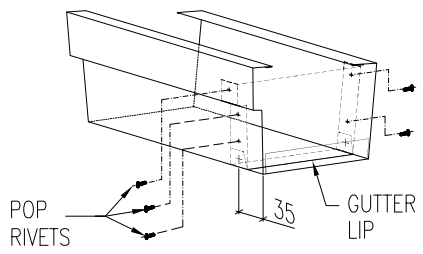


GABLE TRIM TOP TWO VERTICAL LEGS NEED TO BE EXTENDED TO COVER EAVE GUTTER AND 20MM LIP (EXTRA LENGTH) TO BE PROVIDED TO FOLD AND RIVET WITH EAVE GUTTER WALL.

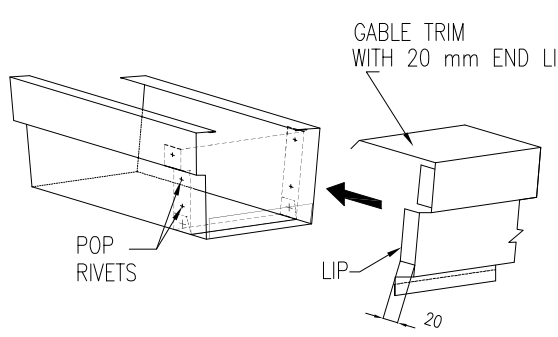
② CUT GABLE TRIM AS SHOWN.& EAVE GUTTER OUTLINE



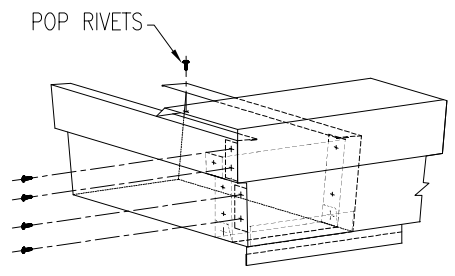
③ APPLY FLOWABLE MASTIC INSIDE EAVE GUTTER AND INSERT END CLOSURE.



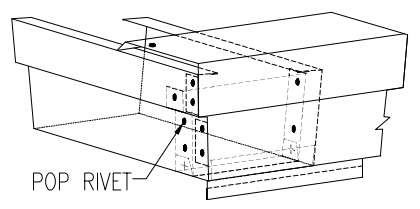
④ FIX END CLOSURE TO EAVE GUTTER BY POP RIVETS AND BEND GUTTER LIP.



⑤ CONNECT GABLE TRIM TO EAVE GUTTER.



⑥ FIX GABLE TRIM TO EAVE GUTTER BY POP RIVETS.



⑦ FINAL ASSEMBLY.

EAVE GUTTER & GABLE TRIM CONNECTION DETAIL

NOTE :
THE BAY SPACING SHOWN IN THE PROPOSAL DRAWING ARE INDICATIVE & SUBJECTED TO CHANGE DEPENDING UPON FINAL DESIGN REQUIREMENT.

PRODUCT : PEB LITE

NOTE : FOR OTHER DETAILS REF. DESIGN DATA SHEET

EZYBUILD®
TATA BLUESCOPE BUILDING PRODUCTS

TATA Bluescope Steel Ltd.,
Survey No. 247 & 250
Hinjewadi, Taluka Mulshi,
Pune – 411 057 (India)
Tel : +91 20 6674 2000
Fax : +91 20 6674 2001

LEGEND:

NSW –	NEAR SIDE WALL ELEVATION
FSW –	FAR SIDE WALL ELEVATION
LEW –	LEFT END WALL ELEVATION
REW –	RIGHT END WALL ELEVATION
DFO –	DOOR FRAMED OPENING
RUD –	ROLL UP DOOR
VFO –	VENTILATOR FRAMED OPENING
WFO –	WINDOW FRAMED OPENING
NBTBSL–	NOT BY TBSL
RV –	ROTARY VENT

NOTES:–
1. ALL DIMENSIONS ARE IN MM.

D1 :	XXXX(W) X	XXXX (H)	(00 NOS)
D2 :	XXXX(W) X	XXXX (H)	(00 NOS)
D :	XXXX (W) X	XXXX (H)	(00 NOS)
EX. :	XXXX(W) X	XXXX (H)	(00 NOS)
W :	(W) X	(H)	

PROJECT NAME:
Toilet Block for Labours-BHEL

DRAWING TITLE:
PROPOSAL DRAWING

JOB SITE LOCATION : ENQ/WB/1735B		
QUOTE NO : Kolkata		REV: 0
DRG NO : E8	SCALE : NTS	
DRN : NMT	DATE : 26.04.17	
CHK : NMT	REV DATE : 00.00.00	
DSN : WAQ	SENT ON : 26.04.17	A3

TBSL/BPD–ENGG/FORM/007(R1)

THIS DRAWING IS PURELY FOR APPROVAL PURPOSE ONLY AND NOT FOR CONSTRUCTION

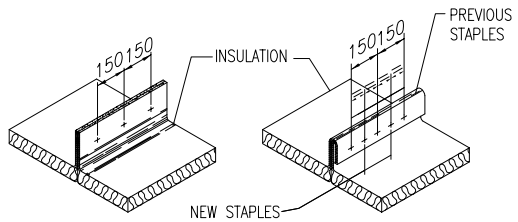


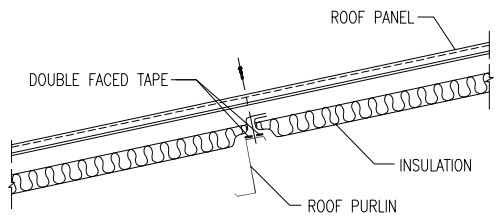
FIG. 1 FIG. 2

STAPLE PIN & STAPLER NOT BY TBSL

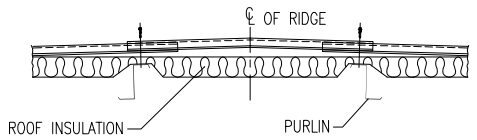
NOTE:

1. PULL TABS TOGETHER & STAPLE AT APPROX. 150mm ON CENTERS ALONG FULL LENGTH AS SHOWN IN FIG.1
2. FOLD TABS OVER & STAPLE THRU FOLDED TABS BETWEEN PREVIOUS STAPLES AS SHOWN IN FIGURE 2.

INSULATION SIDE LAPPING DETAIL

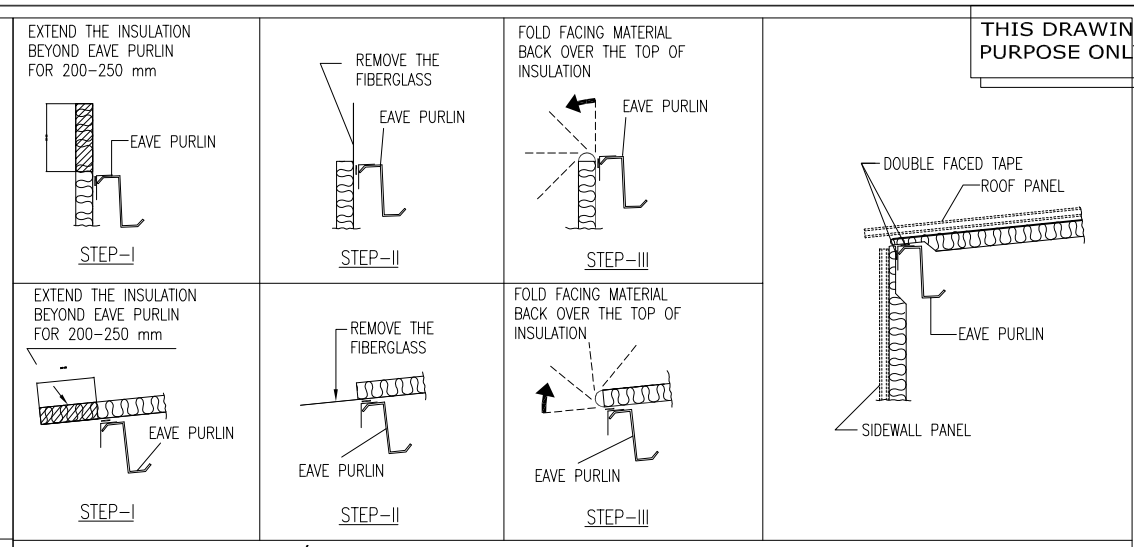


INSULATION END LAP

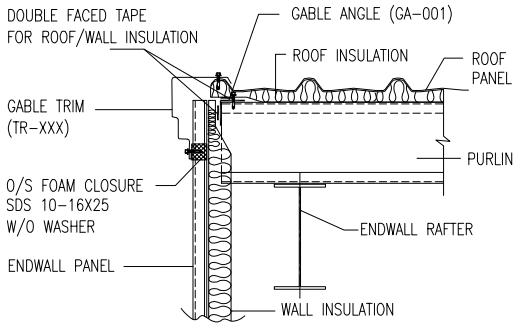


INSULATION AT RIDGE

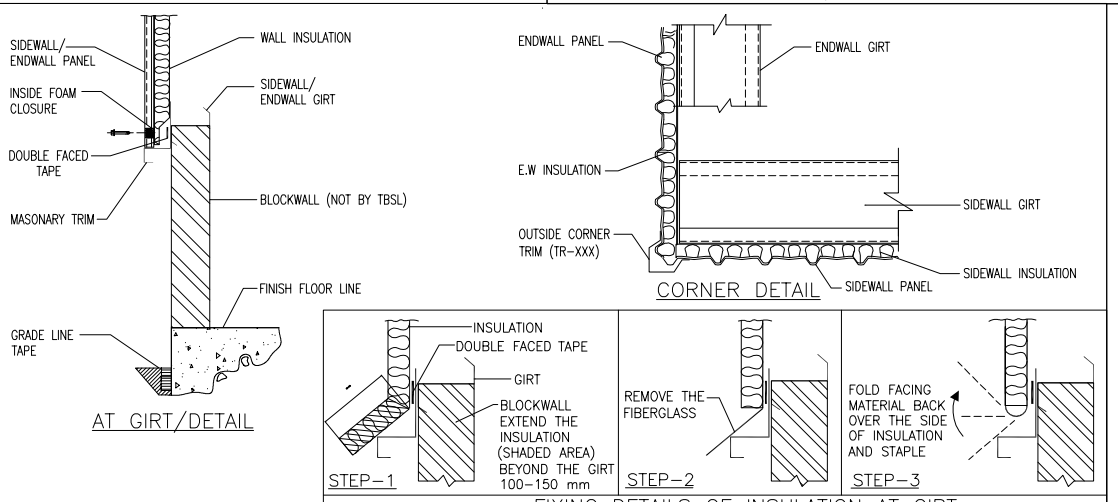
INSULATION DETAIL AT END LAPPING



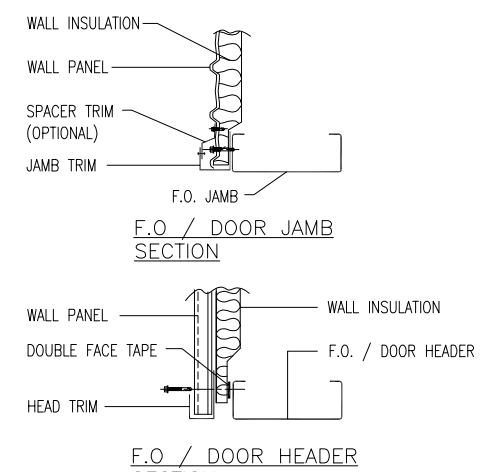
WALL/ROOF INSULATION DETAIL AT EAVE PURLIN



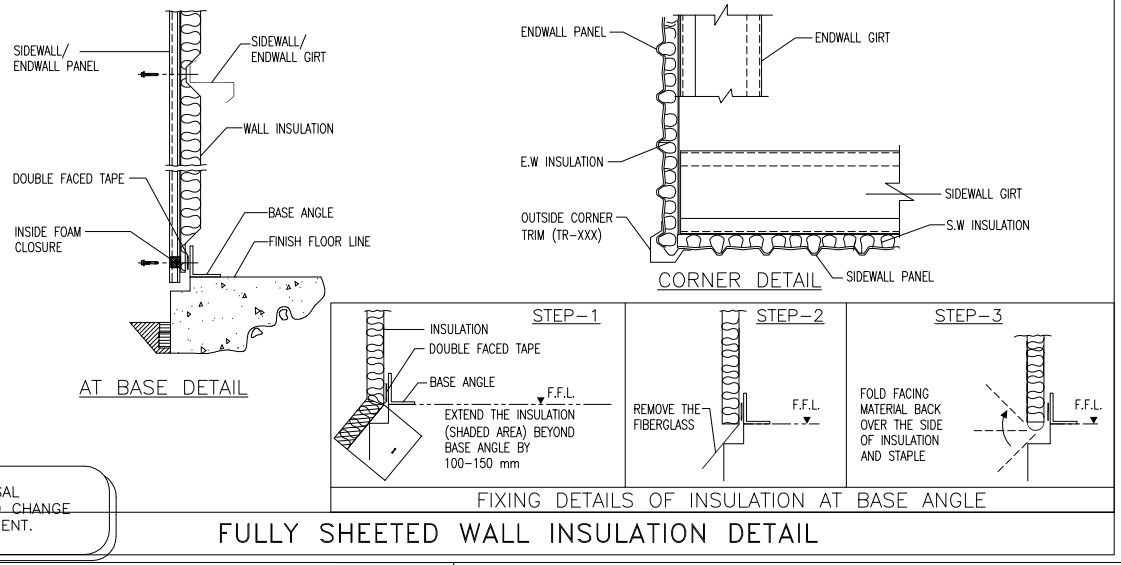
GABLE DETAIL W/ INSULATION



PARTIALLY SHEETED WALL INSULATION DETAIL



F.O. DETAIL W/ INSULATION



FULLY SHEETED WALL INSULATION DETAIL

NOTE :
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NOTE : FOR OTHER DETAILS REF. DESIGN DATA SHEET

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NBTBSL– NOT BY TBSL
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NOTES:–
1. ALL DIMENSIONS ARE IN MM.

D1 : XXXX(W) X XXXX (H) (00 NOS)
D2 : XXXX(W) X XXXX (H) (00 NOS)
D : XXXX (W) X XXXX (H) (00 NOS)
EX. : XXXX (W) X XXXX (H) (00 NOS)
W : (W) X (H)

PROJECT NAME:
Toilet Block for Labours-BHEL

DRAWING TITLE:
PROPOSAL DRAWING

JOB SITE LOCATION : ENQ/WB/1735B		
QUOTE NO : Kolkata		REV: 0
DRG NO : E9	SCALE : NTS	
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CHK : NMT	REV DATE : 00.00.00	
DSN : WAQ	SENT ON : 26.04.17	A3

TBSL/BPD–ENGG/FORM/007(R1)

APPROVED
Checked and Approved.

Date: 06-Jun-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

CABLE ERECTION PHILOSOPHY

REV.	DATE	ALTERED	CHECKED	APPROVED	NOTE
3	23.04.18	SKS	VY	SL	REVISED IN LINE WITH FICHTNER COMMENT DATED 27.02.2018 AND DISCUSSIONS HELD IN DRM AT PEM-NOIDA DATED 23.04.2108
2	29.11.17	SKS	VY	SL	REVISED IN LINE WITH MOM BETWEEN BIFPCL, FICHTNER AND BHEL-PEM, DATED 07-11-2017 TO 10-11-2017
B	05.07.17	SKS	VY	SL	REVISED IN LINE WITH FICHTNER COMMENT DATED 09.08.2017

PROJECT

2x660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH
(EPC MAIN PLANT PACKAGE)

OWNER CONSULTANT:

FICHTNER
Consulting Engineers Limited

M/s FICHTNER GmbH & Co KG,

Stuttgart,GERMANY

OWNER:

BANGLADESH–INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

	DATE	NAME
DRAWN BY		*MKM*
DESIGN BY		*MKM*
CHECKED BY		*AB*
APPROVED BY		*SL*

SUPERSEDES:

SUPERSEDED BY:

SYSTEM:

SCALE:

SHEET 1 *OF* 12

TITLE

CABLE ERECTION PHILOSOPHY

SIZE:

PROJECT NO.: 421

ANNEX:

DOCUMENT NO.: Maitree-00-BTW-EDB-105002-PEM

REV 3

SIZE-A4

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Date: 06-Jun-2018

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Scope

1.1 This document is intended to cover the aspects of cable raceway design and installation, laying and termination of various types of cables for main power house and auxiliary plant areas of the project.

1.2 Design calculations for cable sizing and selection & design memorandum for fire sealing system are covered in a separate document.

1.3 Latest revisions of all drawings / documents (i.e. reference documents as listed in Cl. No. 1.4 and all Electrical Equipment & Cabling Layout drawings) shall be referred.

1.4 Reference standards/ documents.

1) IEC 61537 - Cable management systems- Cable tray systems and cable ladder systems

2) Drg. No. MAITREE-00-BTW-EDB-105003-PEM (Typical details of Cable Trays And Accessories)

3) Drg. No. MAITREE-00-BTW-EDB-105004-PEM (Installation details for Cable Tray support system)

4) IEC 60364: Low-voltage electrical installations

5) Doc. No. MAITREE-00-BTW-EDB-105006-PEM (Design Memorandum for Cable Fire Sealing System)

6) Doc. No. MAITREE-00-BTW-EDB-105014-PEM (Design Calculations For MV Cables Selection & Sizing)

7) Doc. No. MAITREE-00-BTW-EDB-105026-PEM (Design Calculations For LV Cables Selection & Sizing)

8) General Technical Specification (B0.6.18.12.1 and B0.6.18.12.9)

9) Electricity Grid Code of the Bangladesh Energy Regulatory Commission.

2.0 Cable Raceway System

2.1 Cables shall generally be laid in galvanised MS cable trays in multi-tier arrangement. Cable trays, for indoor installations hot dip galvanized material with an average coating thickness according to ASTM A123/123M shall be used. The trays shall in turn be supported on flexible cable tray support systems in cable vaults, along structural members/ concrete surfaces inside plant buildings, cable trenches below switchboards/ MCCs in auxiliary plant buildings, and interconnecting pipe-cum-cable trestles. The trays shall be fixed to supports by means of bolting. Clamping of trays to the cantilever arms shall be resorted to where due to fabrication mismatches, there are misalignments between the respective locations of holes in trays and the cantilever arms. Cable trays shall be fixed to the horizontal/vertical arm of supporting

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structure as per the reference drawings at serial no. 1.4(3) above. Cables can be routed through cable duct bank wherever required.

2.2 The pull pit and duct bank arrangement shall be used for carrying cables as per requirement; these will be restricted to maximum interval of 30 meters. For isolated & long outdoor cable route with very few cables, the cables can be directly buried.

2.3 Generally cable trays shall be oriented horizontally in all areas, except in areas subject to coal dust or ash deposition (such as boiler platforms etc). Cable trays may be oriented vertically in other areas also if so required due to reasons such as space restriction, accessibility, plant aesthetics, operational clearances, etc. as per approved layout drawings.

2.4 All cable trays used in power plant shall be ladder type, however for laying of instrumentation cables the perforated type cable trays shall be used.

2.5 In outdoor areas & battery rooms the fibre reinforced plastic (FRP) type cable trays shall be used.

2.6 Horizontally laid FRP trays located outside buildings shall be provided with cable tray cover. The cable tray cover shall be provided on top most cable tray. The material of cable tray cover shall FRP with 3 mm thickness.

2.7 Vertical cable shafts, whenever routed through switchgear/ MCC rooms, will be enclosed with 1.6 mm thick perforated type hot rolled MS sheet Cover upto height of 1M, after completion of cabling.

2.8 Cable trays shall be generally ladder type of widths 600mm, 450 mm, 300 mm,150 mm. Perforated type cable trays of 600mm, 450mm, 300 mm, 150 mm, 100 mm and 50mm size.

2.9 Suitable cable tray accessories such as horizontal and vertical bends, crosses, tees, reducers etc. shall be used in conjunction with straight runs of cable trays wherever required as per approved layout drawings to ensure a continuous and break-free tray support system for cables. Tray accessories shall be generally factory fabricated. However the same may also be fabricated at site from the straight length of respective sizes if required.

2.10 The cable trays & accessories shall be of approved makes, and generally conforming to reference drawing at 1.4 (2). Minor fabrication differences (which do not affect the overall dimensions of the trays) due to specific manufacturing practices of different trays manufacturers shall be acceptable.

2.11 Cable trays of width 600 mm shall be subjected to deflection test as under: -

A 2.5 metre straight section of cable trays shall be simply supported at the two ends. A uniformly distributed load of 100 Kg per meter for 600mm tray will be applied along the length of the tray. The maximum deflection at the mid span shall not exceed 2.5 mm per 1.5 meter.

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2.12 The flexible cable tray support system shall comprise of galvanised MS single channel (C1) or double channel (C2) members as main supports, to which galvanised MS cantilever arms of sizes commensurate with the tray being supported shall be fixed by means of spring nuts. Along overhead cable tray paths employing trays installed in vertical orientation, trays may be fixed directly to the vertical channel supports (e.g. along cable trestles) through bolting/ clamping.

2.13 Cable tray risers in plant buildings shall be supported on cage structures made from double channels as vertical members along the four vertices of a rectangle and single channel horizontal members connected to the vertical members at every 1000mm. Each tray of the risers will be fixed directly to one horizontally fixed single channel available at every 1000mm within this cage.

2.14 The main supports (single/ double channels) shall be fixed to concrete/ steel surfaces by means of clamps/ brackets with spring nuts. The clamps/ brackets shall be fixed to the corresponding surfaces as permitted by site conditions in any of the following ways as per approved Document No. MAITREE-00-BTW-EDB-105004-PEM, Installation Details for Cable trays Support System (Boltable type) :

a) Fixed with anchor bolts directly to concrete surface
c) Clamped to steel structural members

2.15 Horizontal runs of cable trays shall be supported at intervals of 1500mm approximately. Vertical runs (risers) shall be supported at approximately every 1000mm interval. A spacing of 300mm will be maintained between cable trays for cable laying convenience and effective heat dissipation. However, wherever layout constraints do not permit this spacing, the same may be reduced to 250mm, for trays carrying control and instrumentation cables.

2.16 The cable tray numbering shall be provided at every 30 meter and at each end of cable tray & branch connection.

2.17 The cable tray & cable riser of less than 20 meter length have to be earthed once. Continuous Steel Cable tray section with length more than 20 meter have to be earthed twice. Cable tray earthing is not applicable for FRP type cable trays.

2.18 Cable trays, for indoor installations hot dip galvanized material with an average coating thickness according to ASTM A123/123M shall be used. All galvanisation damaged due to cutting/ welding operation required to be carried out for the installation of the support system at project site, cable trays & accessories shall be made good with application of two coats of cold galvanisation paint.

2.19 For laying cables along concrete walls, ceilings, building steel structures or masonry structures etc., the cables shall be clamped with GI saddles screwed to the GI flats welded to the inserts. Where inserts are not available the saddles may be directly fixed to the walls using anchor bolts and NS flat spacer of min. 6 mm thickness.

2.20 Provisions of IEC 61537 shall be followed for cables buried directly in ground. For road/rail crossings, Hume/GI pipe buried pipes (at a depth of minimum 800 mm) shall be used. Alternatively, RCC duct banks may also be used. Buried cable routes shall have marker projecting 150 mm above ground and shall be spaced at an interval of

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30 m along the route and at every bend. Though directly buried cable shall generally be avoided and will be only used for street lighting; however specific approval shall be taken in other areas in case same is unavoidable due to layout constraint.

2.21 Local cabling near equipment shall be done using GI conduits/ cable pits/ local cable trays as per layout conditions.

2.22 The trays shall be stopped approximately 200mm short of the wall on both sides and cables passed through the opening. This method is adopted for smooth passage of cables and effective sealing of cable openings

2.23 Cables for redundant equipment shall be run in separate trays/ separate route, as far as possible.

2.24 Cables from two different services viz. supply from station board and supply from unit board shall be segregated to prevent simultaneous damage due to fire in one of the services

2.25 50/75mm wide galvanised cable troughs can also be used for installation of cables from main route to instruments /equipment terminal box

2.26 300/500/800 mm wide cable slits shall be provided in TG Hall, Transformer yard & BOP areas for local cabling.

2.27 For cable laying in BOP areas/ remote areas whenever existing structure or pipe rack is not available, pedestals shall be used.

2.28 Switchgear in the main plant building & ESP control room building will be located on RCC floors with a cable vault provided below each switchgear room. Cable vault in main power house shall have minimum height of 3.5mtrs. Switchgear in auxiliary plant buildings will generally be trench mounted, and located inside switchgear/ MCC rooms.

3.0 General Philosophy of Cable Installation

3.1 Laying, dressing, clamping and jointing/ termination process of power, control and instrumentation cables shall follow the requirements of IEC 61537.

3.2 All precautions as per IEC 61537 & Field Quality Plan (FQP) shall be taken while handling the cables.

3.3 For the purpose of cable laying, the cables are categorised as under:

a) Level 1: MV cables

b) Level 2: LV power cables, measuring and control cables at voltages above 60V

c) Level 3: power cables, measuring and control cables at voltages of 60 V and below

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3.4 All cables shall be provided with identification tags indicating the cable numbers in accordance with the cable circuit schedule. The aluminium metal cable tags shall be fixed at terminal ends, at tray intersection / bend and at each side of floor/ wall/ duct crossings etc and at every 20m in cable trench/tray or buried run.

3.5 Single core cables for a. c. three phase circuits, when laid on trays, shall be in trefoil formation (each trefoil with RYB phases formation), with each trefoil `D' apart from the next trefoil in the tray. 'D' is the diameter of cable. The trefoil formation shall be duly secured to the cable tray by means of trefoil clamps of nonmagnetic type (Aluminium/ Nylon-6 clamps) at every 1000 mm interval for vertical run and 1500 mm interval for horizontal run.

3.6 Multi-core cables 11/3.3 kV grade when laid on trays shall be in single layer in touching formation and clamped by means of self-locking type, fire resistance nylon cable ties.

3.7 1100 V grade cables as per details mentioned below shall be placed in single layer in touching formation and clamped by means of nylon cable ties.

a) Single core cables : 500 sq mm or higher (when not laid in trefoil formation- e.g. dc circuits)/ neutral cables)

b) Multi-core cables : 95 sq mm or higher

3.8 Control and instrumentation cables shall be laid in multi layers, but not exceeding three layers in any section. The Control/instrumentation cable cores shall be neatly bunched and served with nylon ties to keep it in position at the terminal block. Special purpose cables (e.g. IPB, WAN etc.) shall be laid as per system manufacturer/ supplier recommendations.

3.9 While power, control and instrumentation cables shall generally be laid in separate trays, low current carrying power cables (valve/ damper actuator power cables) may be laid along with control cables. In most such cases, the cable sizes shall be 2.5 sq mm; however, in a few cases higher sizes if required as per approved cable sizing calculations (due to voltage drop criterion) may be used. Separate trays are not envisaged exclusively for DC circuits.

3.10 Cables shall be placed on trays on the basis of their types and functions as under for horizontal formations:

a) HT cables: in the top tier(s) of ladder type trays.

b) LT power cables: in the ladder tray(s) below the HT cable trays.

c) Control cables: in the ladder tray(s) next below to the LT power cable tray(s).

d) Instrumentation cables (screened control cables): in perforated tray below ladder type cable tray of control cable.

3.11 For vertical formations, the outermost tray shall be considered as the topmost tray and the order as indicated shall be followed. In rare cases, where there is no clear distinction of bottom/ top trays, the order convenient for linking the horizontal and

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vertical formations avoiding criss-crossing, or exit of cables shall be followed. Typical examples of tray numbering are given overleaf.

3.12 Wherever it is not possible to accommodate cables as per the criteria indicated in the clauses 3.10 & 3.11 (due to layout constraints) for very short field runs, control cables may be laid in the same tray with the instrumentation cables with clear minimum gap of 100mm between the two types of cables.

3.13 To facilitate pulling of cables in conduits, powdered soft stone, plastic soap or other dry inert lubricant may be used where required. However any material harmful to the cable sheaths or which represent an environmental risk shall not be used.

3.14 No single core cable shall pass through a GI conduit/ pipe or duct singly except DC single core cables. AC single core cables shall pass through GI conduit/ pipe in trefoil formation only, or through PVC pipes. Conduit/pipe occupancy (ratio of total cable area to conduit area shall not exceed the following: -

1) One Cable: 53 %

2) Two Cables: 31 %

3) Three Cables & Up: 40 %

Exposed pipes/ conduits if used in corrosive areas shall have anti-corrosive coating both inside & outside. When choosing the size of conduits/pipes or ducts, care must be taken that sufficient ventilation is available and that there is no possibility of thermal overheating, or strain on the cables.

3.15 Conduits/ steel pipes shall be of mild steel, heavy duty class, hot dip galvanised, furnished in standard length of 5 metres as per IEC 60423 standard.

3.16 Wherever specific cable routes are not shown in cable schedules, cables may be laid through the shortest route as per the above criteria, as directed by site Engineer.

3.17 Cable clamping spacing for cables laid in cable trays shall be generally as under:

(a) <u>Aluminium/ Trefoil clamps (Nylon-6 clamps):</u>

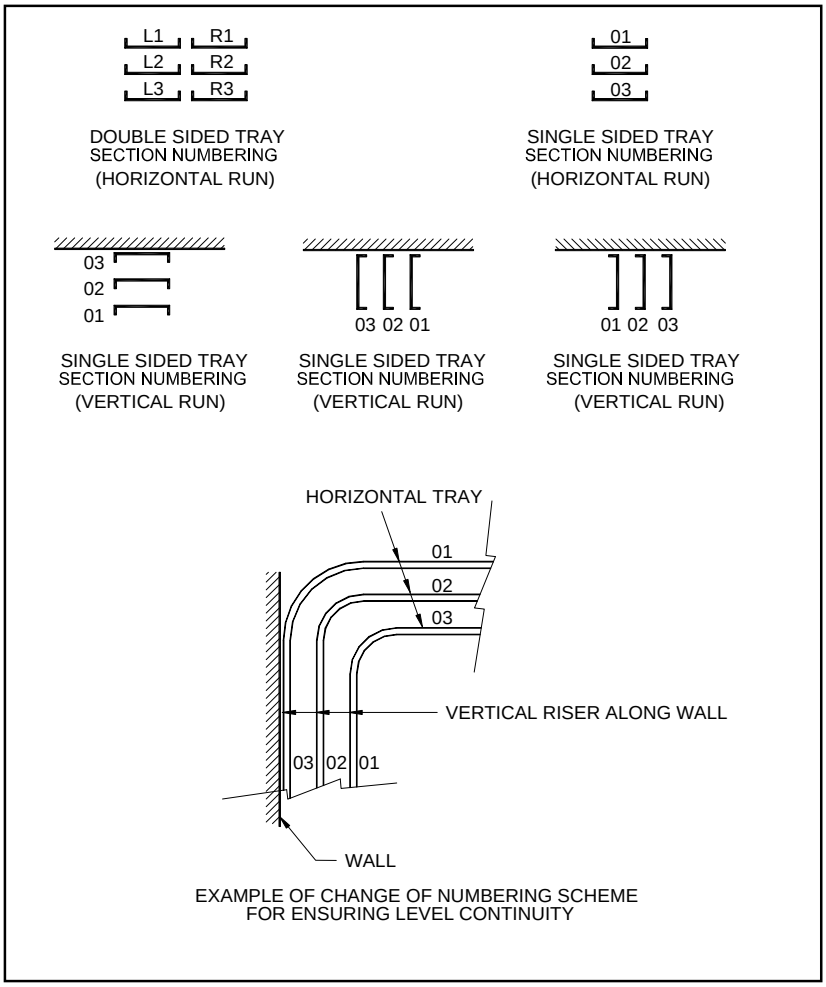
1) Horizontal run spacing: 1500 mm (max.)

2) Vertical run spacing: 1000 mm (max.)

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Date: 06-Jun-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.



(b) Other Clamps (Nylon ties etc.)

1. Power cables of sizes indicated under

(i) Single core cables: 500 sq mm or higher

(when not laid in trefoil formation- e.g. dc circuits)

(ii) Multi core cables: 95 sq mm or higher

Horizontal runs: Individually tied at 1500 mm interval (max.)

Vertical runs: Individually tied at 1000 mm interval (max.)

2. Power cables of other sizes

Horizontal runs: Collectively clamped at 1500 mm interval (max.)

Vertical runs: Collectively clamped at 1000 mm interval (max.)

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3. Control Cables

Horizontal runs:	Collectively clamped at 1500 mm interval (max.)
Vertical runs:	Collectively clamped at 1000 mm interval (max.)

3.18 Clamp spacing for cables supported directly along structure/ ceiling shall be as under:

a) Clamp spacing

1. In horizontal runs: 1500 mm (max.)

2. In vertical runs: 1000 mm (max.)

b) Spacing between cables: 30 mm (min.)

c) Supports shall also be provided at each bend.

3.19 5% extra space for additional cable trays for future use, shall be provided in present cable route.

3.20 The control and communication cables must be laid sufficiently apart from the power cables so that no interference will occur and the transmission of fault signals is excluded. For this purpose the following minimum separations are to be observed

a) 300 mm between low voltage power cables and measuring and control cables at voltages of 60V and below.

b) 300 mm between power cables and measuring and control cables at voltages above 60 V,

c) 600 mm between medium voltage power cables and measuring and control cables at voltages of 60V and below.

3.21 When laying power cables, the radii should not be smaller than the values given by the cable manufacturer.

3.22 When laying power cables by machine, particular attention must be paid to the permissible tensile forces. The tensile force shall be calculated according cable manufacturers guidelines. If laid by machine for each cable line a printout shall be provided which verify the maximum pulling force appeared for the cable line.

3.23 Laying procedure shall be according to the grouping factor used in the cable calculation.

3.24 Sack of sands shall be used for temporary fire sealing of Wall/ floor penetrations of cable during cable erection.

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4.0 Cable Termination & Jointing

4.1 Termination and jointing of cables shall conform to the requirements of IEC 61537 and shall be carried out as per the recommendations of termination and jointing kit supplier. Cable terminations at various electrical and electronic equipment terminals shall be done as per approved scheme/ interconnection diagrams.

4.2 All cable entries in the equipment shall be sealed by cable glands supplied with the equipment. When the equipment are supplied with undrilled gland plates for cable/ conduit entry into the equipment, all drilling & cutting on the gland plate and any minor modification work required to complete the job shall be carried out at site as per cable glanding requirement. Types of glands to be used are as under.

I. Material: Tinned brass conforming to BS: 6121

II. Type: Double compression

4.3 Termination of cables shall be done as per termination drawings & interconnection diagrams furnished. Shorting & looping of cores/ wires at terminals and between the panels if required shall be carried out as per approved scheme.

4.4 HT power cable termination kits / jointing kits shall be of heat–shrinkable /pre moulded /Push on / Cast resin/ Elastic mould type, tested as per Equivalent IEC standard.

4.5 Termination of copper conductor cables shall be done as indicated below:

ii) Copper conductor cable:- Copper tubular terminal end for solderless crimping to copper conductor.

iii) Copper conductor control cables:- Copper Cable lugs for control cable termination shall be PVC insulated/ sleeved type. The Material for lugs will be tinned copper only. Lugs for control cable shall be insulated & terminal shall be pin type/ flat type/ ring type / U type to suit terminal provided at panels.

4.6 Screened control cables of small cross sectional area, (0.5 sq mm) shall be terminated by means of cage clamp termination system.

4.7 Individual cores of control cables shall have ferrules for identification. Ferrule numbers shall be provided as per the control schemes and other related documents.

4.8 Junction boxes may be used, wherever required, for jointing/ marshalling of control and instrumentation cables.

5.0 Grounding of Cabling System

5.1 Armour grounding:

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a) Armour of the HT cables and LT single core cables shall be grounded only at one end of cable preferably the source end. However for route length of more than 500m these cables shall be grounded at both ends.

b) Armour of other cables shall be grounded at both ends of cable.

5.2 Screen Grounding:

a) Screen of multi-core cables shall be grounded at both ends.

b) Screen of single-core power cables shall be grounded at one end. However for route length of more than 500m these cables shall be grounded at both ends.

c) Screen of electronic grounding system cables shall be grounded as per the Control System panel manufacturer recommendation.

6.0 Testing Of Cable Installation

6.1 Testing and electrical measurement of cable installations shall generally conform to the requirement of IEC 60502 & shall be listed below.

6.2 Prior to installation, cables shall be tested for

a) Continuity of conductors for all cores of cables.

b) Insulation resistance between conductors and earth.

c) Insulation resistance between conductors of multi core cables.

6.3 Pre installation checks for cable tray installation shall be as under:

a) Availability of clear passage/ path for the cable tray network as per approved drawings.

b) Cold galvanisation paint treatment for all damaged portions of galvanisation due to cutting / repairs etc.

c) Correctness of installation of number and type of tray / tray accessories /support material as per approved drawings.

d) Firmness/ tightness of all welded joints.

e) Alignment / inter tray separation as per approved layout drawings.

f) Grounding connections for trays / cable boxes / marshalling boxes.

6.4 After installation cables shall be tested for

a) Continuity of conductors for all cores of cables.

b) Insulation resistance between conductors.

c) Insulation resistance between conductors & earth.

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d) Check for earth continuity for armour / screen (where applicable), and proper earth connection for cable glands, cable boxes etc.

e) DC High voltage test (for all HT cables & LT power cables of sizes 300 sq. mm and above). :-All HT power cables after installation and prior to connections shall be subjected to high potential tests. Also the insulation resistance values shall be measured both before and after high potential test for comparison. The leakage current shall also be measured during the high potential test.

f) Check for correct polarity & phasing of cable connections

g) Firmness/ tightness of terminations.

h) For correctness of all connections as per relevant wiring diagram.

i) For provision of correct cable tags, core ferrules etc.

6.5 All documents/ records regarding test data and all other measured values shall be duly vetted by the site Engineer before energizing the circuit and kept for future record and reference. The results of all tests shall conform to the specification requirements as well as any other specific performance guarantee.

6.6 Joints for less than 250m run of cables shall not be provided.

6.7 If the cables laid in ground requirements of B0.6.18.12.1 shall be fulfilled:

a. The cables must be laid at a depth of 0.8 m at least.
b. After excavating, first a layer of sand shall be filled in the trench.
c. On the sand the cables are laid separately from each other according to voltage systems.
d. The trench is filled with sand and covered with concrete covers or bricks finalized by a cable warning tape with the inscription "CAUTION BURIED HIGH VOLTAGE CABLE".
e. The thermal resistance of the backfilling shall not exceed 150 Kcm/W.
f. A ground temperature of 28 °C has to be considered for the design of the cables.

ABBREVIATIONS

- MS – Mild Steel
- MV – Medium Voltage
- LV – Low Voltage
- MCC – Motor Control Centre
- GI – Galvanised Iron
- RCC – Reinforced Concrete Cement
- FRP - Fibre Reinforced Plastic

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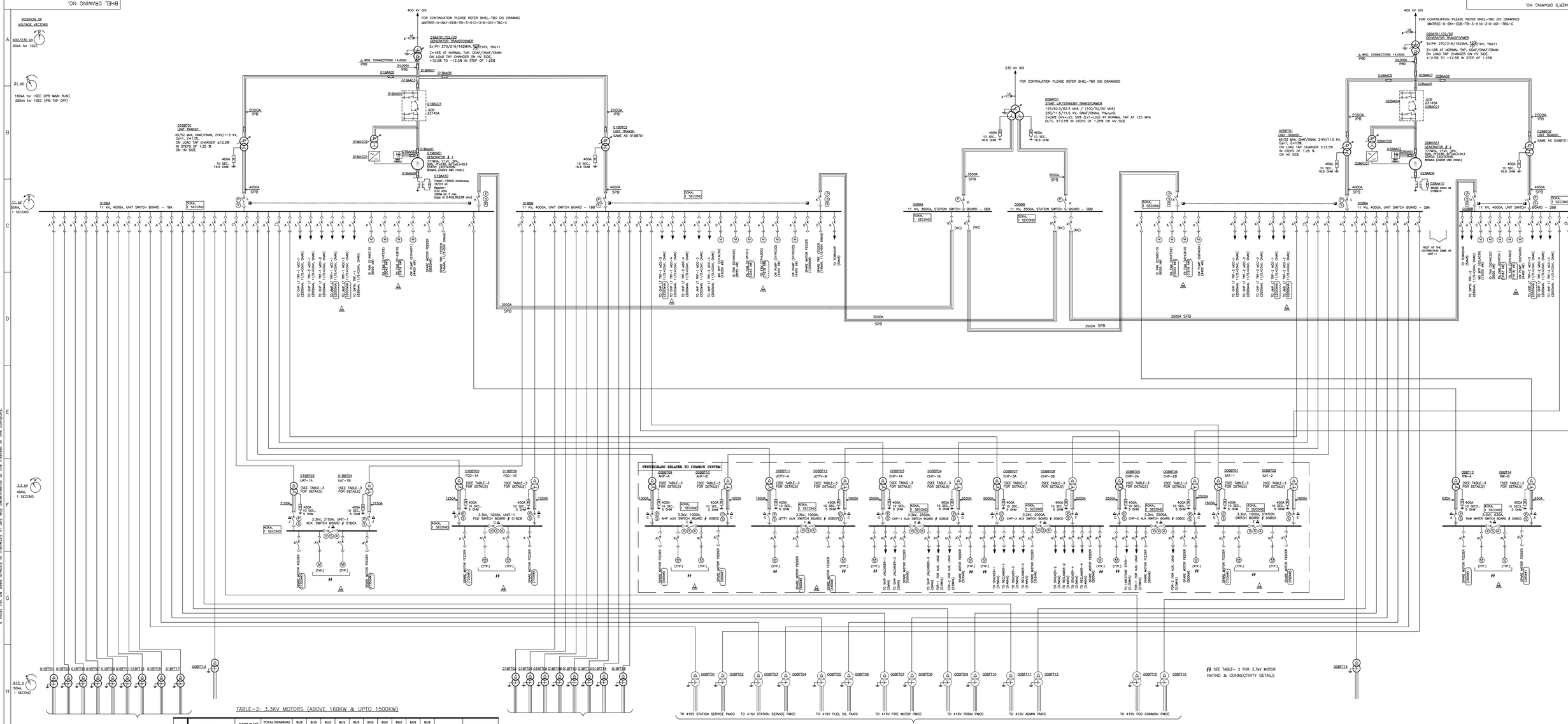
BHEL DRAWING NO. PE-DG-421-565-E001

CUSTOMER'S DRAWING NO.

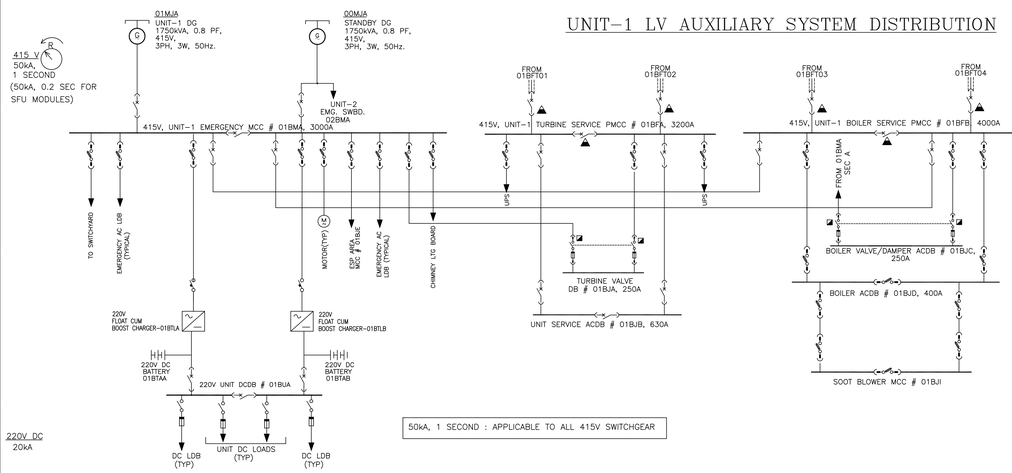
FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

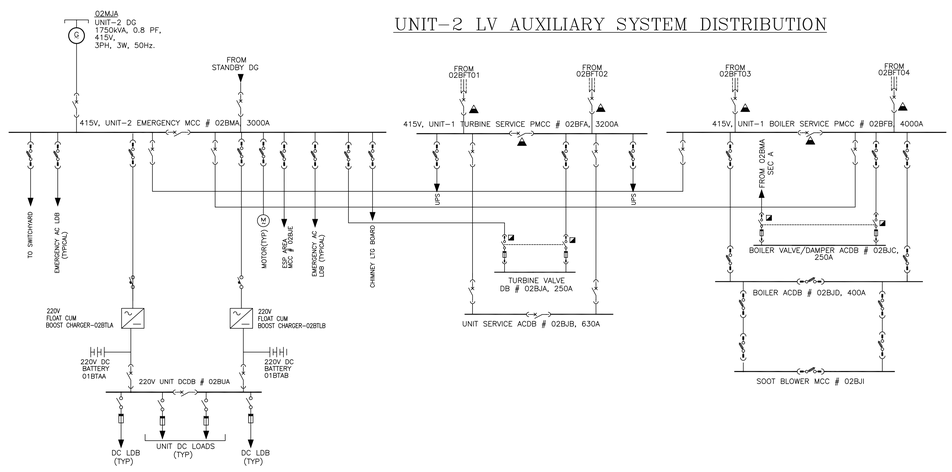
COMPUTER FILE NAME: PE-DG-K45-100-M001


POSITION OF VOLTAGE VECTORS
400 kV GIS
FOR CONTINUATION PLEASE REFER BHEL-TBG GIS DRAWING MAITREE-O-BAY-EDB-TB-3-510-316-001-TBG-C
018AT01/02/03 GENERATOR TRANSFORMER 3x1PH 270/216/162MVA, 420/21kV, YNd11 Z=16% AT NORMAL TAP, ODAF/ONAF/ONAN ON LOAD TAP CHANGER ON HV SIDE, +12.5% TO −12.5% IN STEP OF 1.25%
MOG, CONNECTIONS 14,000A IPBD
24,000A IPBD
018MA05
018MA27
018MA06
018MA03
018MA04
018MC01 CCB 23145A
018MC02
018MA02
018MA01 GENERATOR # 1 777MVA, 21kV, 3ph, 50Hz, 0.85PF(LAG)=20.2 KA(sym) EXCITATION 800AMA (UNDER VKO CONG.)
018MA10 Rated = 1250kA continuous, 40/63 kA, Rotating= 1250A for 5 min, (taps at 0.44,0.39,0.06 ohm)
018BT01 UNIT TRANSF. 65/52 MVA, ONAF/ONAN, 21KV/11.5 KV, Dyn1, Z=13% ON LOAD TAP CHARGER ±12.5% IN STEPS OF 1.25 % ON HV SIDE
018BT02 UNIT TRANSF. SAME AS 018BT01
2000A IPB
400A 10 SEC. 16.8 OHM
4000A SPB
11 kV 50KA 1 SECOND
018BA 11 kV, 4000A, UNIT SWITCH BOARD – 1BA
018BB 11 kV, 4000A, UNIT SWITCH BOARD – 1BB
50KA 1 SECOND
3500A SPB
TO CHP-1A, 1 TRF-1, ACC-1 (2500kVA, 11/3.43kV, Dnyn)
TO CHP-1A, 1 TRF-2, ACC-2 (2500kVA, 11/3.43kV, Dnyn)
TO CHP-1B, 1 TRF-1, ACC-3 (2500kVA, 11/3.43kV, Dnyn)
TO CHP-1B, 1 TRF-2, ACC-4 (2500kVA, 11/3.43kV, Dnyn)
TO SWTG TRF-1 (630kVA, 11/0.433kV, Dnyn)
DL FAN (2)(HHT032) (630 kW)
PA FAN (2)(HHT033) (630 kW)
ID FAN (2)(HHT034) (4400 kW)
SPARE MOTOR FEEDER (630kW)
SPARE MOTOR FEEDER (1500kW, 11/3.433kV, Dnyn)
TO TERMINUP (SMAT)
230 kV GIS
FOR CONTINUATION PLEASE REFER BHEL-TBG GIS DRAWINGS
028AT01 START UP/STANDBY TRANSFORMER 125/62.5/62.5 MVA // (100/50/50 MVA) 230/11.5/11.5 KV, ONAF/ONAN, YNynn0, Z=24% (HV–LV); 50% (LV1–LV2) AT NORMAL TAP AT 125 MVA OLTC, ±12.5% IN STEPS OF 1.25% ON HV SIDE
400A 10 SEC. 16.8 OHM
3500A SPB
028BA 11 kV, 3500A, STATION SWITCH – BOARD – 0BA
028BB 11 kV, 3500A, STATION SWITCH – BOARD – 0BB
(NC)
028MA05
028MA27
028MA06
028MA03
028MA04
028MC01 CCB 23145A
028MC02
028MA02
028MA01 GENERATOR # 2 777MVA, 21kV, 3ph, 50Hz, 0.85PF(LAG)=20.2 KA(sym) EXCITATION 800AMA (UNDER VKO CONG.)
028MC03
028MA10 details same as 018MA10
028BT01 UNIT TRANSF. 65/52 MVA, ONAF/ONAN, 21KV/11.5 KV, Dyn1, Z=13% ON LOAD TAP CHARGER ±12.5% IN STEPS OF 1.25 % ON HV SIDE
028BT02 UNIT TRANSF. SAME AS 028BT01
028BA 11 kV, 4000A, UNIT SWITCH BOARD – 2BA
028BB 11 kV, 4000A, UNIT SWITCH BOARD – 2BB
REST OF THE DISTRIBUTION SAME AS UNIT-1
TO SWGTRF-2 (SMAT)
TO SWTG TRF-2 (630kVA, 11/0.433kV, Dnyn)
TO CHP-1A, 1 TRF-1, ACC-1 (2500kVA, 11/3.43kV, Dnyn)
TO CHP-1A, 1 TRF-2, ACC-2 (2500kVA, 11/3.43kV, Dnyn)
TO CHP-1B, 1 TRF-1, ACC-3 (2500kVA, 11/3.43kV, Dnyn)
TO CHP-1B, 1 TRF-2, ACC-4 (2500kVA, 11/3.43kV, Dnyn)
TO AHP-1, 1 TRF-1, ACC-5 (2500kVA, 11/3.43kV, Dnyn)
TO AHP-1, 1 TRF-2, ACC-6 (2500kVA, 11/3.43kV, Dnyn)
3.3 kV 40KA 1 SECOND
018BT03 UAT–1A
018BT04 UAT–1B
(SEE TABLE–3 FOR DETAILS)
3150A
400A 10 SEC. 5 OHM
3.3kV, 3150A, UNIT–1 AUX. SWITCH BOARD # 01BCA
40KA 1 SECOND
018BT05 FGD–1A
018BT06 FGD–1B
1250A
3.3kV, 1250A, UNIT–1 FGD SWITCH BOARD # 01BCB
SPARE MOTOR FEEDER (1500kW)
FGDA MOTOR FEEDER (710kW)
SPARE MOTOR FEEDER (1500kW)
FGDB MOTOR FEEDER (710kW)
SWITCHGEARS RELATED TO COMMON SYSTEM
00BBT09 AHP–A
00BBT10 AHP–B
1000A
3.3kV, 1000A, AUX SWITCH BOARD # 00BCE
00BBT11 JETTY–A
00BBT12 JETTY–B
3.3kV, 1000A, JETTY SWITCH BOARD # 00BCD
00BBT03 CHP–1A
00BBT04 CHP–1B
2500A
3.3kV, 2500A, CHP–1 AUX SWITCH BOARD # 00BCB
00BBT07 CHP–3A
00BBT08 CHP–3B
2000A
3.3kV, 2000A, CHP–3 AUX SWITCH BOARD # 00BCG
00BBT05 CHP–2A
00BBT06 CHP–2B
3.3kV, 2500A, CHP–2 AUX SWITCH BOARD # 00BCC
00BBT01 SAT–1
00BBT02 SAT–2
1600A
3.3kV, 1600A, STATION SWITCH BOARD # 00BCA
00BBT12 RW–A
00BBT14 RW–B
630A
3.3kV, 630A, RAW WATER SWITCH BOARD # 00BCG
SPARE MOTOR FEEDER (630kW)
TO STACKER–1 (1500kW)
TO STACKER–2 (1500kW)
TO RECLAIMER–1 (1500kW)
TO RECLAIMER–2 (1500kW)
TO STACKER–3 (1500kW)
TO STACKER–4 (1500kW)
TO RECLAIMER–3 (1500kW)
TO RECLAIMER–4 (1500kW)
TO SHIP UNLOADER–1 (2MW)
TO SHIP UNLOADER–2 (2MW)
TO SHIP UNLOADER–3 (2MW)
TO JETTY AUX. LOAD (2MW)
TO JETTY AUX. LOAD (2MW)
TO CHP–1 AUX. LOAD (2MW)
TO CHP–1 AUX. LOAD (2MW)
TO CHP–3 AUX. LOAD (2MW)
TO CHP–3 AUX. LOAD (2MW)
TO LIMESTONE SHUT–1 (2MW)
TO LIMESTONE SHUT–2 (2MW)
FDH–1 FOR AUX. LOAD (2MW)
FDH–2 FOR AUX. LOAD (2MW)
TO RAW WATER PUMP–1 (2MW)
TO RAW WATER PUMP–2 (2MW)
TO RAW WATER PUMP–3 (2MW)
TO RAW WATER PUMP–4 (2MW)
TO RAW WATER PUMP–5 (2MW)
TO RAW WATER PUMP–6 (2MW)
TO RAW WATER PUMP–7 (2MW)
TO RAW WATER PUMP–8 (2MW)
TO RAW WATER

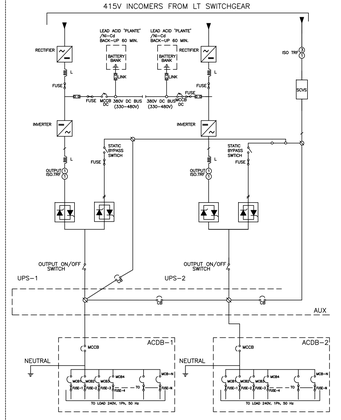
UNIT–1 LV AUXILIARY SYSTEM DISTRIBUTION



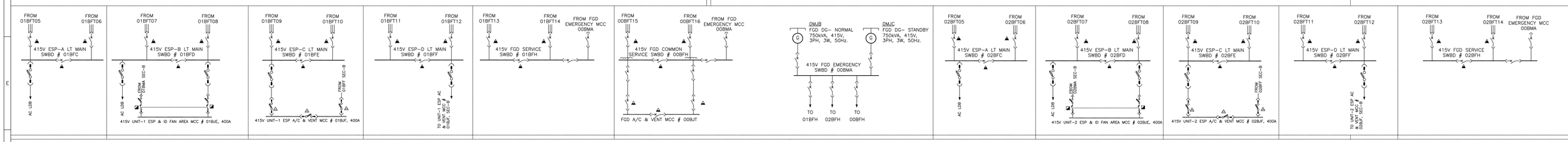
UNIT–2 LV AUXILIARY SYSTEM DISTRIBUTION

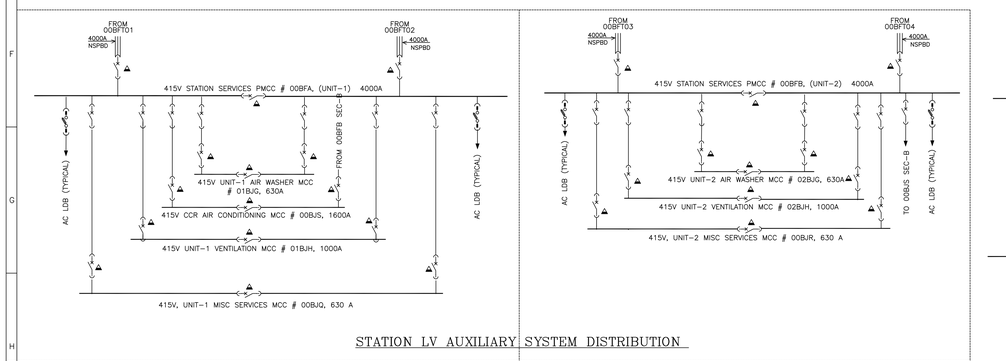


TYPICAL UPS(SAFE AC SYSTEM) SCHEME



FOR DETAILS PLEASE REFER UPS SINGLE LINE DIAGRAM DRG. NO.
Maitree–01–CW–FS–421145I004–PEM–0





STATION LV AUXILIARY SYSTEM DISTRIBUTION

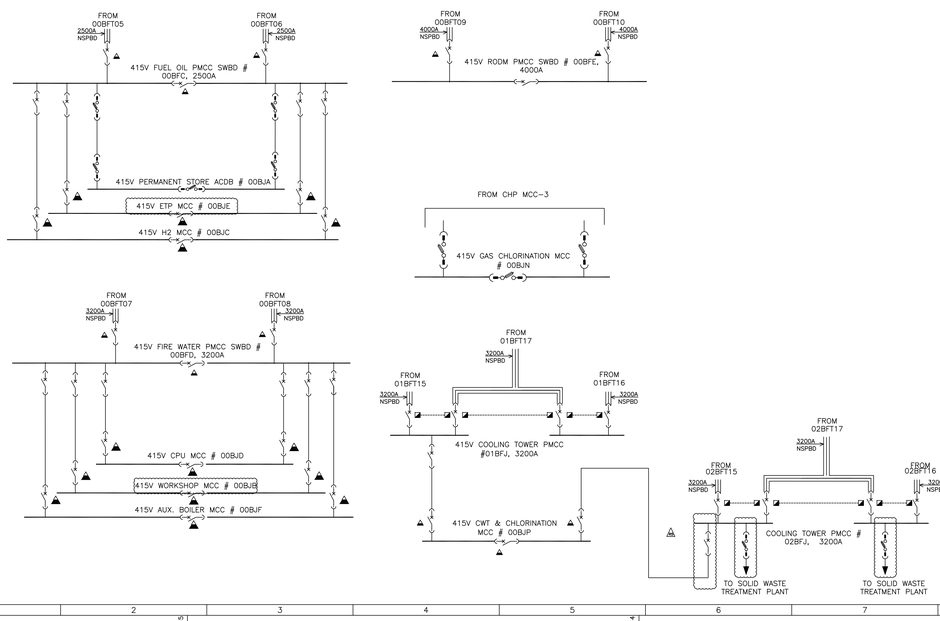


TABLE –5: SWITCHGEAR LOCATION

SL. No.	LOCATION	NAME	DESIGNATION
1	UNIT # 1 MV SWITCHGEAR ROOM MAIN POWER HOUSE BUILDING, 3.5M A–C BAY 01UMA02	11 KV UNIT–1 SWITCHBOARD	#01BBA
		11 KV UNIT–1 SWITCHBOARD	#01BBB
		11 KV STATION SWITCHBOARD	#0BBA
		3.3 KV UNIT–1 AUX. SWITCHBOARD	#01BCA
		415 V UNIT–1 AIR WASHER MCC	#01BJG
2	UNIT–1 LV SWITCHGEAR ROOM MAIN POWER HOUSE BUILDING 12M A–C BAY 01UMA04	415 V UNIT–1 TURBINE SERVICE PMCC	#01BFA
		415 V STATION SERVICE PMCC (UNIT–1)	#00BFA
		415 V UNIT–1 EMERGENCY MCC	#01BMA
		220 V UNIT–1 MAIN DCDB	#01BUA
		415 V UNIT–1 TURBINE VALVE DB	#01BJA
		415 V UNIT–1 SERVICE ACDB	#01BJB
		415 V MISC SERVICES MCC	#00BJQ
3	UNIT–1 BOILER PMCC ROOM MAIN POWER HOUSE BUILDING 27.5M C–G BAY 01UMA09	415 V UNIT–1 BOILER SERVICE PMCC	#01BFB
		415 V UNIT–1 BLR. VALVE & DAMPER ACDB	#01BJC
		415 V UNIT–1 BOILER ACDB	#01BJD
		415 V UNIT–1 SOOT BLOWER MCC	#01BJI
		415 V UNIT–1 VENT MCC	#01BJH
		415 V CCR AIR CONDITIONING MCC	#00BJS
4	UNIT–1 ESP CONTROL ROOM	415 V UNIT–1 ESP–A LT MAIN SWITCHBOARD	#01BFC
		415 V UNIT–1 ESP–B LT MAIN SWITCHBOARD	#01BFD
		415 V UNIT–1 ESP–C LT MAIN SWITCHBOARD	#01BFE
		415 V UNIT–1 ESP–D LT MAIN SWITCHBOARD	#01BFF
		415 V UNIT–1 ESP & ID FAN AREA MCC	#01BJE
		415 V UNIT–1 ESP AC & VENT. MCC	#01BJF
5	UNIT # 2 MV SWITCHGEAR ROOM MAIN POWER HOUSE BUILDING, 3.5M A–C BAY 02UMA02	11 KV UNIT–2 SWITCHBOARD	#02BBA
		11 KV UNIT–2 SWITCHBOARD	#02BBB
		11 KV STATION SWITCHBOARD	#00BBB
		3.3 KV UNIT–2 AUX. SWITCHBOARD	#02BCA
		415 V UNIT–2 AIR WASHER MCC	#02BJG
6	UNIT–2 LV SWITCHGEAR ROOM MAIN POWER HOUSE BUILDING 12M A–C BAY 02UMA04	415 V UNIT–2 TURBINE SERVICE PMCC	#02BFA
		415 V STATION SERVICE PMCC (UNIT–2)	#00BFB
		415 V UNIT–2 EMERGENCY MCC	#02BMA
		220 V UNIT–2 MAIN DCDB	#02BUA
		415 V UNIT–2 TURBINE VALVE DB	#02BJA
		415 V UNIT–2 SERVICE ACDB	#02BJB
		415 V MISC SERVICES MCC	#00BJR

SL. No.	LOCATION	NAME	DESIGNATION
7	UNIT–2 BOILER PMCC ROOM MAIN POWER HOUSE BUILDING 27.5M C–G BAY 02UMA09	415 V UNIT–2 BOILER SERVICE PMCC	#02BFB
		415 V UNIT–2 BLR. VALVE & DAMPER ACDB	#02BJC
		415 V UNIT–2 BOILER ACDB	#02BJD
		415 V UNIT–2 SOOT BLOWER MCC	#02BJI
		415 V UNIT–2 VENT MCC	#02BJH
8	UNIT–2 ESP CONTROL ROOM	415 V UNIT–2 ESP–A LT MAIN SWITCHBOARD	#02BFC
		415 V UNIT–2 ESP–B LT MAIN SWITCHBOARD	#02BFD
		415 V UNIT–2 ESP–C LT MAIN SWITCHBOARD	#02BFE
		415 V UNIT–2 ESP–D LT MAIN SWITCHBOARD	#02BFF
		415 V UNIT–2 ESP & ID FAN AREA MCC	#02BJE
		415 V UNIT–2 ESP AC & VENT. MCC	#02BJF
9	FGD SWGR ROOM (0.0M), 01UVG	3.3 KV UNIT–1 FGD SWITCHBOARD	#01BCB
10	FGD SWGR ROOM (0.0M), 01UVG	3.3 KV UNIT–2 FGD SWITCHBOARD	#02BCB
11	AHP MCC–2 ROOM	3.3 KV AHP AUX. SWITCHBOARD	#00BCE
12	AHP MCC–3 ROOM	3.3 JETTY AUX. SWITCHBOARD	#00BCF
13	CHP MCC–1 ROOM	3.3 CHP SWITCHBOARD	#00BCB
14	CHP MCC–2 ROOM	3.3 CHP SWITCHBOARD	#00BCC
15	CHP MCC–3 ROOM	3.3 CHP SWITCHBOARD	#00BCD
16	COMPRESSOR HOUSE, 01UTF	3.3 KV STATION SWITCHBOARD	#00BCA
17	INTAKE PUMP HOUSE (58), 01UGA	3.3 KV RAW WATER SWITCHBOARD	#00BCG
18	FUEL OIL AREA (22), 01UEL	415V FUEL OIL PMCC	#00BFC
19	FIRE WATER SWGR ROOM (0.0M)	415V FIRE WATER PMCC	#00BFD
20	ROOM PLANT (14)	415V RODM PMCC	#00BFE
21	ADMIN BLDG (29), 01UYC	415V ADMIN BUILDING PMCC	#00BFF
22	COOLING TOWER PH UNIT–1 (70), 01URA	415V COOLING TOWER PMCC–1 SWBD	#01BFJ
23	COOLING TOWER PH UNIT–2 (70), 02URA	415V COOLING TOWER PMCC–2 SWBD	#02BFJ
24	PERMANENT STORE (27), 01USU	415V PERMANENT STORE ACDB	#00BJA
25	WORKSHOP AREA (26), 01UST	415V WORKSHOP MCC	#00BJB
26	H2 GEN AREA (45), 01UEG	415V H2 MCC	#00BJC
27	CPU REGENERATION (44), 01UPH	415V CPU MCC	#00BJD
28	ETP AREA (52), 01USR	415V ETP MCC	#00BJE
29	FIRE WATER SWGR ROOM (0.0M)	415V AUX. BOILER MCC	#00BJF
30	PT PLANT (19), 01UEM	415V PTP MCC	#00BJH
31	AUDITORIUM (28), 01UYG	415V AUDITORIUM ACDB	#00BJK
32	CANTEEN (30), 01UYD	415V CANTEEN ACDB	#00BJL
33	SERVICE BLDG. (08), 01UYB	415V SERVICE BUILDING MCC	#00BJM
34	GAS CHLORINATION FOR RIVER INTAKE (49), 01UGD	415V GAS CHLORINATION MCC	#00BJN
35	CW PUMP HOUSE (15), 01URO	415V CWT & CHLORINATION MCC	#00BJP
36	FGD SWITCHGEAR ROOM 01UVG	415V UNIT–1 FGD SERVICE SWBD	#01BFH
37	FGD SWITCHGEAR ROOM 01UVG	415V UNIT–2 FGD SERVICE SWBD	#02BFH
38	FGD SWITCHGEAR ROOM 01UVG	415V FGD COMMON SERVICE SWBD	#00BFH
39	FIRE WATER SWGR ROOM (0.0M)	415V DESALINATION PMCC	#00BFJ
40	FGD SWITCHGEAR ROOM 01UVG	415V FGD AC & VENT MCC	#00BJT
41	FGD SWITCHGEAR ROOM 01UVG	415V FGD EMERGENCY MCC	#00BMA

NUMBER UNDER BRACKETS ARE FOR PLOT PLAN AREA IDENTIFICATION

TABLE –3 : SERVICE TRANSFORMER DETAILS

S. NO.	TRANSFORMER ID	SERVICE	RATING/PARAMETERS	LOCATION
11	UNIT–1 01BFT01, 01BFT02	UNIT TURBINE SERVICE TRANSFORMER	11kV/433 V, 2000kVA ANL Dyn11, Z=8 %, OFF CKT. TAP CHANGER ±5% IN STEPS OF 2.5%	LV SWITCHGEAR ROOM 01UMA04 02UMA04
12	UNIT–2 02BFT01, 02BFT02			
13	UNIT–1 01BFT03, 01BFT04	UNIT BOILER SERVICE TRANSFORMER	11kV/433 V, 2500kVA ANL Dyn11, Z=10 %, OFF CKT. TAP CHANGER ±5% IN STEPS OF 2.5%	BOILER MCC ROOM 01UMA09 02UMA09
14	UNIT–2 02BFT03, 02BFT04			
15	UNIT–1 01BFT05, 01BFT06, 01BFT07, 01BFT08, 01BFT09, 01BFT10, 01BFT11, 01BFT12,	ESP SERVICE TRANSFORMER	11kV/433 V, 1650kVA ONAN, Dyn11, Z=8 %, OFF CKT. TAP CHANGER ±5% IN STEPS OF 2.5%	ESP BUILDING
16	UNIT–2 02BFT05, 02BFT06, 02BFT07, 02BFT08, 02BFT09, 02BFT10, 02BFT11, 02BFT12,			
17	UNIT–1 01BFT13, 01BFT14	FGD SERVICE TRANSFORMER	11kV/433 V, 2000kVA (ACR)Dyn11, Z=10 %, OFF CKT. TAP CHANGER ±5% IN STEPS OF 2.5%	FGD AREA 01UVG 02UVG
18	UNIT–2 02BFT13, 02BFT14			
19	UNIT–1 01BFT15, 01BFT16, 01BFT17	CT SERVICE TRANSFORMER	11kV/433 V, 2000kVA ONAN, Dyn11, Z=10 %, OFF CKT. TAP CHANGER ±5% IN STEPS OF 2.5%	CT AREA 01URA 02URA
20	UNIT–2 02BFT15, 02BFT16, 02BFT17			
21	00BFT01, 00BFT02 00BFT03, 00BFT04	STATION SERVICE TRANSFORMER	11kV/433 V, 2500kVA ANL Dyn11, Z=10 %, OFF CKT. TAP CHANGER ±5% IN STEPS OF 2.5%	LV SWITCHGEAR ROOM 01UMA04 02UMA04
22	00BFT05, 00BFT06	FUEL OIL SERVICE TRANSFORMER	11kV/433 V, 1600kVA ONAN, Dyn11, Z=8 %, OFF CKT. TAP CHANGER ±5% IN STEPS OF 2.5%	FUEL OIL AREA
23	00BFT07, 00BFT08	FIRE WATER SERVICE TRANSFORMER	11kV/433 V, 2000kVA ONAN, Dyn11, Z=10 %, OFF CKT. TAP CHANGER ±5% IN STEPS OF 2.5%	FIRE WATER AREA
24	00BFT09, 00BFT10	RODM PLANT SERVICE TRANSFORMER	11kV/433 V, 2500kVA ONAN, Dyn11, Z=10 %, OFF CKT. TAP CHANGER ±5% IN STEPS OF 2.5%	RODM PLANT AREA
25	00BFT11, 00BFT12	ADMIN SERVICE TRANSFORMER	11kV/433 V, 2500kVA ONAN, Dyn11, Z=10 %, OFF CKT. TAP CHANGER ±5% IN STEPS OF 2.5%	ADMIN BUILDING 01UYC
26	00BFT13, 00BFT14	DESALINATION SERVICE TRANSFORMER	11kV/433 V, 1600kVA ONAN, Dyn11, Z=8 %, OFF CKT. TAP CHANGER ±5% IN STEPS OF 2.5%	DESALINATION AREA
27	00BFT15, 00BFT16	FGD COMMON SERVICE TRANSFORMER	11kV/433 V, 1600kVA (ACR)Dyn11, Z=8 %, OFF CKT. TAP CHANGER ±5% IN STEPS OF 2.5%	FGD AREA 01UVG

REV	DATE	ALTD	CHD	APPD
5	11.02.19			

1). REVISED TO INCORPORATE CUSTOMER COMMENTS AS PER TCS STD. 06.11.18.
2) MOTOR RATINGS UPDATED AS PER MOTOR DRAWNETS.

REV	DATE	ALTD	CHD	APPD
4	18.07.18			

1). REVISED TO INCORPORATE CUSTOMER COMMENTS AS PER TCS 18/344 STD. 07.12.17.
2) 11kV RATINGS UPDATED.
3) STARTUP/STANDBY TRF. RATING UPDATED.
4) CORRESPONDING SWGR RATINGS UPDATED.
5) DESALINATION SERVICE TRF (SBFT13 AND SBFT14 ADDED.
6) FGD EMERGENCY MCC AND FGD DIESEL GENERATORS ADDED.
7) FGD AC & VENT MCC ADDED.

REV	DATE	ALTD	CHD	APPD
3	16.01.18			

1) REVISED TO INCORPORATE CUSTOMER COMMENTS AS PER TCS 16/344 STD. 07.10.17.
2) 00BFT01, 00BFT02, 00BFT03, 00BFT04 RATING REVISED TO 2.0MVA FROM 1.6MVA.
3) 00BFT05, 00BFT06, 00BFT07, 00BFT08 RATING REVISED TO 2.0MVA FROM 1.6MVA.
4) SBFT13, SBFT14, 00CO ADDED.
5) SBFT13, SBFT14, 00FG DELETED
6) 3.3KV MOTOR RATINGS UPDATED AS PER TABLE–2

REV	DATE	ALTD	CHD	APPD
2	04.10.17			

REVISED TO INCORPORATE CUSTOMER COMMENTS AS PER MOM STD. 24.06.17.

REV	DATE	ALTD	CHD	APPD
1	29.06.17			

REVISED TO INCORPORATE CUSTOMER COMMENTS STD. 15.03.17 VIA TCS–133 ALONGWITH BHEL REPLIES STD. 29.06.17.

JOB NO. 421
STATUS CONTRACT
DISTRIBUTION
TO
No.OFF

BIFPCL
FICHTNER
PROJECT 2X660 MW MAITREE STPP, BANGLADESH
BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
E	DRN	SuM		30.11.2016
	DESN	SuM		30.11.2016
	CHD	SL		30.11.2016
	APPD	MK		30.11.2016

TITLE
ELECTRICAL SINGLE LINE DIAGRAM FOR AUXILIARY POWER DISTRIBUTION

DEPT. SCALE
SIGN
DATE
DRAWING NO. MAITREE–00–BAY–EDB–105013 –PEM
SHEET 2 OF 2 REV 5
SIZE–A0

COMPUTER FILE NAME: PE–DG–K45–100–M001

FIRST ANGLE PROJECTION | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | (ALL DIMENSIONS ARE IN mm)

DRG. NO. **3 452 00 01075**

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REF.DRG.NO.

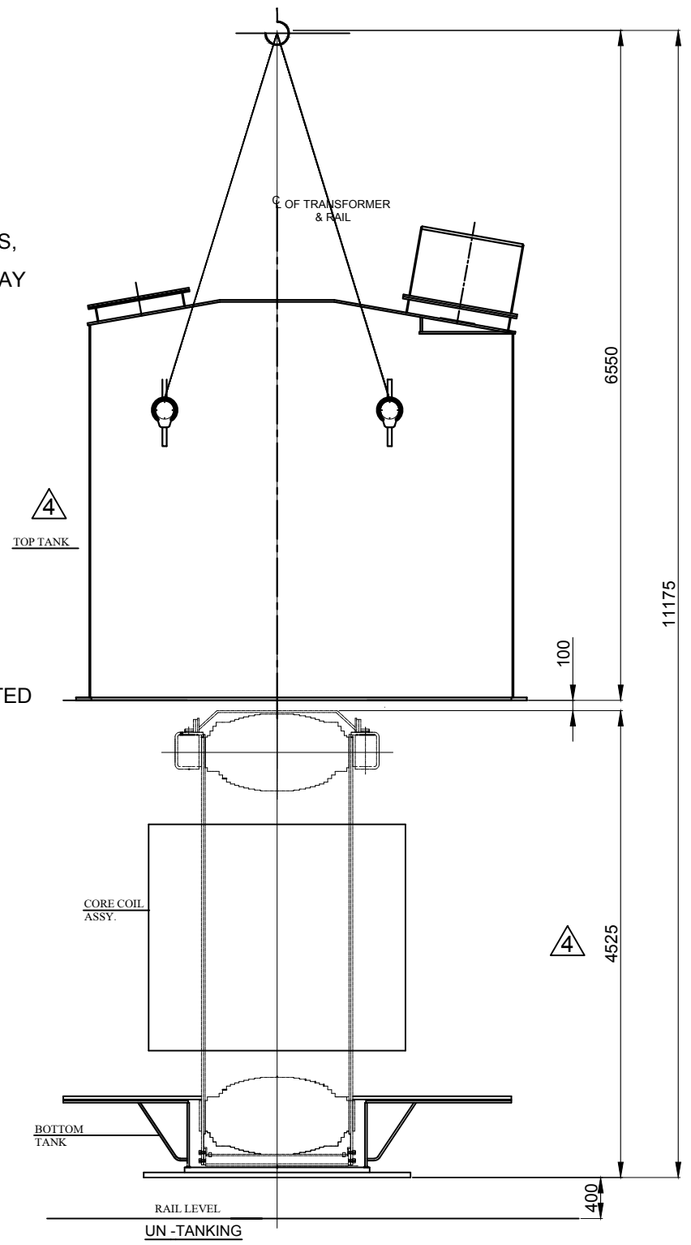
SIGN.DATE

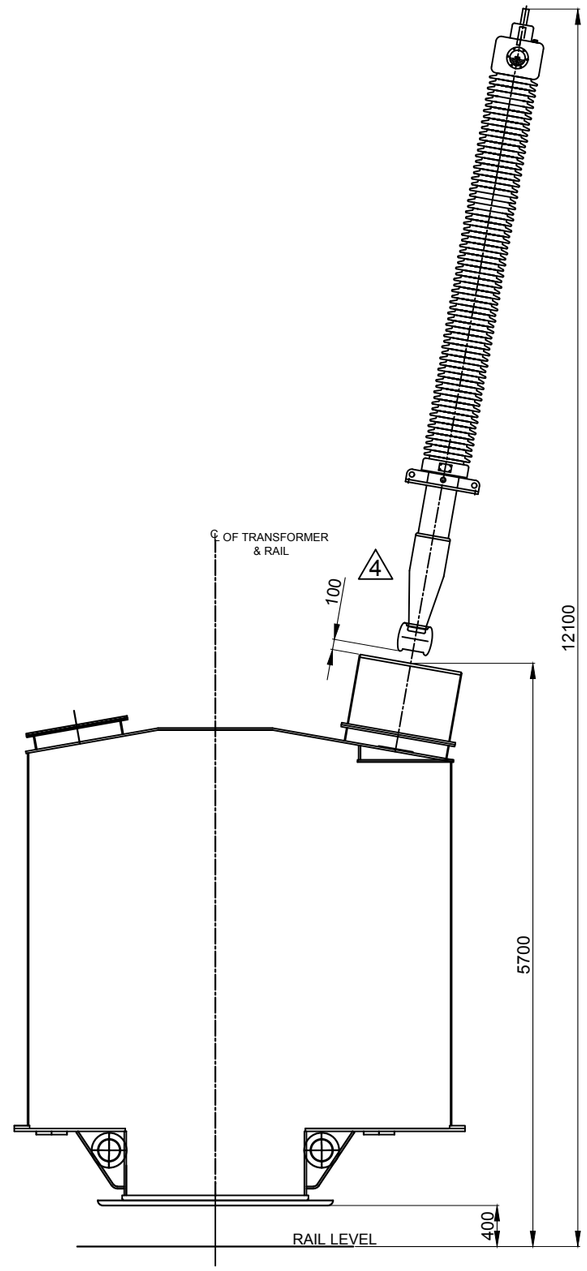
INVENTORY NO.

NOTES:-

1. THE DESIGN FEATURES SHOWN ON THIS DRAWING (GENERALLY IN LINE WITH IEC:60076 & AGREED CUSTOMER SPECIFICATION MEEETS THE STATUTORY, REGULATORY & SAFETY REQUIREMENTS WITH RESPECT TO EARTHING ARRANGEMENT, DANGER AND OTHER LABELS, CLEARANCES IN AIR, PROVISION FOR PRESSURE RELIEF DEVICE, GAS & OIL ACTUATED RELAY AND ANTI EARTH QUAKE CLAMPING ARRANGEMENT.
2. ALL HEIGHT WISE DIMENSIONS ARE GIVEN FROM PLINTH LEVEL/RAIL LEVEL
3. FOR CRITICAL DIMENSIONS TOLERANCES ARE INDICATED IN THE DRAWING. FOR OTHER DIMENSION, GENERAL TOLERANCE MAY BE TREATED AS ± 5%.
4. WIRING FROM INSTRUMENTS, CTS ETC NOT SHOWN FOR CLARITY.
5. FOR PAINTING DETAILS/PROCEDURE , REFER DOC. NO. :- MAITREE-00-BFA-FF-100000-GEN
6. BUSHING FINALIZATION IS IN PROCESS, ACCORDINGLY DIMENSION RELATED TO BUSHING MAY BE UPDATED LATER ON (IF REQUIRED.)
7. ALL DIMENSIONS IN MILLIMETER.
8. MAKE OF FITTINGS AND ACCESSORIES AS PER BIFPCL APPROVED VENDOR LIST.
9. DURING INFRARED THERMOGARPHY, TEMPERATURE OF ANY PART OF TANK SHALL BE LIMITED AS PER IEC:60076.

MINIMUM AIR CLEARANCES	
HV-EARTH	3100 MM
NEUTRAL-EARTH	320 MM
LV-EARTH	320 MM





	DATE	ALTERED	CHECKED	APPROVED	NOTE
4	15.12.18	RAKESH	KD/KG	LK/KGK	REFER REVISION TRIANGLE.
3	18.10.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER COMMENTS.
2	06.08.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER REQUIREMENT.
1	29.06.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER REQUIREMENT.

	DATE	NAME
DRAWN BY	23.02.17	OPG
DESIGN BY	26.03.18	KG
CHECKED BY	27.03.18	KD
APPROVED BY	27.03.18	AKP/KGK
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM:		

PROJECT
2 x 660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH (EPC MAIN PLANT PACKAGE)

OWNER CONSULTANT:
FICHTNER
M/s FICHTNER GmbH & Co KG, Stuttgart,GERMANY

OWNER:
BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

SCALE:
SHEET 01 OF 05

TITLE: GENERATOR TRANSFORMER-OGA & OGA PART LIST

KKS CODE: MAIN TRANSFORMER :- 1BAT01/02/03 & 2BAT01/02/03
SPARE TRANSFORMER :- 0BAT02

W.O. NO.: 66001-X-512-01 | 21/420/√3 KV,I PHASE, 270 MVA GEN.TRFR.

SIZE: A3 | FILE: 3 452 00 01075

ANNEX: | DRAWING NO. : MAITREE-0-BAT-EE-225123-BPL | REV : 04

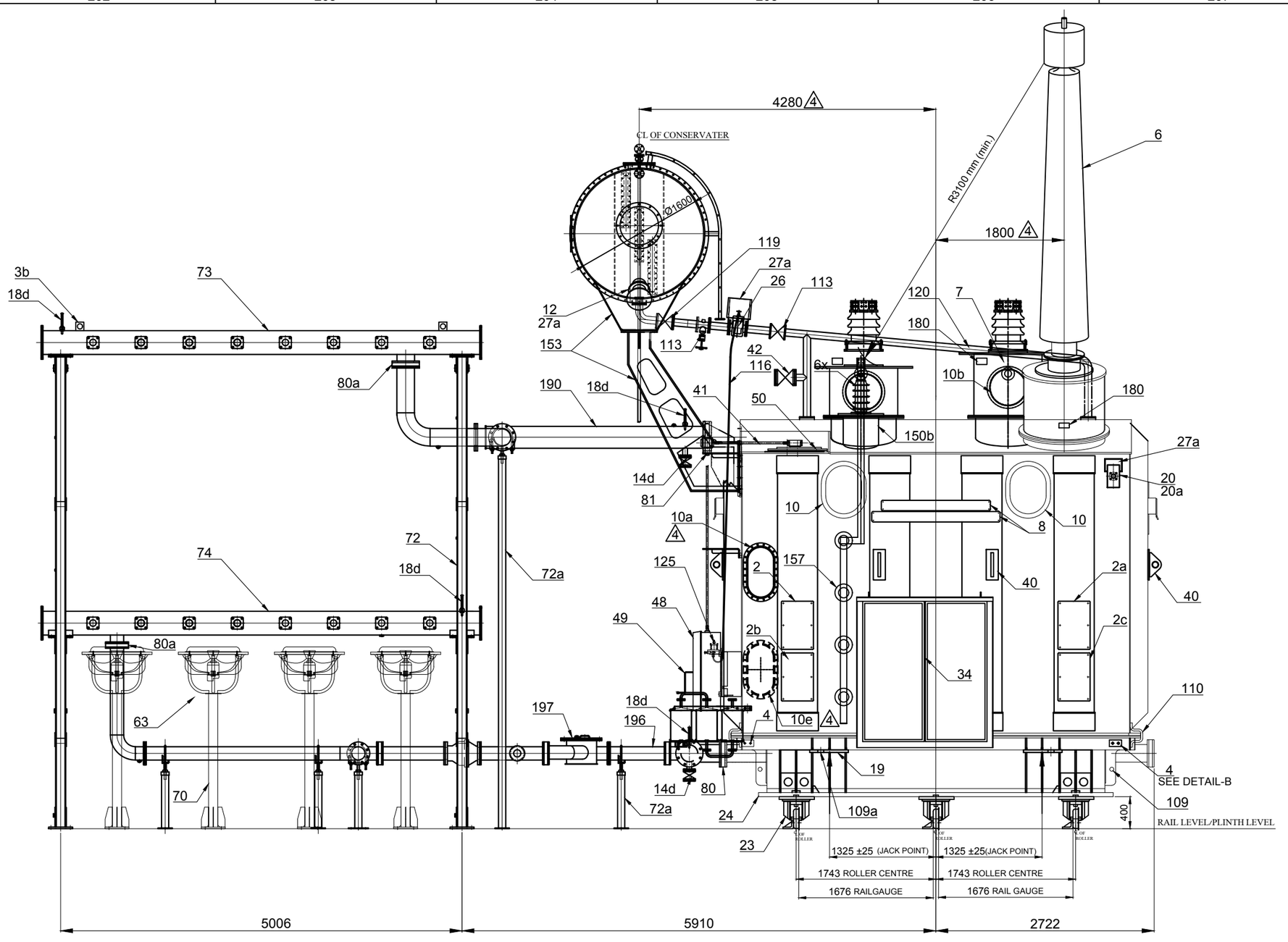
DRG. NO. **3 452 00 01075**

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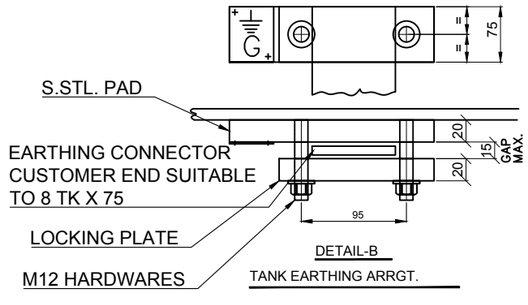
REF.DRG.NO.

SIGN.DATE

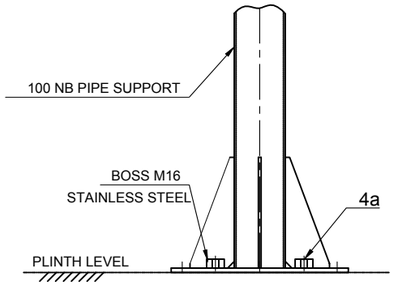
INVENTORY NO.



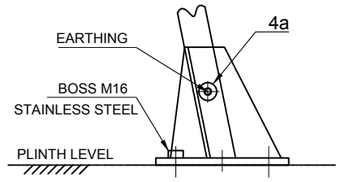
ELEVATION VIEW



DETAIL-B
TANK EARTHING ARRGT.



DETAIL-D
FAN SUPPORT



DETAIL-E
'A' FRAME

	DATE	ALTERED	CHECKED	APPROVED	NOTE
4	15.12.18	RAKESH	KD/KG	LK/KGK	REFER REVISION TRIANGLE.
3	18.10.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER COMMENTS.
2	06.08.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER REQUIREMENT.
1	29.06.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER REQUIREMENT.

PROJECT
2 x 660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH (EPC MAIN PLANT PACKAGE)

OWNER CONSULTANT:
FICHTNER
M/s FICHTNER GmbH & Co KG, Stuttgart,GERMANY

OWNER:
BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

SCALE:
SHEET 02 OF 05

	DATE	NAME
DRAWN BY	23.02.17	OPG
DESIGN BY	26.03.18	KG
CHECKED BY	27.03.18	KD
APPROVED BY	27.03.18	AKP/KGK
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM:		

TITLE: GENERATOR TRANSFORMER-OGA & OGA PART LIST

KKS CODE: MAIN TRANSFORMER :- 1BAT01/02/03 & 2BAT01/02/03
SPARE TRANSFORMER :- 0BAT02

W.O. NO.: 66001-X-512-01 21/420/√3 KV,I PHASE, 270 MVA GEN.TRFR.

SIZE: A3 FILE: 3 452 00 01075

ANNEX: DRAWING NO. : MAITREE-0-BAT-EE-225123-BPL REV : 04

FIRST ANGLE PROJECTION | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | (ALL DIMENSIONS ARE IN mm)

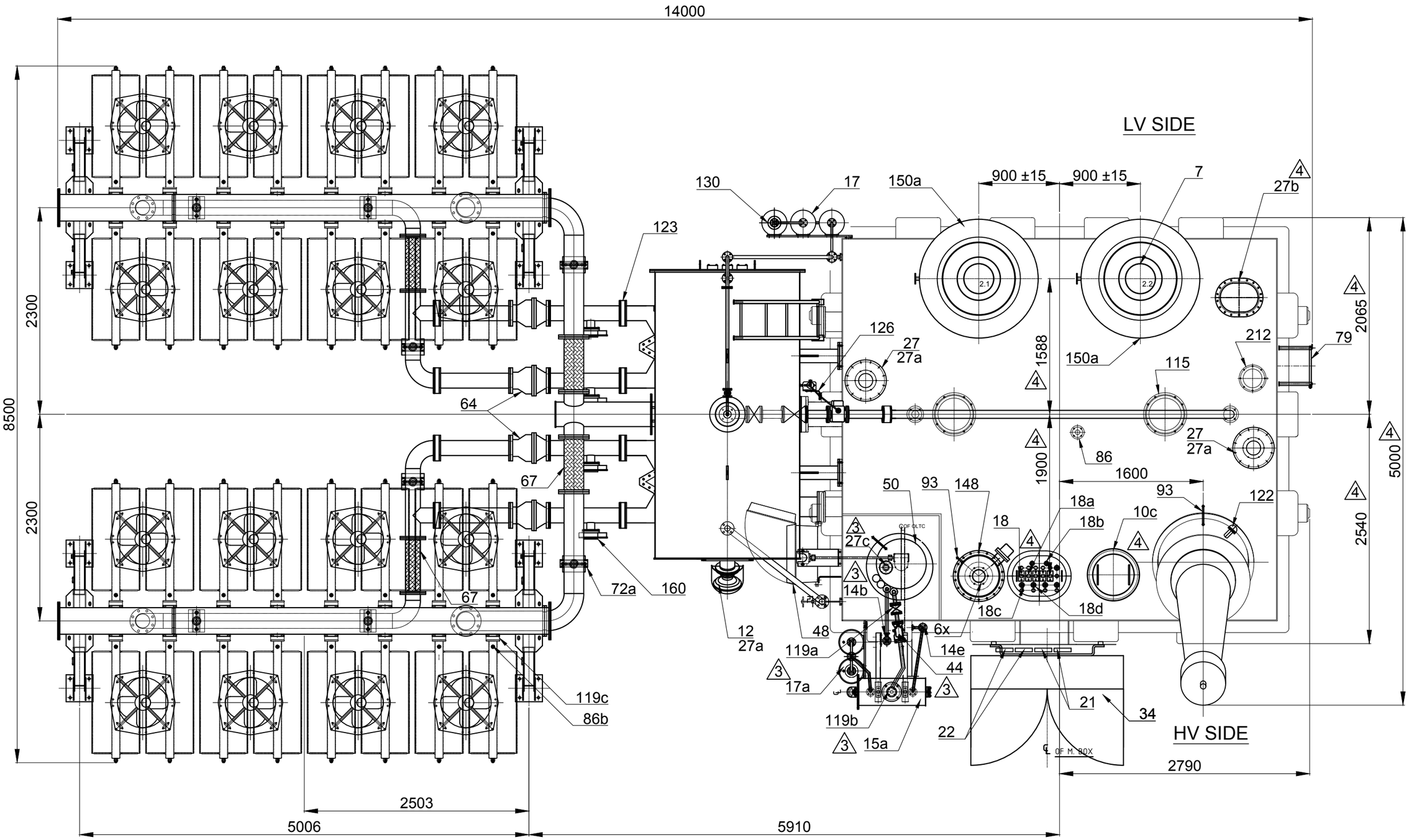
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REF.DRG.NO.

SIGN.DATE

INVENTORY NO.



PLAN VIEW

	DATE	ALTERED	CHECKED	APPROVED	NOTE
4	15.12.18	RAKESH	KD/KG	LK/KGK	REFER REVISION TRIANGLE.
3	18.10.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER COMMENTS.
2	06.08.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER REQUIREMENT.
1	29.06.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER REQUIREMENT.

PROJECT
2 x 660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH
(EPC MAIN PLANT PACKAGE)

OWNER CONSULTANT:
FICHTNER
M/s FICHTNER GmbH & Co KG, Stuttgart,GERMANY

OWNER:
BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

SCALE:
SHEET 03 OF 05

	DATE	NAME
DRAWN BY	23.02.17	OPG
DESIGN BY	26.03.18	KG
CHECKED BY	27.03.18	KD
APPROVED BY	27.03.18	AKP/KGK
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM:		

TITLE: GENERATOR TRANSFORMER-OGA & OGA PART LIST

KKS CODE: MAIN TRANSFORMER :- 1BAT01/02/03 & 2BAT01/02/03
SPARE TRANSFORMER :- 0BAT02

W.O. NO.: 66001-X-512-01 | 21/420/√3 KV,I PHASE, 270 MVA GEN.TRFR.

SIZE: A3 | FILE: 3 452 00 01075

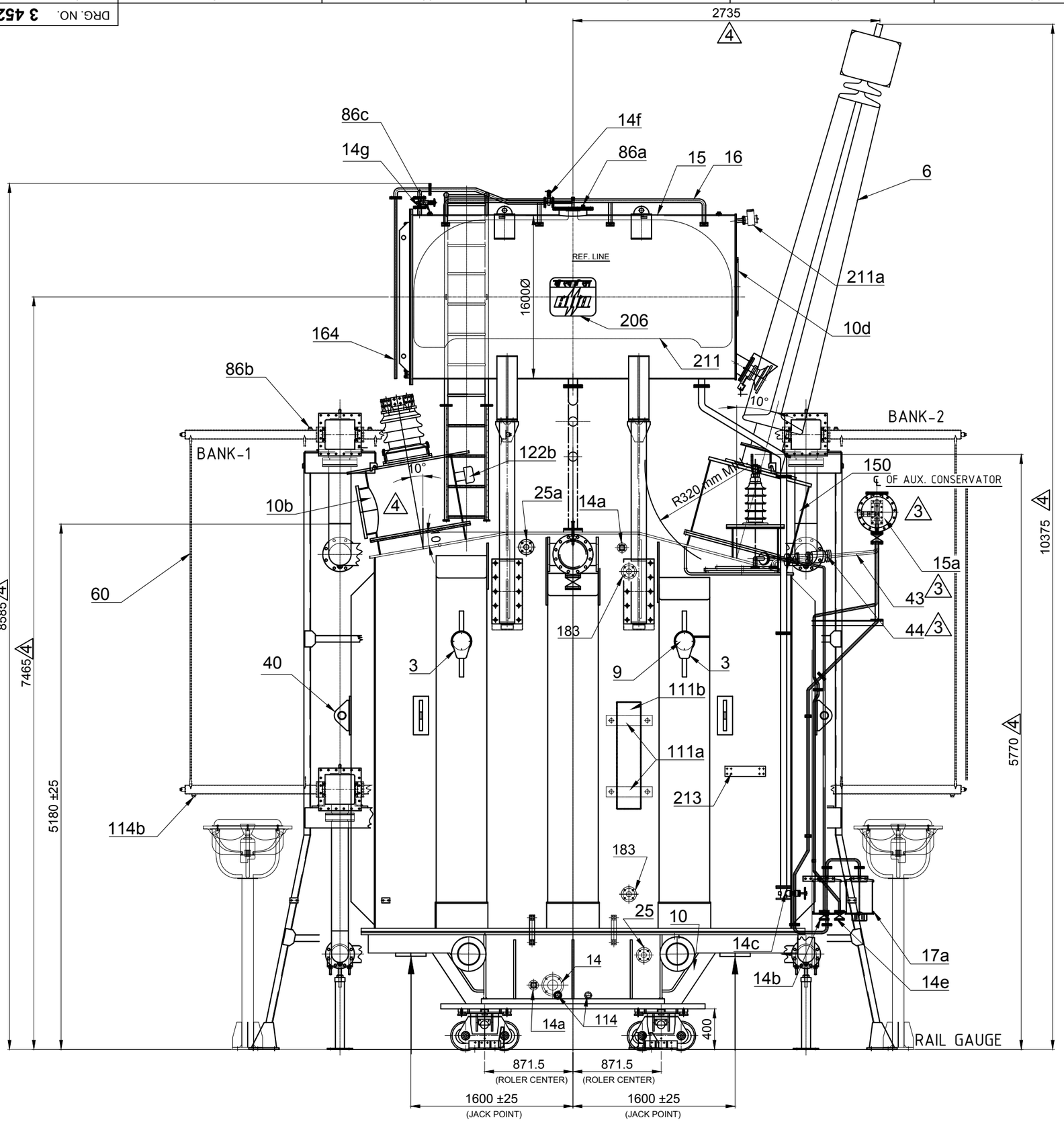
ANNEX: | DRAWING NO. : MAITREE-0-BAT-EE-225123-BPL | REV : 04

FIRST ANGLE PROJECTION | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | (ALL DIMENSIONS ARE IN mm)

DRG. NO. **3 452 00 01075**

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REF.DRG.NO. | SIGN.DATE | INVENTORY NO.



END VIEW

	DATE	ALTERED	CHECKED	APPROVED	NOTE
4	15.12.18	RAKESH	KD/KG	LK/KGK	REFER REVISION TRIANGLE.
3	18.10.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER COMMENTS.
2	06.08.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER REQUIREMENT.
1	29.06.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER REQUIREMENT.

PROJECT
2 x 660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH (EPC MAIN PLANT PACKAGE)

OWNER CONSULTANT:
FICHTNER
M/s FICHTNER GmbH & Co KG, Stuttgart,GERMANY

OWNER:
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BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

SCALE:
SHEET 04 OF 05

	DATE	NAME
DRAWN BY	23.02.17	OPG
DESIGN BY	26.03.18	KG
CHECKED BY	27.03.18	KD
APPROVED BY	27.03.18	AKP/KGK
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM:		

TITLE: GENERATOR TRANSFORMER-OGA & OGA PART LIST

KKS CODE: MAIN TRANSFORMER :- 1BAT01/02/03 & 2BAT01/02/03
SPARE TRANSFORMER :- 0BAT02

W.O. NO.: 66001-X-512-01 21/420/√3 KV,I PHASE, 270 MVA GEN.TRFR.

SIZE: A3 | FILE: 3 452 00 01075

ANNEX: | DRAWING NO. : MAITREE-0-BAT-EE-225123-BPL | REV : 04

FIRST ANGLE PROJECTION | 501 | 502 | 503 | 504 | 505 | 506 | 507 | 508 | (ALL DIMENSIONS ARE IN mm)

DRG. NO. **3 452 00 01075**

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REF.DRG.NO. | SIGN.DATE | INVENTORY NO.

TURRETS & BUSHINGS

IT.NO.	DESCRIPTION	QTY.	ZONE
6	OIP CONDENSER BUSHING FOR HV	1	206-B
6x	HV NEUTRAL BUSHING 36 KV, 2000 Amp.	1	205-B
7	LV BUSHING	2	307-B
10b	INSPECTION COVER LV BUSHING CONNECTION	2	307-B
122	CONNECTION BOX FOR C.T. TERMINAL (H.V. SIDE)	1	307-E
122b	CONNECTION BOX C.T. TERMINAL (L.V. SIDE)	2	402-D
148	CONNECTION BOX C.T. TERMINAL (NEUTRAL SIDE)	1	306-D
150	H.V. TURRET	1	405-D
150a	L.V. TURRET	2	305-B
150b	H.V.N TURRET	1	206-C
157	NEUTRAL GROUNDING CONNECTION WITH 36 KV CLASS INSULATOR (COPPER STRAP SIZE 10 TK X 125 WIDE)	1	205-D
180	TERMINAL MARKING PLATES	4	207-C

CONSERVATOR & ITS PIPE WORK

IT.NO.	DESCRIPTION	QTY.	ZONE
10d	INSPECTION COVER FOR CONSERVATOR BOLTED	1	405-C
12	OIL GAUGE MAGNETIC TYPE WITH LOW OIL LEVEL ALARM	1	204-C
14c	DRAIN GATE VALVE 50 NB FOR MAIN CONSERVATOR	1	405-G
14e	DRAIN VALVE 15 N.B. AUX. CONSERVATOR	1	405-G
14f	15 NB GATE VALVE FOR BREATHER PIPE WORK	1	404-B
14g	50 NB VALVE FOR VACUUMING	1	403-B
15	OIL CONSERVATOR (ATMOSEAL TYPE) WITH AIR CELL & PRISMATIC OIL GAUGE	1	404-B
15a	AUX. CONSERVATOR 300 DIA WITH PRISMATIC OIL GAUGE FOR OLTC (3)	1	406-D
16	RAILING FOR CONSERVATOR	2	405-B
17	DEHYDRATING BREATHER FOR MAIN CONSERVATOR IN SERIES (3 NOS)	1	305-B
17a	DEHYDRATING BREATHER FOR AUX. CONSERVATOR IN SERIES (2 NOS) (3)	1	406-6
26	BUCHHOLZ RELAY 80 NB	1	205-B
27a	RAIN HOOD FOR (1 MOG, 2 PRV, 1 BUCHHOLZ RELAY, 1 SUDDEN PRESSURE RELAY)	5	204-C,305-C 307-D,205-B 207-C
42	VACUUM PULLING 50 NB GATE VALVE	1	205-C
86a	AIR RELEASE PLUG 1/4" BSP FOR MAIN CONSERVATOR,	1	404-B
86c	AIR RELEASE PLUG 3/4" BSP FOR MAIN CONSERVATOR,	2	403-B
113	ISOLATING GATE VALVE FOR BUCHHOLZ RELAY 80 NB	1	205-C
113a	ISOLATING GATE VALVE FOR BUCHHOLZ RELAY 80 NB	1	205-C
116	6 NB BUCHHOLZ GAS RELEASE DEVICE PIPE	1	205-C
119	CONSERVATOR ISOLATION VALVE	1	205-B
120	MAIN CONSERVATOR PIPE 80 NB	1 SET	208-C
125	GAS COLLECTING DEVICE WITH PIPE	1	205-D
130	BREATHER GANGING ARRANGEMENT.	1	204-B
153	CONSERVATOR SUPPORT	2	204-C
164	BREATHER PIPE FOR MAIN CONSERVATOR (15 NB)	1	403-C
206	MONOGRAM ON MAIN CONSERVATOR	1	404-C
211	AIR CELL INSIDE MAIN CONSERVATOR	1	404-C
211a	AIR CELL LEAKAGE DETECTOR	1	405-C

COOLING SYSTEM

IT.NO.	DESCRIPTION	QTY.	ZONE
3b	LIFTING LUG FOR RADIATORS/HEADERS (2NO. ON EACH RADIATOR/HEADER)	72	202-B
4a	BOSS FOR EARTHING M16 WITH BOLT, PLAIN WASHER & SPRING WASHER M16 ON 'A' FRAME AND FAN SUPPORT	32	205-G
14d	DRAIN/FILTER GATE VALVE FOR COOLING SYSTEM Ø 50	2	204-D
18d	THERMOMETER ON COOLING SYSTEM (3 ON P/W, 4 ON HEADERS)	7	202-C 204-C
60	RADIATORS (2 X 60%)	32	401-E
63	FAN AND MOTOR (10 WORKING + 6 STAND BY)	16	202-E
64	OIL PUMP & MOTOR (1NO. WORKING+1NO. STANDBY PER BANK)	4	303-D
67	FLEXIBLE HOSE (200 NB) (STAINLESS STEEL)	4	303-D
70	FAN SUPPORTS	16	202-F
72	A FRAME SUPPORT	4	203-D
72a	PIPE SUPPORT (6 NOs FOR 200 NB PIPE , 2 NOs FOR 200 NB PIPE TOP)	8	204-D
73	TOP HEADERS	2	202-B
74	BOTTOM HEADERS	2	202-D
80a	BUTTERFLY VALVE FOR HEADERS 200 N.B.	4	203-C
86b	AIR RELEASE PLUG 32 NOs FOR RADIATORS & 04 NOs HEADERS	36	402-C
114b	DRAIN PLUG 32 NOs FOR RADIATORS & 04 NOs HEADERS 3/4" BSP	36	402-F
119c	ISOLATING BUTTERFLY VALVE FOR RADIATORS Ø 80	64	303-F
123	200 NB ISOLATING B/F VALVE FOR PUMP & MOTOR SET & O. F. INDICATOR (4)	8	304-C
160	OIL FLOW INDICATOR DIRECTION R-L (RIGHT TO LEFT)	4	304-E
190	TOP OIL PIPE (RADIATOR BANK) 200 & 250 N.B.	2+1	204-C
196	BOTTOM OIL PIPE (RADIATOR BANK) 200 & 250 N.B.	4+1	204-E
197	REVERSE FLOW BLOCKING DEVICE	2	204-E

TAPCHANGER

IT.NO.	DESCRIPTION	QTY.	
14b	25 N.B. GATE VALVE FOR OLTC SUCTION (3)	1	405-G
27c	PRESURE RELIEF VALVE FOR O.L.T.C (3)	1	305-E
41	BEVEL GEAR BOX	1	205-C
43	O.L.T.C. OIL CONSERVATOR CONNECTION PIPE 25NB (3)	1 SET	405-E
44	O.L.T.C. PROTECTIVE RELAY (OIL SURGE RELAY FOR OLTC) (3)	1	405-E
48	O.L.T.C. DRIVING UNIT	1	205-C
49	O.L.T.C. MOTOR DRIVING HANDLE	1	204-D
50	ON LOAD TAP CHANGER (BHEL MAKE)	1	305-D
119a	ISOLATING GATE VALVE 25NB (FOR OLTC) (3)	1	305-F
119b	ISOLATING GATE VALVE FOR AUX.CONSERVATOR 25 NB (3)	1	305-F

TRANSFORMER

IT.NO.	DESCRIPTION	QTY.	ZONE
2	RATING AND DIAGRAM PLATE (BILINGUAL)	1	205-D
2a	DO'S & DONT'S INSTRUCTION PLATE	1	206-D
2b	VALVE SCHEDULE PLATE	1	205-E
2c	OIL FILLING INSTRUCTION PLATE	1	206-E
3	LIFTING BOLLARD (FOR TRANSFORMER WITH OIL)	4	403-E
4	EARTHING TERMINALS WITH BOLTS, NUTS, PLAIN WASHERS, SPRING WASHER (M10)	2	207-E
8	NAME PLATE (BANGLA & ENGLISH) ONE EACH	2	206-D
9	PLATE FOR BOLLARD CAPACITY DETAIL	4	404-E
10	INSPECTION COVER FOR HV & HVN BUSHING END CONNECTION (4)	2	206-D
10a	INSPECTION COVER FOR OLTC ON TANK WALL (HV SIDE) (4)	1	205-D
10c	INSPECTION COVER WITH HANDLE ON TANK COVER (4)	1	307-E
10e	INSPECTION COVER FOR MAIN ENTRY ON TANK WALL (LV SIDE) (4)	1	205-E
14	100 NB DRAIN GATE VALVE AT BOTTOM TANK	1	404-G
14a	25 NB GATE VALVE WITH ADAPTOR FOR OIL SAMPLING ON TANK (1 TOP TANK & 1 BOTTOM TANK) (4)	2	404-G
18	POCKET FOR OIL TEMPERATURE INDICATOR	1	306-E
18a	POCKET FOR WINDING TEMPERATURE INDICATOR	2	306-E
18b	ORDINARY THERMOMETER WITH POCKET	1	306-E
18c	R.T.D. FOR REMOTE INDICATION FOR WTI	2	306-E
18d	R.T.D. FOR REMOTE INDICATION FOR OTI	1	306-E
19	JACKING PADS (SUITABLE FOR TOTAL WT. WITH OIL)	4	205-E
20	SUDDEN PRESSURE RELAY	1	207-D
20a	40 NB GATE VALVE FOR SUDDEN PRESSURE RELAY	1	207-D
21	OIL TEMPERATURE INDIACATOR MOUNTED IN C.C.C	1	306-F
22	WINDING TEMPERATURE INDICATOR MOUNTED IN C.C.C	2	306-F
23	TWIN BI DIRECTIONAL ROLLERS Ø 320 WITH ANTIEARTHQUAKE CLAMP	6	205-F
24	SKIDS (FOR PULLING IN BOTH DIRECTION WELDED ON BOTTOM TANK BASE)	1	205-F
25	50 NB FILTER GATE VALVE ON BOTTOM TANK	1	404-G
25a	50 NB FILTER GATE VALVE ON TOP TANK	1	404-D
27	PRESSURE RELIEF VALVE	2	305-C
27b	BOX FOR D.P TEST OF INSULATION	1	307-B
34	COOLER CONTROL CABINET WITH ANTI VIBRATION PADS	1	306-F
40	WAGON ANCHORING LUGS	8	207-D
79	LADDER WITH LOCKING DEVICE TO PREVENT CLIMBING	1	308-C
80	200 NB BUTTERFLY VALVE FOR OIL INLET AT BOTTOM	2	205-E
81	250 NB BUTTERFLY VALVE FOR OIL OUTLET AT TOP	1	205-D
86	AIR RELEASE VALVE 1/2" BSP	1	306-D
93	SHORTING LINK (HV-1, HVN-1, OLTC-1)	3	307-D
109	HAULAGE LUG LONGITUDINAL	4	207-F
109a	HAULAGE LUG TRANSVERSAL	4	205-F
110	TOP TANK-BOTTOM TANK SHORTING LINK	2	207-E
111a	PAD FOR ONLINE DGA MOUNTING.	1	404-E
111b	ONLINE DGA SYSTEM	1	404-F
114	DRAIN PLUG FOR BOTTOM TANK (1" B.S.P.)	2	404-G
115	HOLE FOR CLAMPING CORE & COIL ASSEMBLY TO TOP TANK	2	307-D
126	SUPPORT FOR GAS COLLECTING DEVICE	1	305-C
183	50 NB GATE VALVE FOR ONLINE DGA 1 TOP & 1 BOTTOM	2	404-F
212	EARTHING TERMINAL CONNECTION BOARD (CORE, END FRAME & TANK)	1	307-C
213	MOUNTING PAD FOR IMPACT RECORDER	1	404-F

CUSTOMER'S REFERENCE DRAWING

TITLE	MAITREE DOCUMENT NO.	BHEL DRAWING NO.
GENERATOR TRANSFORMER-OGA & OGA PARTLIST	MAITREE-0-BAT-EE-225123-BPL	3 452 00 01075
GENERATOR TRANSFORMER-FOUNDATION PLAN	MAITREE-0-BAT-EE-225125-BPL	3 452 00 01077
GENERATOR TRANSFORMER-H.V. BUSHING	MAITREE-0-BAT-EE-225126-BPL	3 452 00 01098
GENERATOR TRANSFORMER-L.V. BUSHING	MAITREE-0-BAT-EE-225127-BPL	3 452 00 01099
GENERATOR TRANSFORMER-NEUTRAL BUSHING	MAITREE-0-BAT-EE-225128-BPL	3 452 00 01100
GENERATOR TRANSFORMER-BI-DIRECTIONAL ROLLER	MAITREE-0-BAT-EE-225129-BPL	3 452 00 01101
GENERATOR TRANSFORMER-LV BUS DUCT MOUNTING	MAITREE-0-BAT-EE-225130-BPL	3 452 00 01105
GENERATOR TRANSFORMER-LOADING GAUGE DIAGRAM	MAITREE-0-BAT-EE-225131-BPL	3 452 00 01102
GENERATOR TRANSFORMER-RATING & DIAGRAM PLATE	MAITREE-0-BAT-EE-225132-BPL	3 452 00 01103
GENERATOR TRANSFORMER-VALVE SCHEDULE PLATE	MAITREE-0-BAT-EE-225133-BPL	3 452 00 01104
GENERATOR TRANSFORMER-NEUTRAL FORMATION & GROUNDING	MAITREE-0-BAT-EE-225327-BPL	3 452 00 01076
GENERATOR TRANSFORMER-OIL FILLING INSTRUCTION PLATE	MAITREE-0-BAT-EE-225328-BPL	3 452 00 01106

NOTE:-

1. INSULATING OIL SHALL BE AS PER IEC:60296 (NAPHTHENIC BASED)
2. CABLE TRAY & ITS SUPPORTING STRUCTURE FOR CABLES SHALL BE PROVIDED.

APPROXIMATE WEIGHT / QUANTITY

WEIGHT OF TRANSFORMER INCLUDING ACCESSORIES RADIATOR BANK & PIPE WORK	320000 Kg.
TOTAL OIL QUANTITY	82000 LITTER

	DATE	ALTERED	CHECKED	APPROVED	NOTE
4	15.12.18	RAKESH	KD/KG	LK/KGK	REFER REVISION TRIANGLE.
3	18.10.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER COMMENTS.
2	06.08.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER REQUIREMENT.
1	29.06.18	RAKESH	KD/KG	AKP/KGK	DRAWING IS REVISED AS PER CUSTOMER REQUIREMENT.

PROJECT
2 x 660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH (EPC MAIN PLANT PACKAGE)

OWNER CONSULTANT:
FICHTNER
M/s FICHTNER GmbH & Co KG, Stuttgart,GERMANY

OWNER:
BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

SCALE:
SHEET 05 OF 05

	DATE	NAME
DRAWN BY	23.03.18	OPG
DESIGN BY	26.03.18	KG
CHECKED BY	27.03.18	KD
APPROVED BY	27.03.18	AKP/KGK
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM:		

TITLE: GENERATOR TRANSFORMER-OGA & OGA PART LIST

KKS CODE: MAIN TRANSFORMER :- 1BAT01/02/03 & 2BAT01/02/03; SPARE TRANSFORMER :- 0BAT02

W.O. NO.: 66001-X-512-01 | 21/420/√3 KV,I PHASE, 270 MVA GEN.TRFR.

SIZE: A3 | FILE: 3 452 00 01075

ANNEX: | DRAWING NO. : MAITREE-0-BAT-EE-225123-BPL | REV : 04

FIO
FOR INFORMATION ONLY

Date: 11-May-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEM

(BOLTABLE TYPE)

PROJECT	2X660MW BIFPCL MAITREE KHULNA STPP (BANGLADESH)	
	OWNER	BANGLADESH-INDIA FRIENDSHIP POWER CO. (Pvt.) LIMITED (BIFPCL)
FICHTNER	OWNER'S CONSULTANT	FICHTNER GmbH & Co KG GERMANY
BHEL	EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA(U.P) INDIA

DATE	ALT	CHD	APP
16.09.17	MKM	AbA	SL

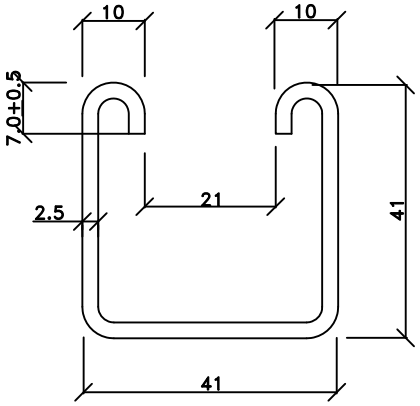
Drawing revised in line with customer comments dated 09.08.2017.
Revised portion is marked with cloud R1

DOCUMENT TITLE:	DPT CODE-E		NAME	SIGN	DATE
INSTALLATION DETAILS FOR CABLE TRAY SUPPORT SYSTEM(BOLTABLE TYPE)		DRN	MKM	-SD-	19.07.17
		CHD	AB	-SD-	19.07.17
		APP	SL	-SD-	19.07.17
DOCUMENT NO:	Maitree-00-BTW-EDB-421507E006-PEM-01				REV. 01

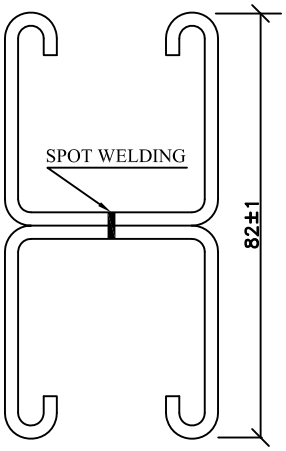
PIO
FOR INFORMATION ONLY

Date: 11-May-2018

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SINGLE CHANNEL C1



DOUBLE CHANNEL C2

TWO LENGTHS OF SINGLE CHANNEL
SPOT WELDED BACK TO BACK
AT 75MM C/C

NOTE:

1. ALL DIMENSIONS ARE IN mm.
2. MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062
3. FINISH : HOT DIP GALVANISED AS PER IS 2629
4. TOLERANCE ON THICKNESS IS AS PER IS 1852
5. PROFILE TOLERANCE ±0.5 mm

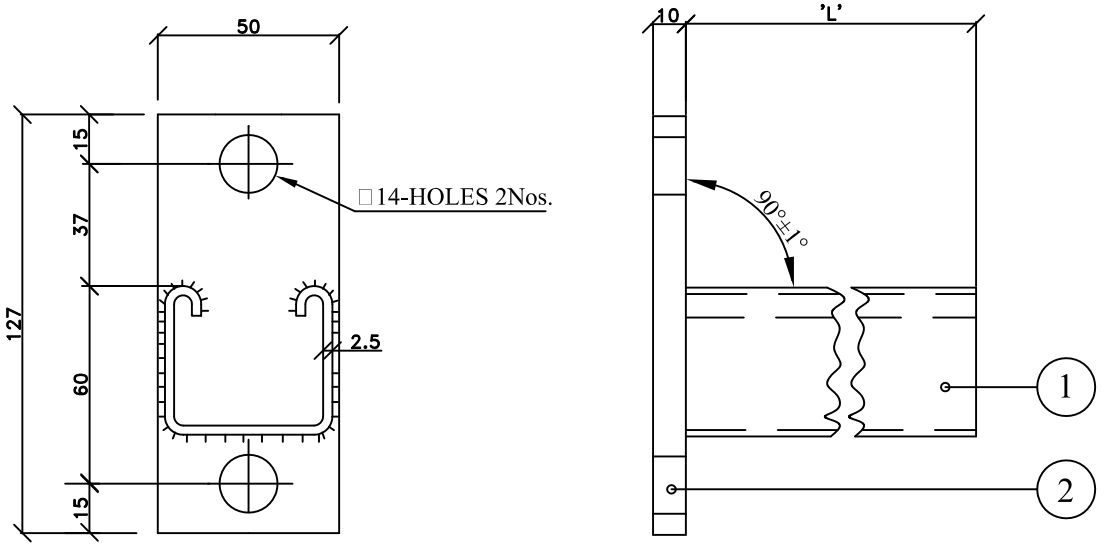
R1

BHEL	TITLE: INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM	DRG. NO. Maitree-00-BTW-EDB-421507E006-PEM-1
		SH 2 OF 19

PIO
FOR INFORMATION ONLY

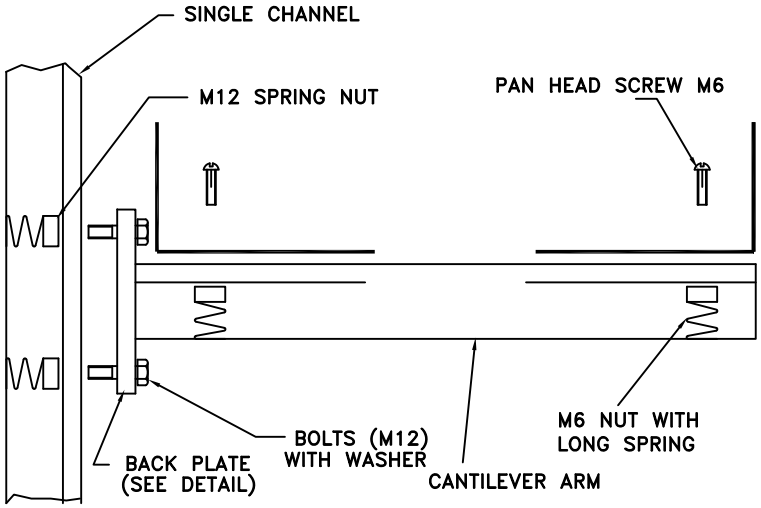
Date: 11-May-2018

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CANTILEVER ARMS

TRAY WIDTH IN MM	CANTILEVER ARM LENGTH (L) IN MM
150	200
300	350
450	500
600	650



TYPICAL ASSEMBLY OF CHANNEL SUPPORTS AND CABLE TRAY

M12 HEX BOLT & WASHER–2NOs.
M12 SPRING NUTS–2NOs.
M6 PAN HEAD SCREWS & WASHER–2NOs.
M6 SPRING NUTS–2NOs.

NOTES :

1. ALL DIMENSIONS ARE IN mm.
2. ITEM NO.1 MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062
3. MATERIAL :MILD STEEL AS PER IS-2062/ BS EN 1993 EUROCODE 3
4. FINISH : HOT DIP GALVANISED AS PER IS:2629/ BS EN ISO 1461
5. TOLERANCE ON THICKNESS AS PER IS:1852/ BS EN 10131
6. ALL FABRICATION TOLERANCES ARE ± 1.0mm

R1

भेल BHEL

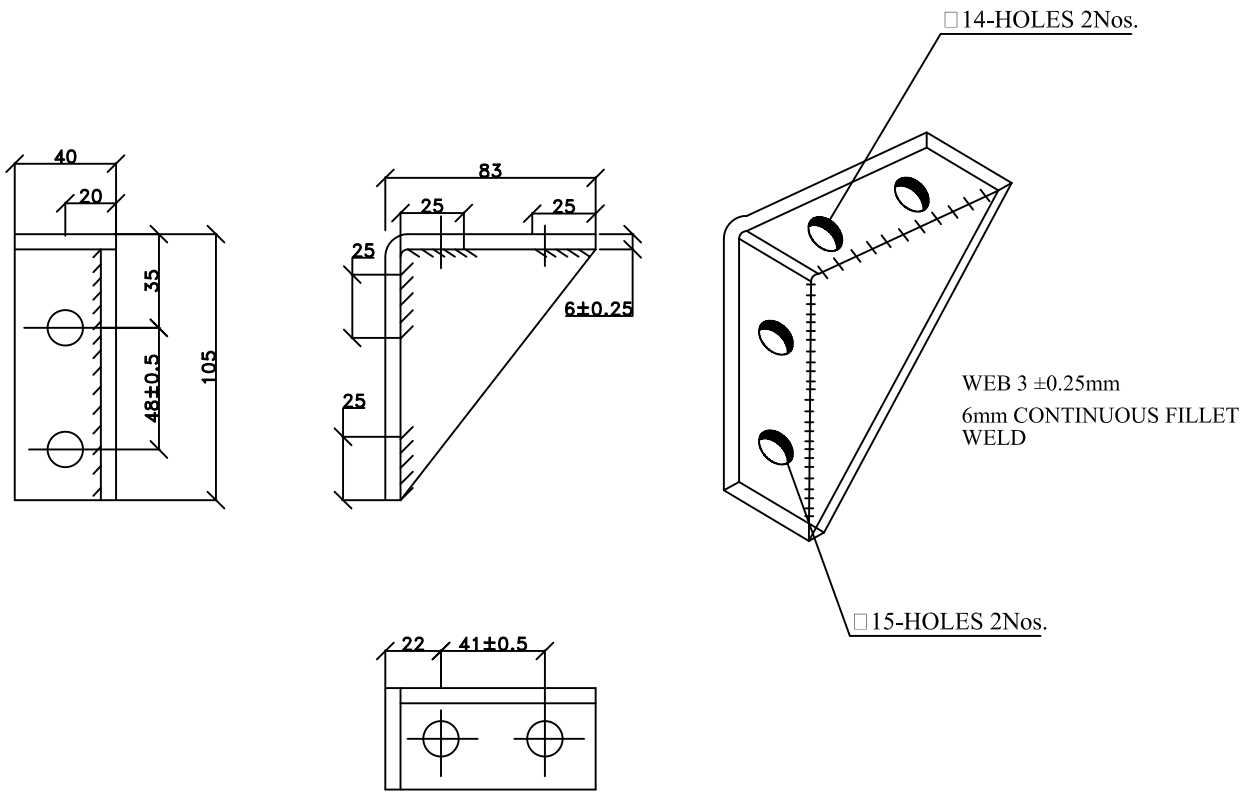
TITLE: INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM

DRG. NO.
Maitree–00–BTW–EDB –421507E006–PEM–1

RIO
FOR INFORMATION ONLY

Date: 11-May-2018

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90^0 ANGLE FITTING HL1

ANCHOR FASTENER–2NOs.
SPRING NUT & WASHER–2NOs.

NOTES :

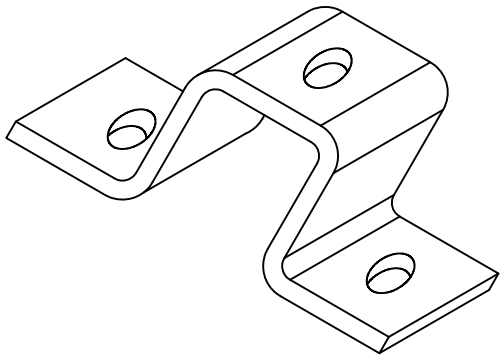
1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES ±1.0 mm
3. MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629 R1
5. TOLERANCE ON THICKNESS AS PER IS:1852

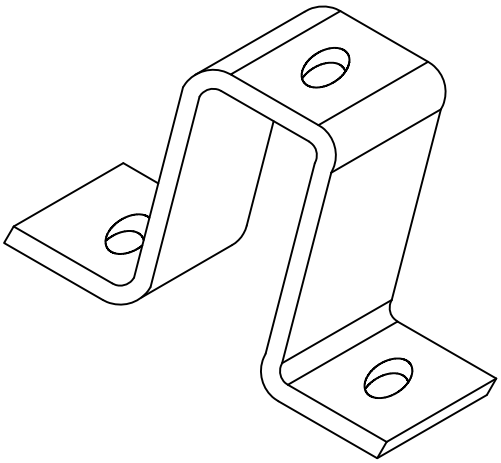
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		SH 4 OF 19

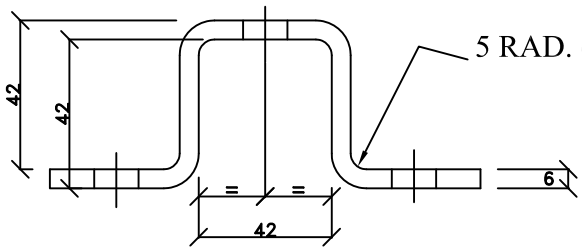
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FOR INFORMATION ONLY

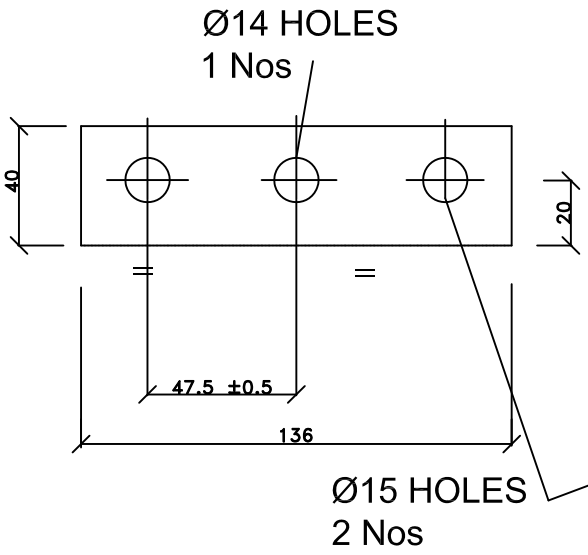
Date: 11-May-2018

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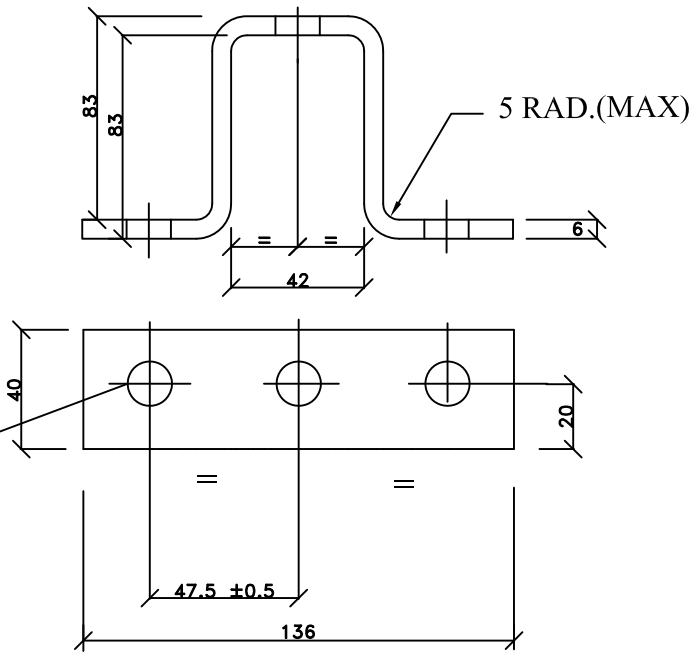








CLAMP FOR SINGLE CHANNEL CC1



CLAMP FOR DOUBLE CHANNEL CC2

NOTES

1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES ±1.0 mm
MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629 R1
5. TOLERANCE ON THICKNESS AS PER IS:1852

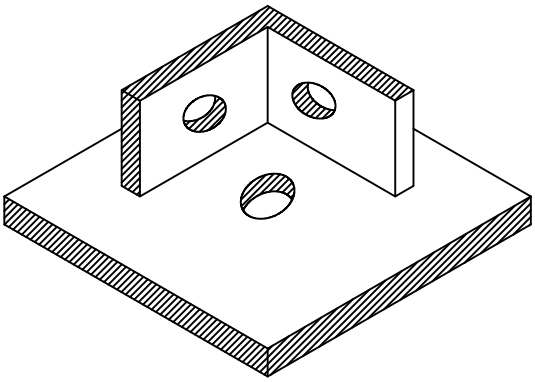
ANCHOR FASTENER–2NOs.
SPRING NUT & WASHER–1NO.

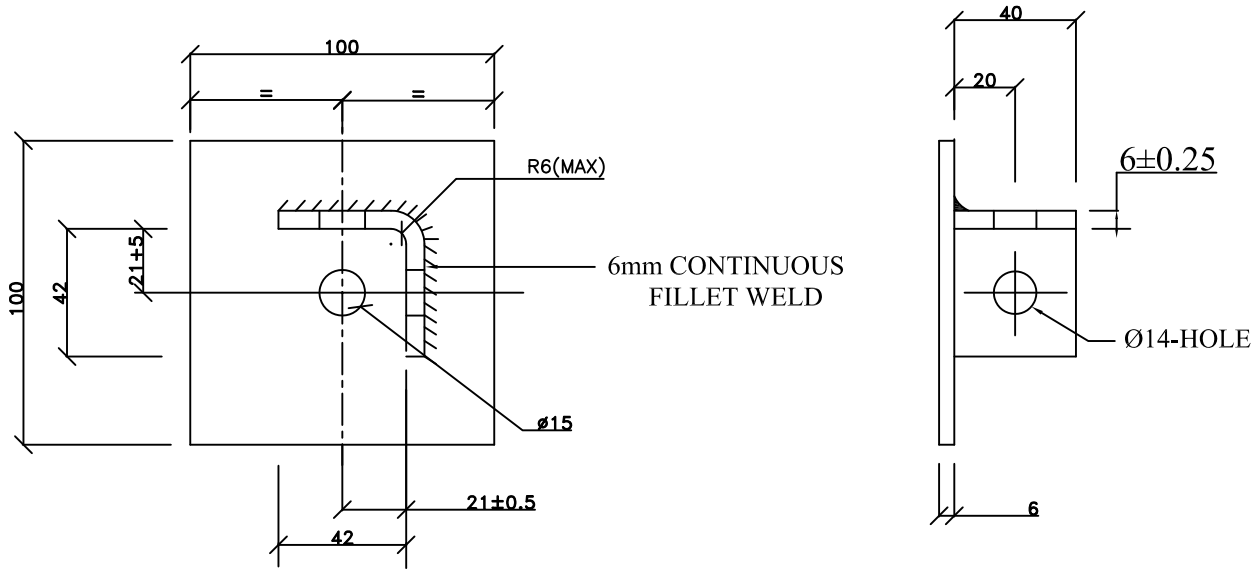
BHEL	TITLE: INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM	DRG. NO. Maitree–00–BTW–EDB –421507E006–PEM–1
		SH 5 OF 19

RIO
FOR INFORMATION ONLY

Date: 11-May-2018

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BASE PLATE FOR SINGLE CHANNEL BP1

NOTE

1. ALL DIMENSIONS ARE IN MM.
2. ALL FABRICATION TOLERANCES ±1.0mm.
3. MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852

R1

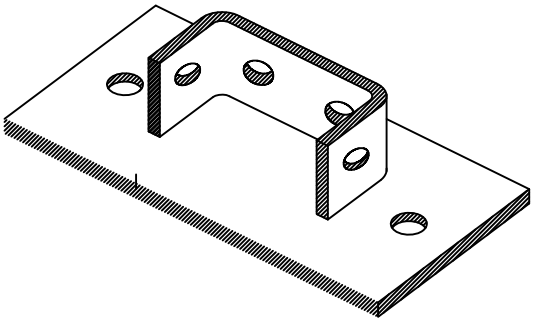
ANCHOR FASTENER–1NO.
SPRING NUT & WASHER–1NO.

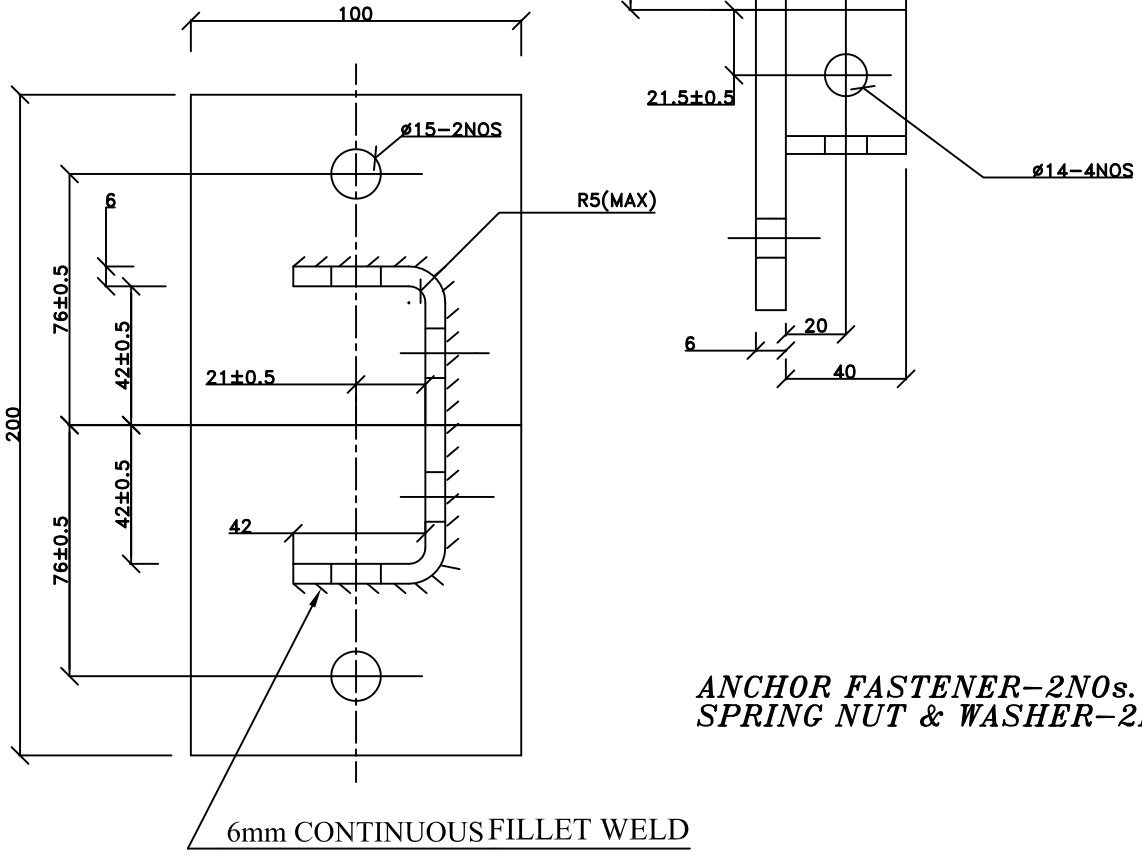
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		SH 6 OF 19

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FOR INFORMATION ONLY

Date: 11-May-2018

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ANCHOR FASTENER–2NOs.
SPRING NUT & WASHER–2NOs.

BASE PLATE FOR DOUBLE CHANNEL BP2

NOTES

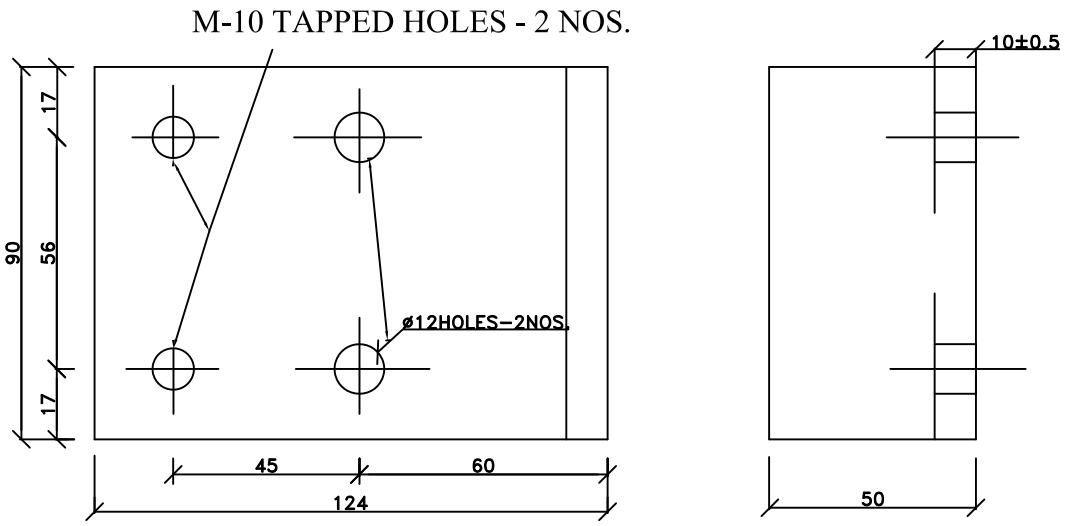
1. ALL DIMENSIONS ARE IN MM
2. ALL FABRICATION TOLERANCES ±1.0mm
3. MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629 R1
5. TOLERANCE ON THICKNESS AS PER IS:1852

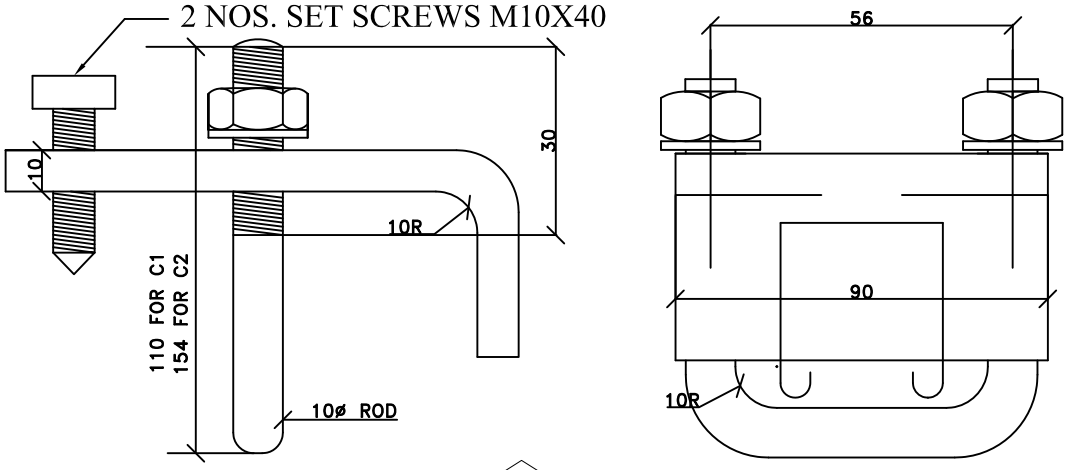
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		SH 7 OF 19

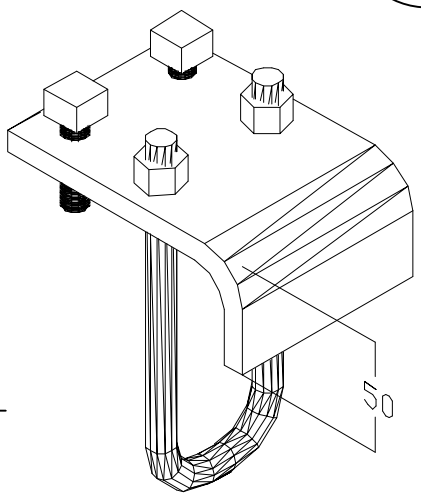
RIO
FOR INFORMATION ONLY

Date: 11-May-2018

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BEAM CLAMP - BC1

M-10 U-BOLT WITH
2Nos PLAIN WASHERS & NUTS
110 mm FOR SC 1
154 mm FOR DC1
2 NOs. SET SCREWS M10X40

NOTES

1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES ±1.0mm
MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852

R1

BHEL

TITLE:

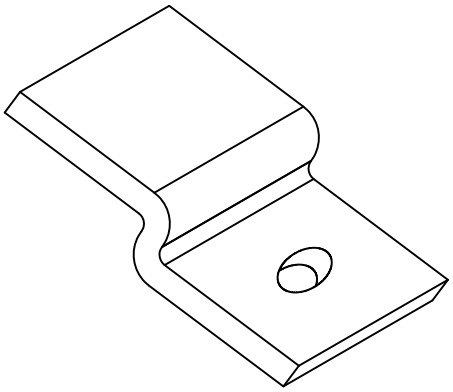
INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM

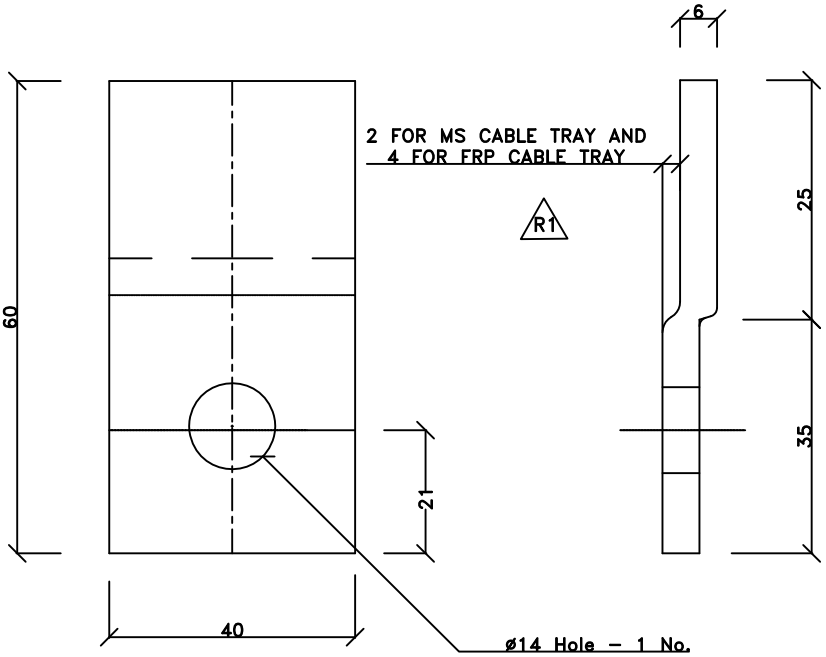
BHEL DRAWING NO.
Maitree-00-BTW-EDB-421507E006-PEM-1

RIO
FOR INFORMATION ONLY

Date: 11-May-2018

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TRAY FIXING CLAMP - TC1

SPRING NUT & WASHER–1NO.

NOTES

1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES : ±1.0mm

MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062

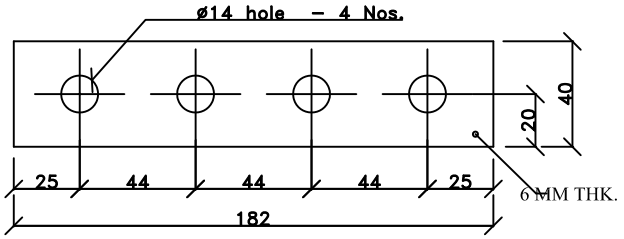
4. FINISH : HOT DIP GALVANISED AS PER IS:2629 R1
5. TOLERANCE ON THICKNESS AS PER IS:1852

BHEL	TITLE: INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM	BHEL DRAWING NO. Maitree–00–BTW–EDB –421507E006–PEM–0
		SH 9 OF 19

RIO
FOR INFORMATION ONLY

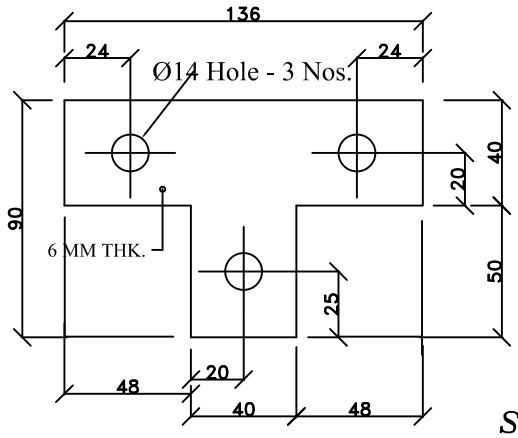
Date: 11-May-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.



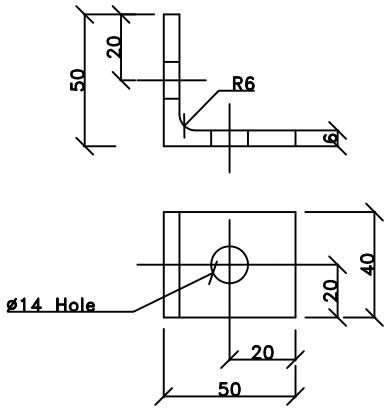
SPRING NUT & WASHER–4NOs.

FLAT PLATE STRAIGHT FITTING PF2



SPRING NUT & WASHER–3NOs.

FLAT PLATE TEE FITTING PF1



SPRING NUT & WASHER–2NOs.

90^0 ANGLE FITTING LA1

NOTES

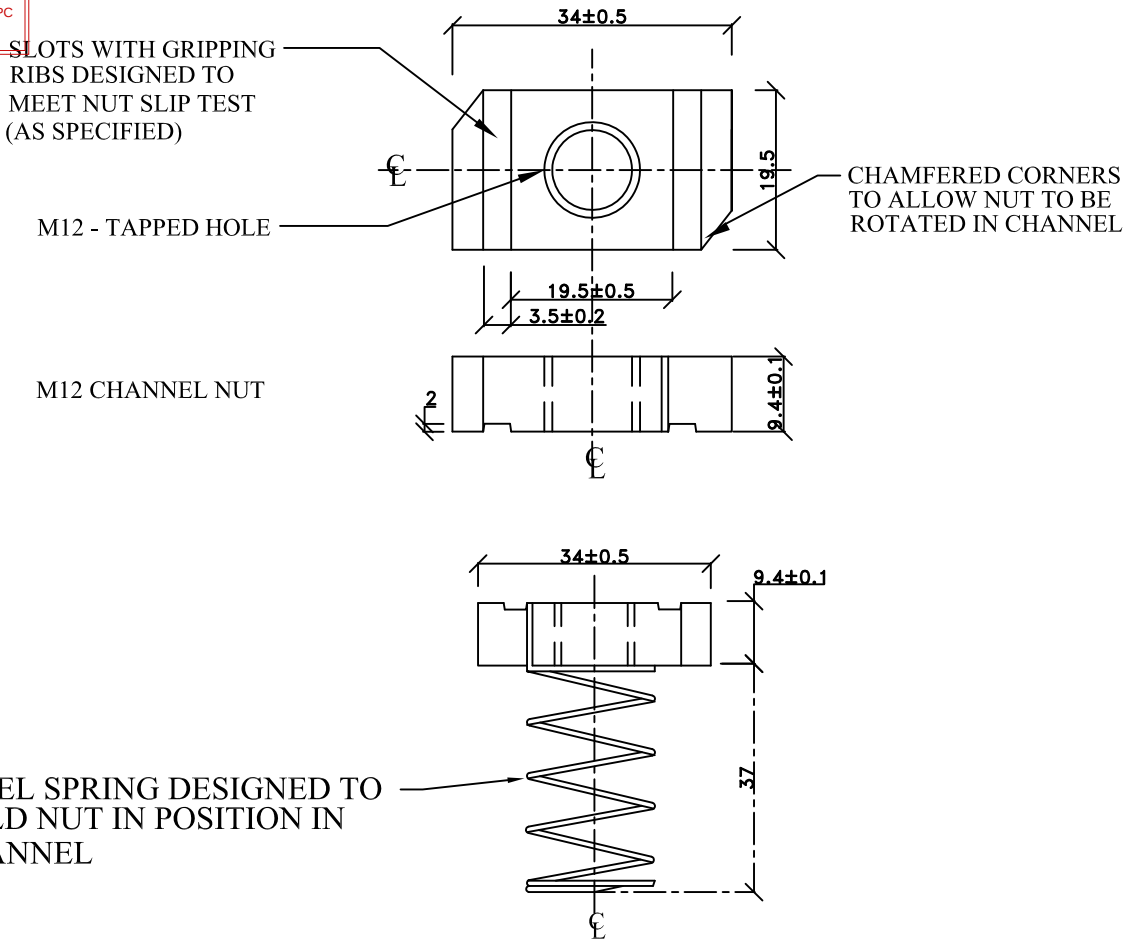
1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES ±1.0 mm
3. MATERIAL : HOT/ COLD ROLLED M.S. AS PER IS-2062 R1
4. FINISH : HOT DIP GALVANISED AS PER IS:2629

BHEL	TITLE: INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM	BHEL DRAWING NO. Maitree–00–BTW–EDB –421507E006–PEM–0
		SH 10 OF 19

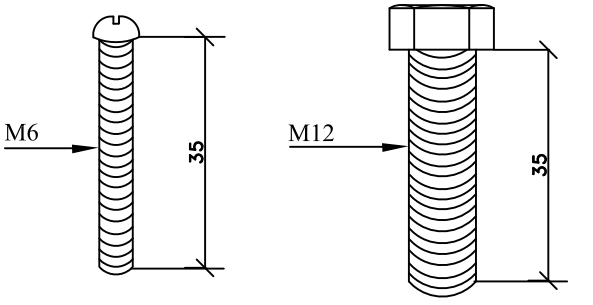
RIO
FOR INFORMATION ONLY

Date: 11-May-2018

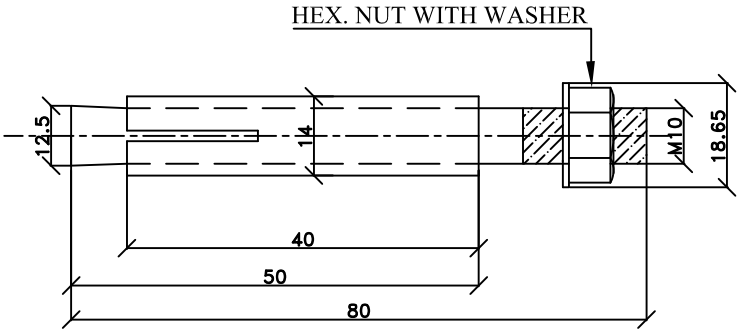
*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.



SPRING NUT ASSEMBLY



PAN HEAD SCREW HEX BOLT



ANCHOR BOLT M10

NOTES:

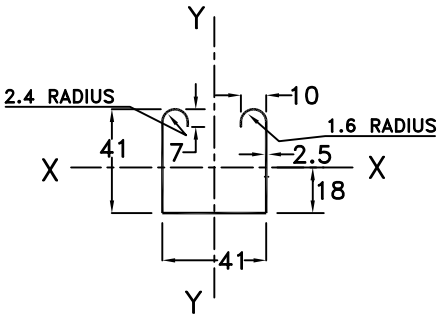
1. MATERIAL - MS AS PER IS - 2062. R1
2. M6 CHANNEL NUT DIMENSIONAL SIMILAR TO M12.
   EXCEPT HOLE DRILLED AND TAPPED TO M6 PAN HEAD SCREWS.
3. TAPPED HOLE THREADING TO MATCH WITH THREADING OF BOLTS.
4. SURFACE PROTECTION ELECTROGALVANISED / CADMIUM PLATED.
5. ALL DIMENSIONS ARE IN MM.

BHEL	**TITLE:** INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM	BHEL DRAWING NO. Maitree-00-BTW-EDB-421507E006-PEM-0
		SH 11 OF 19

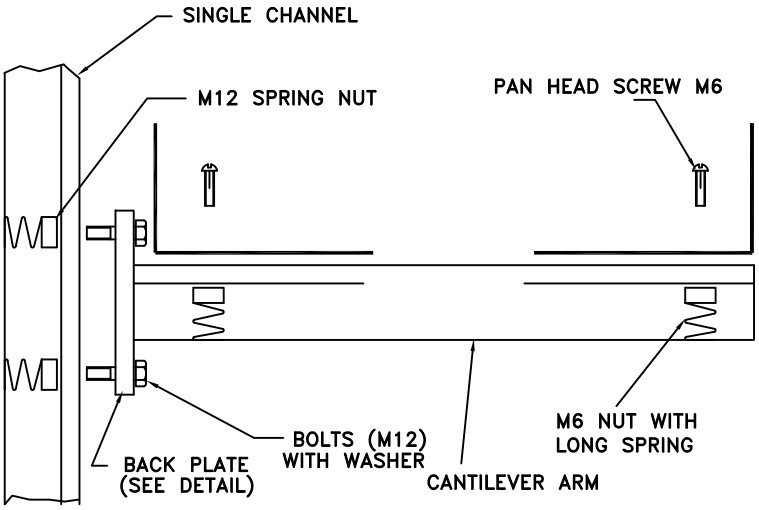
PIO
FOR INFORMATION ONLY

Date: 11-May-2018

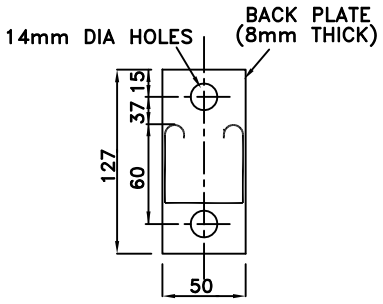
*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.



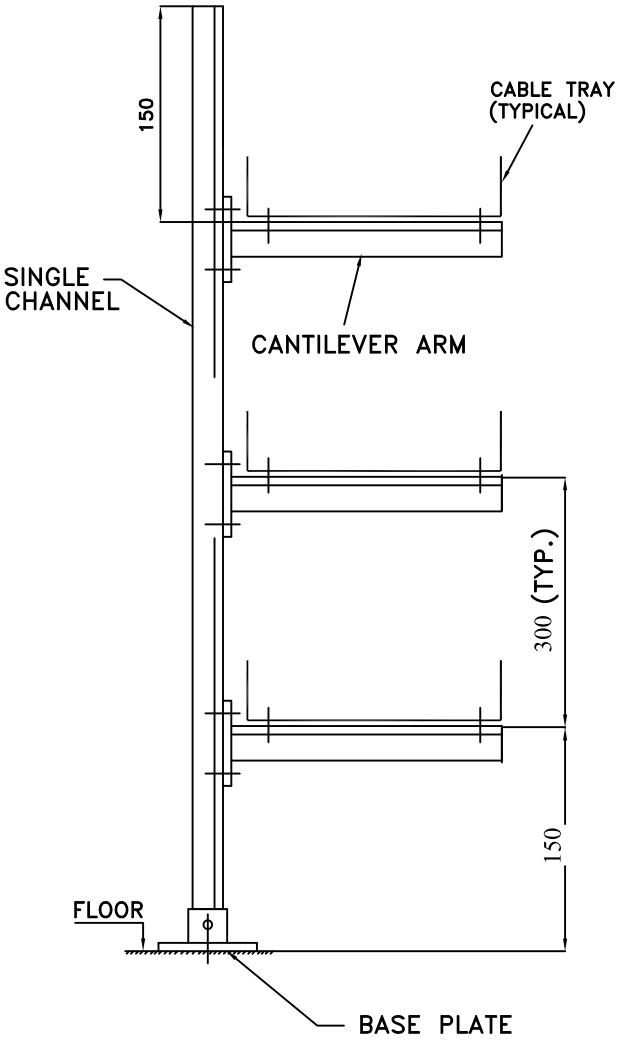
DETAIL OF ITEM–1
(SINGLE CHANNEL)

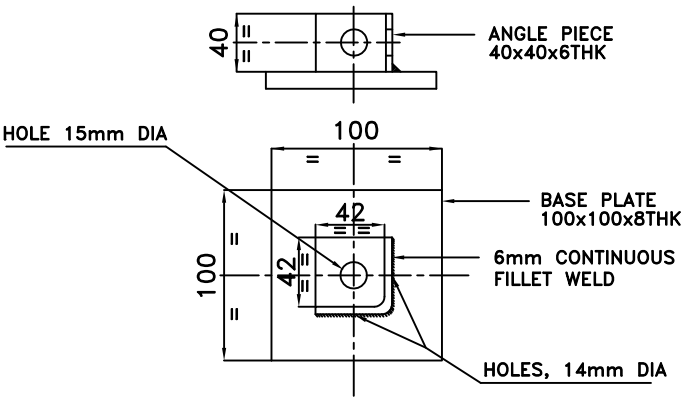


TYPICAL ASSEMBLY OF CHANNEL SUPPORTS AND CABLE TRAY



END VIEW OF
(CANTILEVER ARM)





DETAILS OF BASE PLATE
FOR SINGLE CHANNEL

FLOOR SUPPORTED (SINGLE SIDE TYPE)

SEE GENERAL NOTES IN SHEET 15.

TITLE:

INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM

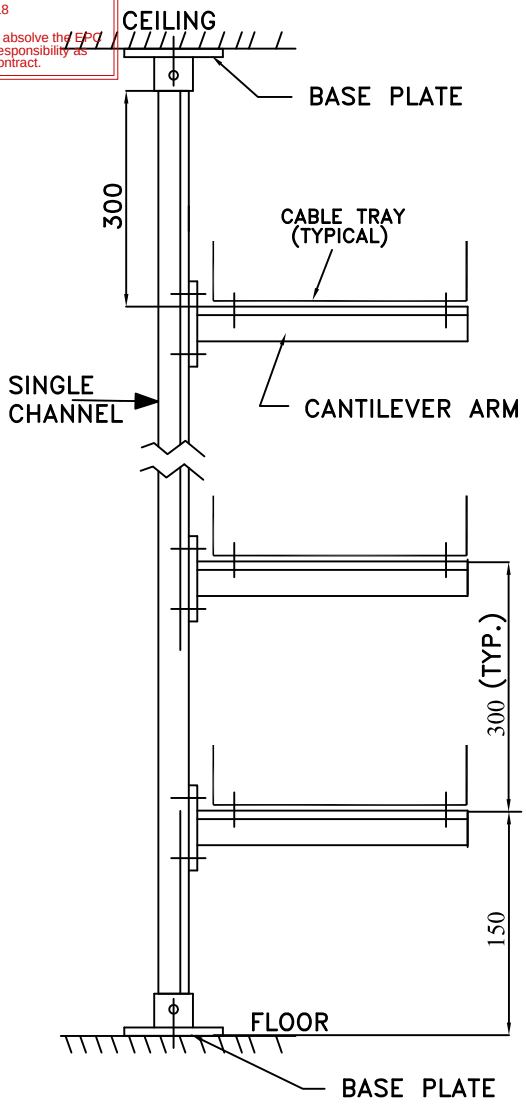
BHEL DRAWING NO.

Maitree–00–BTW–EDB –421507E006–PEM–1

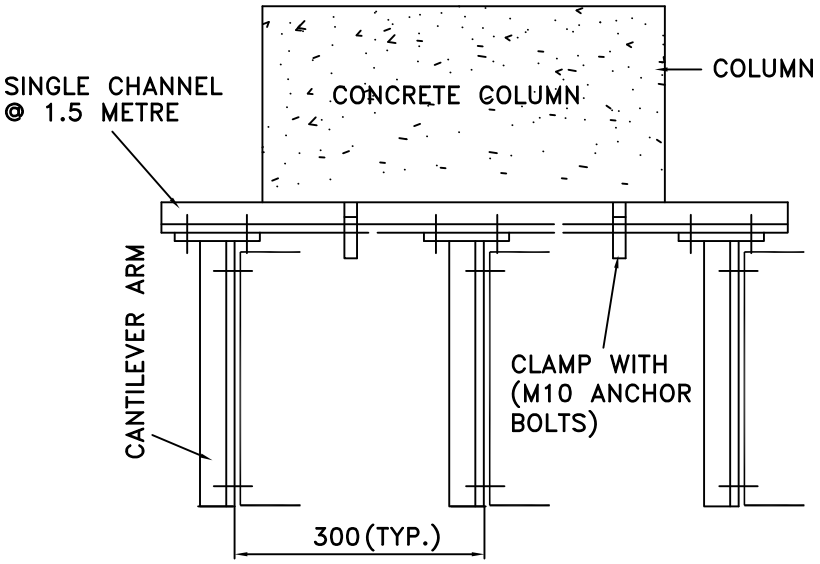
PIO
FOR INFORMATION ONLY

Date: 11-May-2018

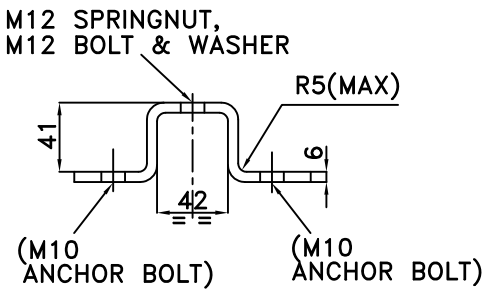
*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.



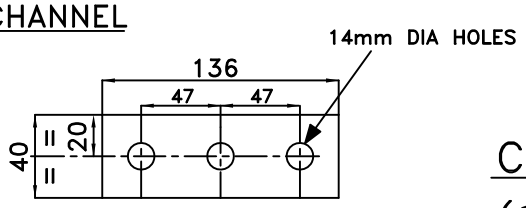
SUPPORTING ARRANGEMENT BETWEEN FLOOR AND CEILING (SINGLE SIDE TYPE)

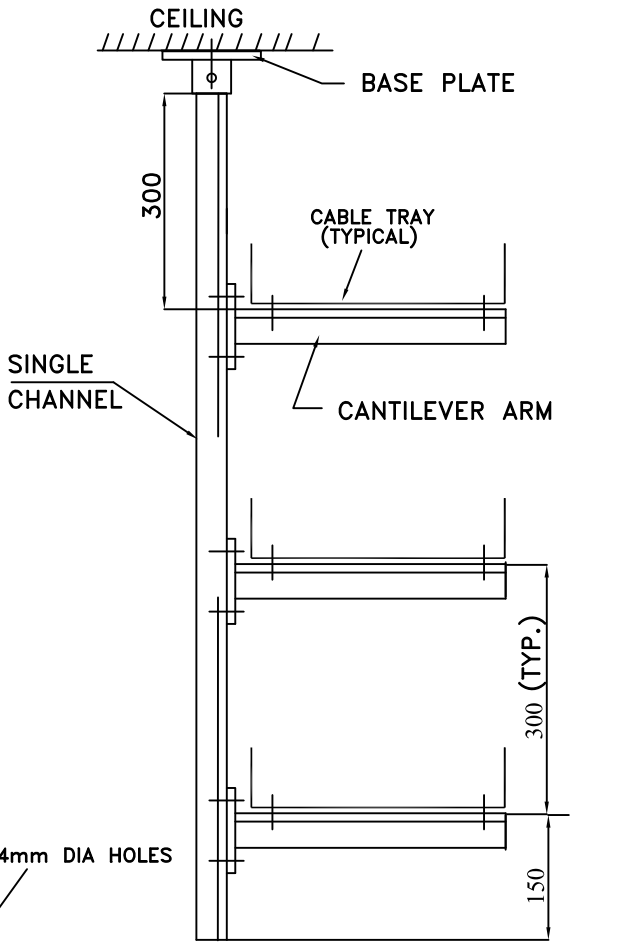


SUPPORT ARRANGEMENT FROM BUILDING COLUMN



CLAMP FOR SINGLE CHANNEL





CEILING SUPPORTED (SINGLE SIDE TYPE)

SEE GENERAL NOTES IN SHEET 15.

TITLE:

INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM

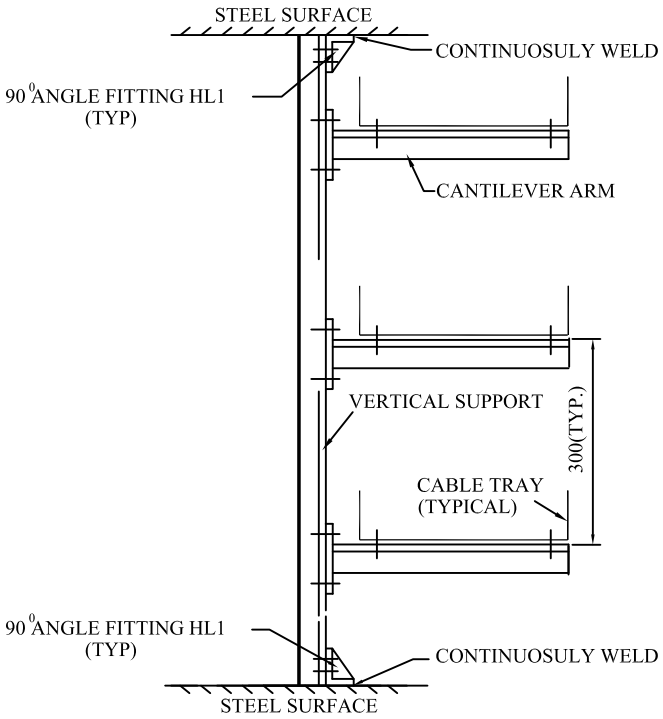
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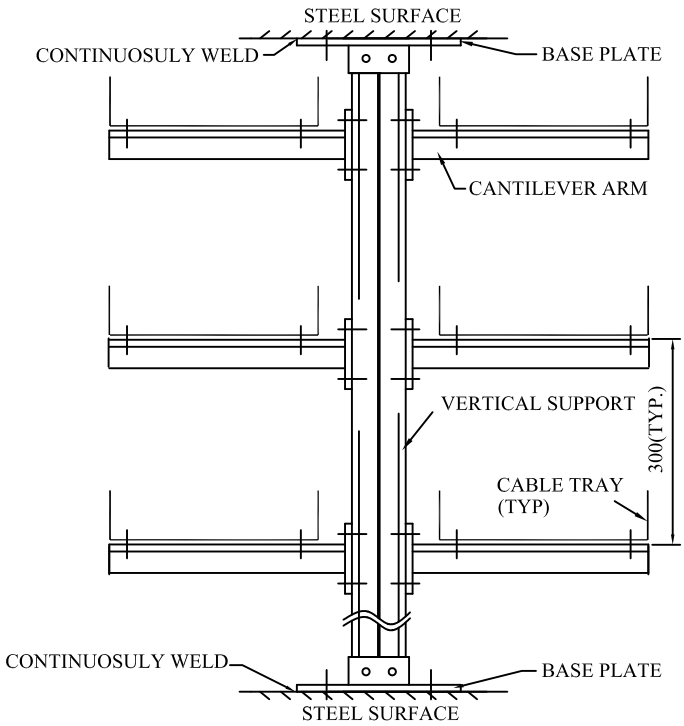
Maitree-00-BTW-EDB-421507E006-PEM-1

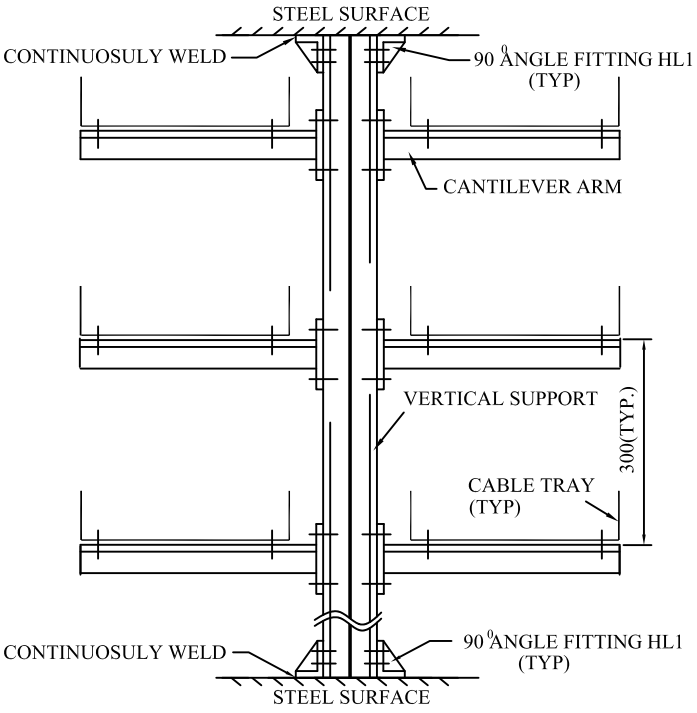
FIO
FOR INFORMATION ONLY

Date: 11-May-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.







SUPPORTING ARRANGEMENT OF (SINGLE SIDE/DOUBLE SIDE) BETWEEN TWO STEEL SURFACE

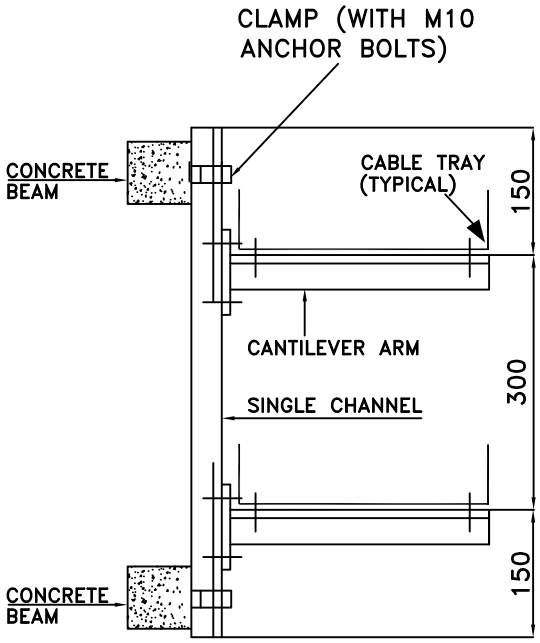
SEE GENERAL NOTES IN SHEET 15.

BHEL	TITLE: INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM	BHEL DRAWING NO. Maitree-00-BTW-EDB -421507E006-PEM-1
		SH 14 OF 19

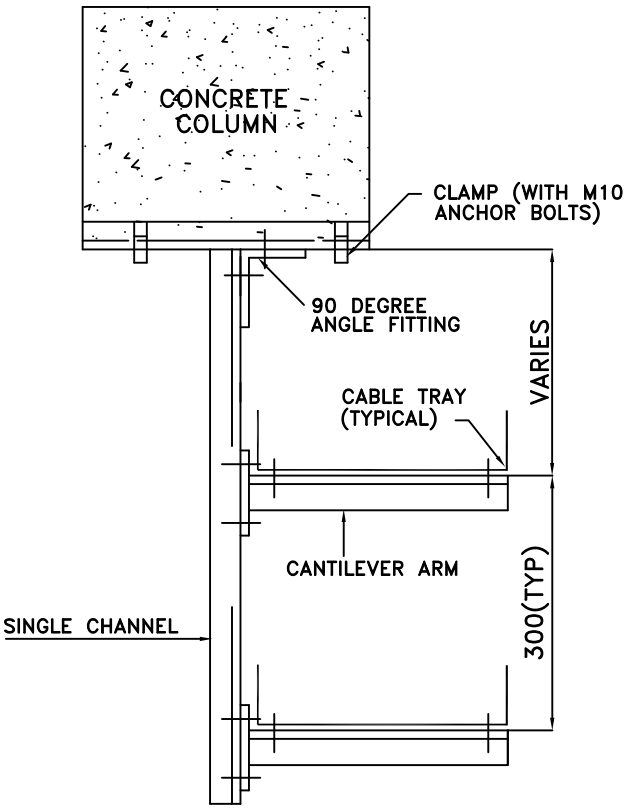
PO
FOR INFORMATION ONLY

Date: 11-May-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.



SUPPORT ARRANGEMENT FROM CONCRETE BEAMS



SUPPORT ARRANGEMENT FROM CONCRETE COLUMNS WITH ANGLE FITTING

GENERAL NOTES

1. ALL DIMENSIONS ARE IN MM UNLESS INDICATED OTHERWISE.
2. ALL SUPPORTS ARE OF 2.5 MM THICK MS CHANNEL SECTIONS AND GALVANISED.
3. ALL FASTENERS SHALL BE ZINC PASSIVATED/ CADMIUM PLATED.
4. ALL SUPPORT SHALL BE FIXED ON WALL / COLUMN / TRENCH BY MEANS OF 136 X 40 X 6 MM THICK CLAMP.
5. ARRANGEMENT SHOWN ARE TYPICAL ONLY.
6. ALL WELDS FOR CABLE TRAY SUPPORTS SHALL HAVE A MINIMUM THROAT THICKNESS OF 6 MM.

BHEL

TITLE: INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM

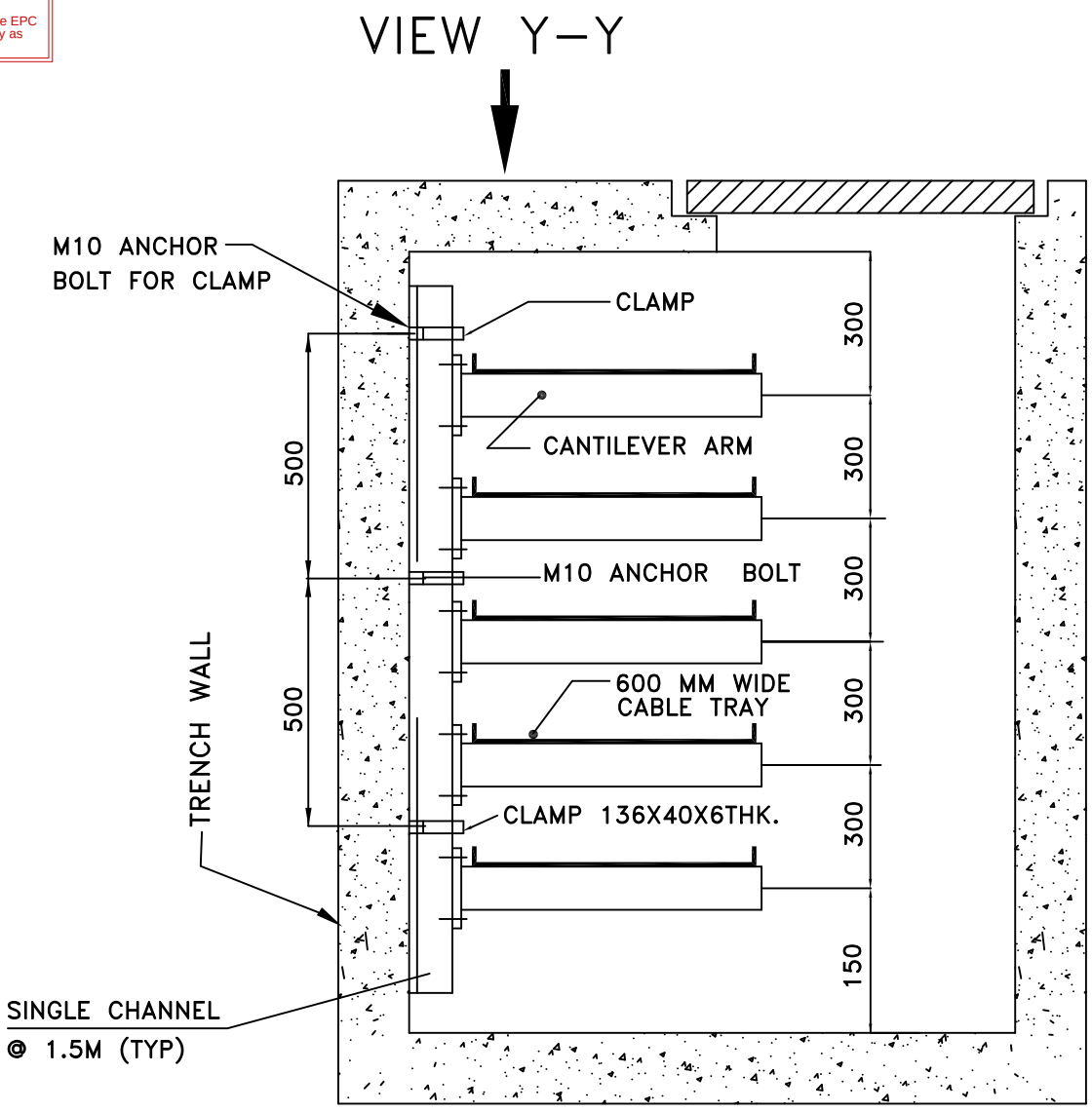
BHEL DRAWING NO.
Maitree-00-BTW-EDB-421507E006-PEM-1

SH 15 OF 19

PO
FOR INFORMATION ONLY

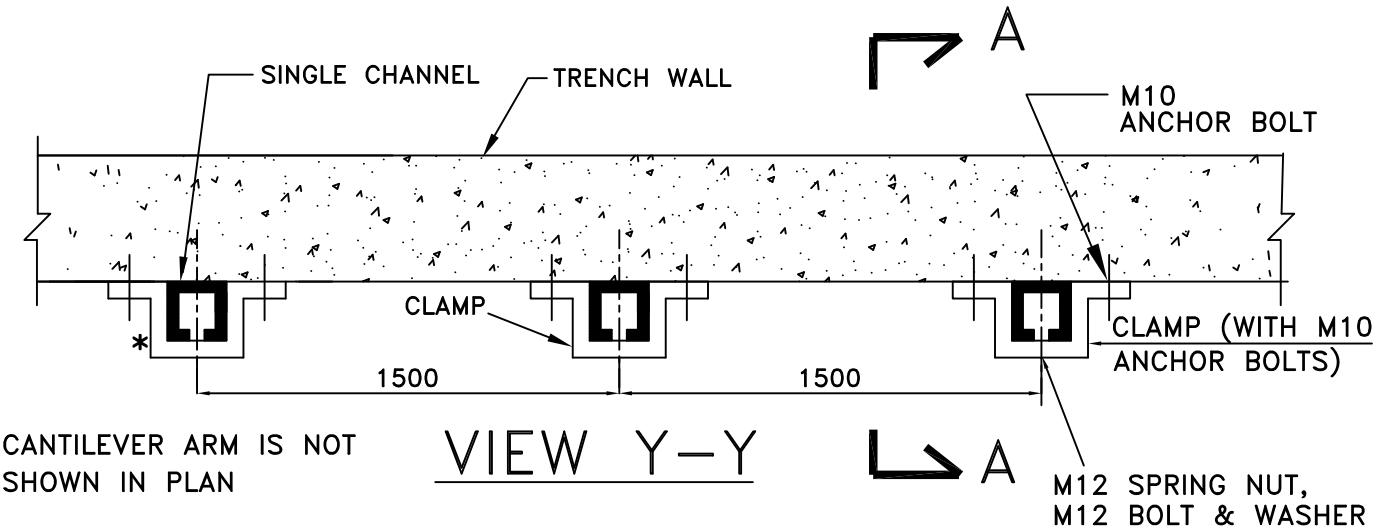
Date: 11-May-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.



SECTION-AA

TYP. CABLE TRAYS FIXING ARRANGEMENT IN TRENCH



*CANTILEVER ARM IS NOT SHOWN IN PLAN

VIEW Y-Y

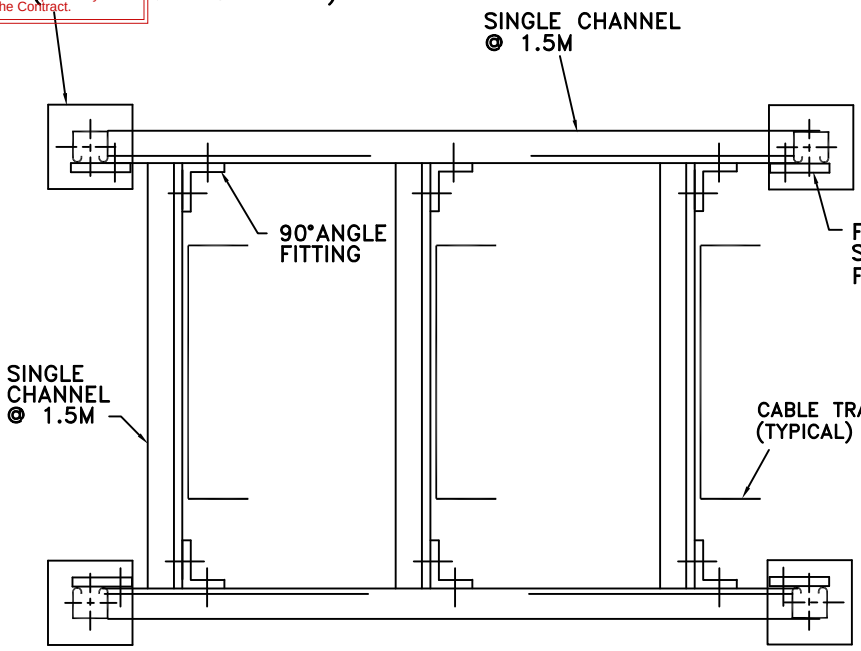
SEE GENERAL NOTES IN SHEET 15.

BHEL	TITLE: INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM	BHEL DRAWING NO. Maitree-00-BTW-EDB -421507E006-PEM-1
		SH 16 OF 19

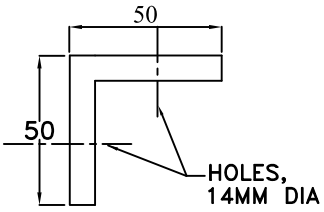
PID
FOR INFORMATION ONLY

Date: 11-May-2019

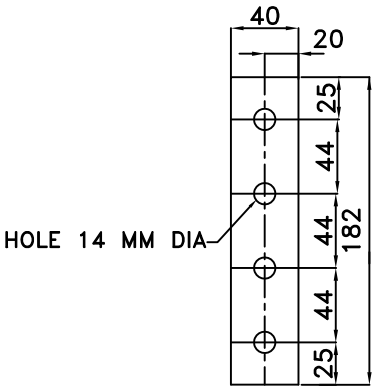
*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.



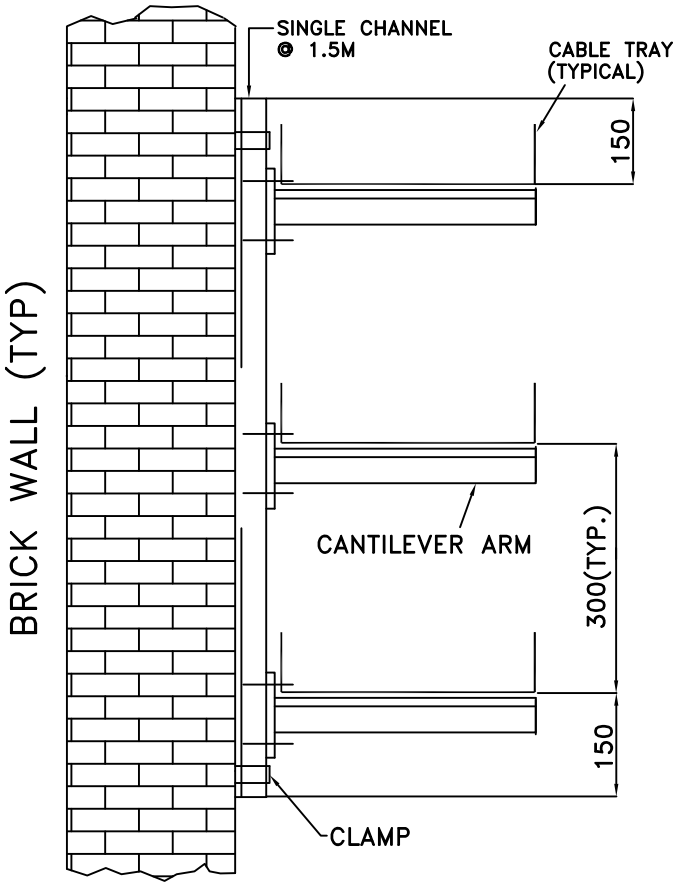
TYPICAL FLOOR SUPPORTED CHANNEL FRAME WORK (FOR BOLTABLE TYPE CABLE TRAY RISER)



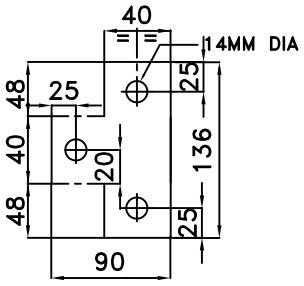
90 DEG. ANGLE FITTING
(6 MM THICK, 40 MM WIDE)



FLAT PLATE
STRAIGHT FITTING
(6 MM THICK)



TYPICAL CHANNEL SUPPORT
(ON WALL)



FLAT PLATE TEE FITTING
(6 MM THICK)

SEE GENERAL NOTES IN SHEET 15.

TITLE:

INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM

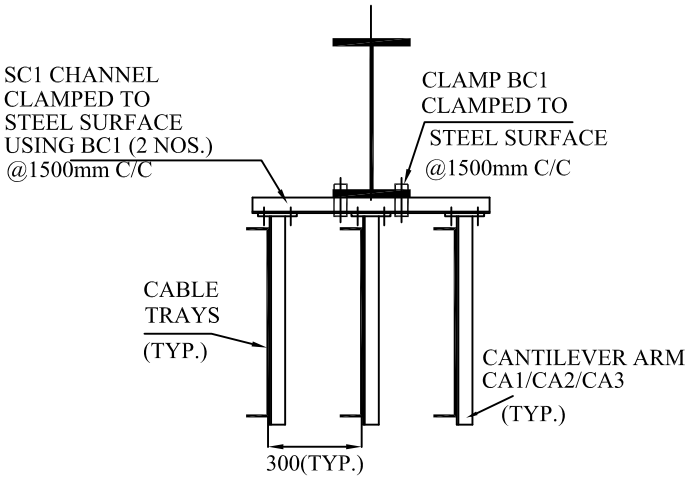
BHEL DRAWING NO.

Maitree-00-BTW-EDB-421507E006-PEM-1

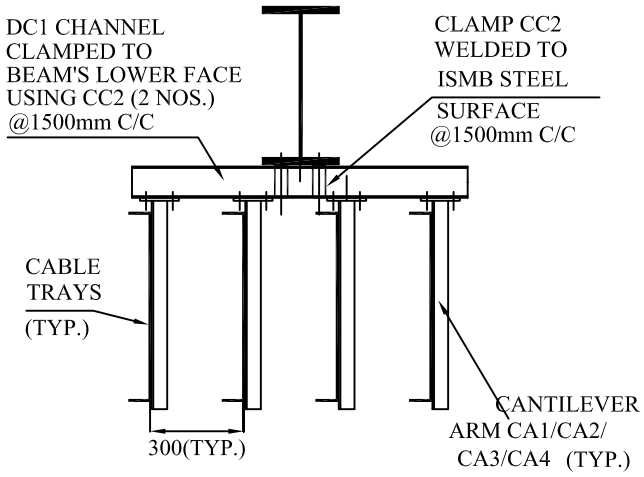
PO
FOR INFORMATION ONLY

Date: 11-May-2018

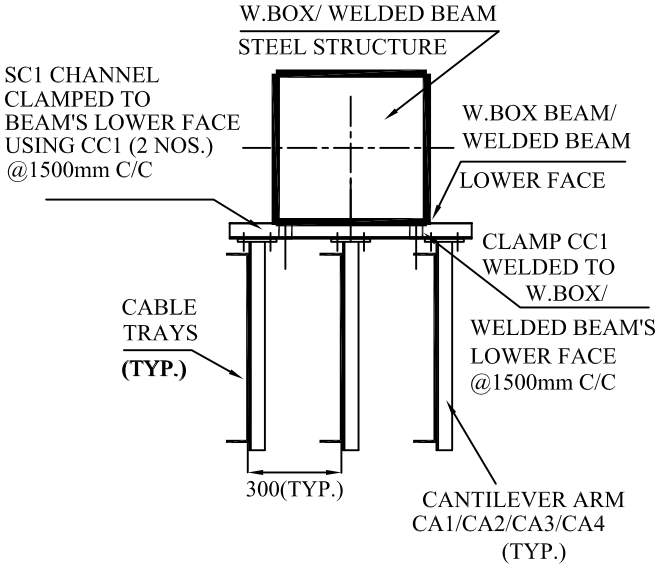
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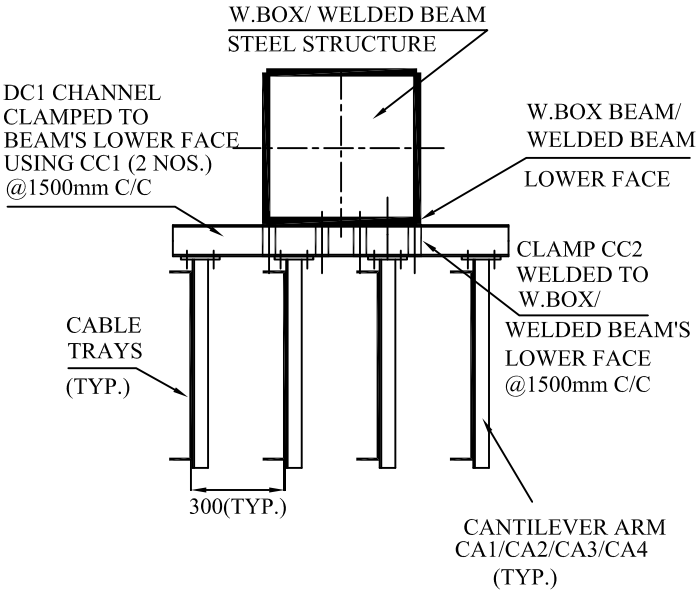
INSTALLATION DETAIL TYPE BB1:
(A)-CABLE TRAYS BELOW I-BEAMS
(UPTO & INCLUDING THREE TRAYS)



INSTALLATION DETAIL TYPE BB2:
(B)-CABLE TRAYS BELOW I-BEAMS
(MORE THAN THREE TRAYS)



INSTALLATION DETAIL TYPE BB3:
(C)-CABLE TRAYS BELOW W. BOX/
WELDED BEAM'S (APPLICABLE FOR
UPTO & INCLUDING THREE TRAYS)



INSTALLATION DETAIL TYPE BB4:
(D)-CABLE TRAYS BELOW W. BOX/
WELDED BEAM'S (APPLICABLE FOR
MORE THAN THREE TRAYS)

CABLE TRAYS SUPPORTING ARRANGEMENT AROUND BOILER PLATFORMS

BHEL

TITLE:

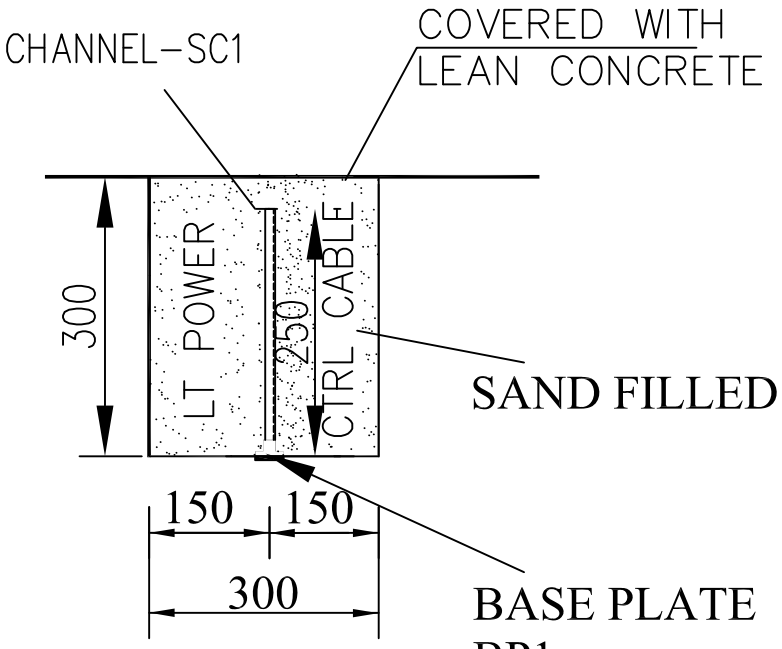
INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM

BHEL DRAWING NO.
Maitree-00-BTW-EDB
-421507E006-PEM-1

PO
FOR INFORMATION ONLY

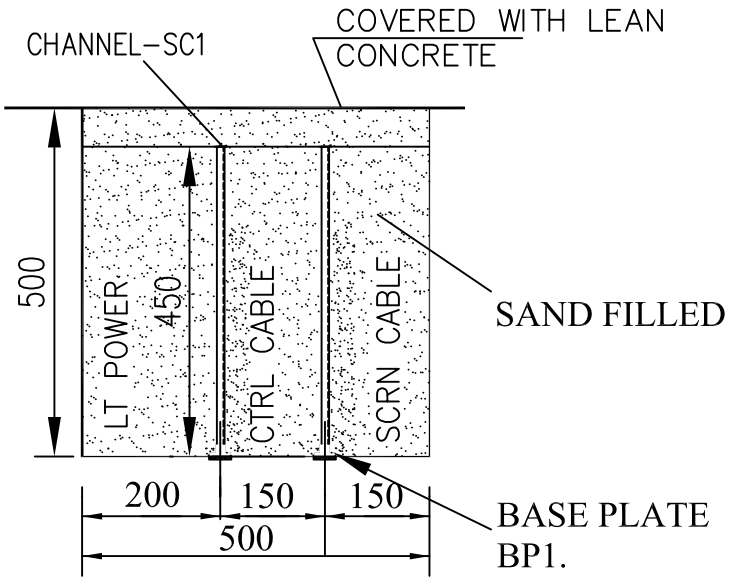
Date: 11-May-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.



CABLE SLIT
300W x 300D

R1



R1

CABLE SLIT
500W x 500D

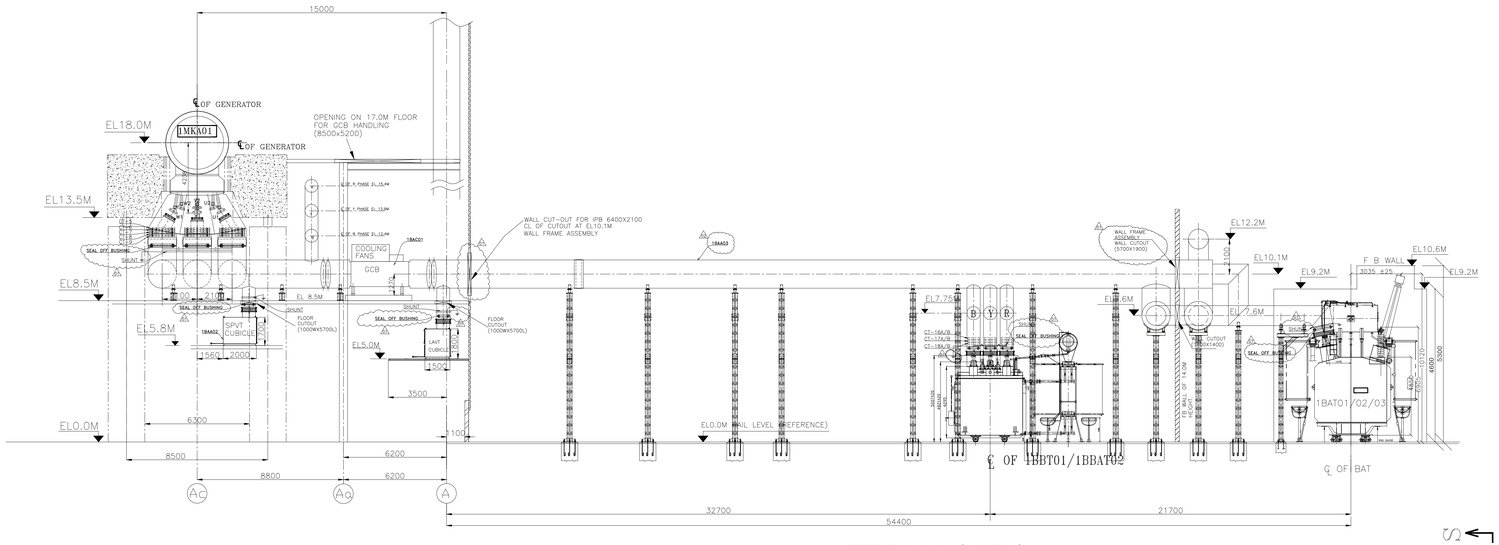
BHEL	TITLE: INSTALLATION DETAILS FOR CABLE TRAYS SUPPORT SYSTEM	BHEL DRAWING NO. Maitree–00–BTW–EDB –421507E006–PEM–1
		SH 19 OF 19

APPROVED
Checked and Approved.

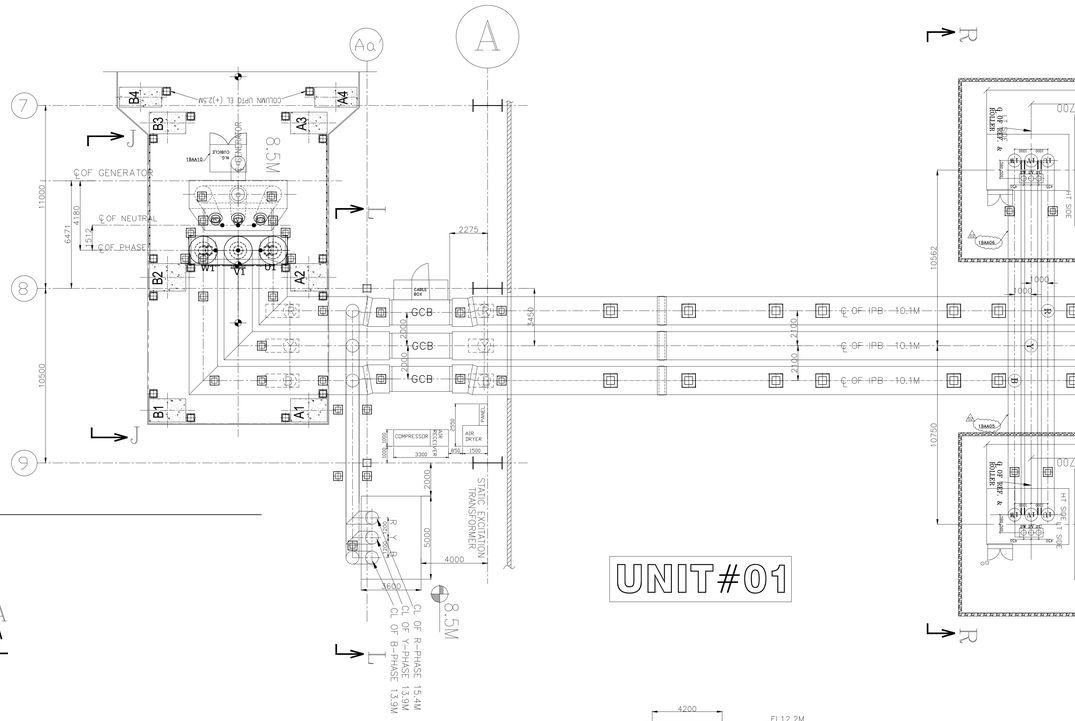
Date: 09-Feb-2019

"Approval doesn't absolve the EPC contractor of its responsibility as specified in the Contract."

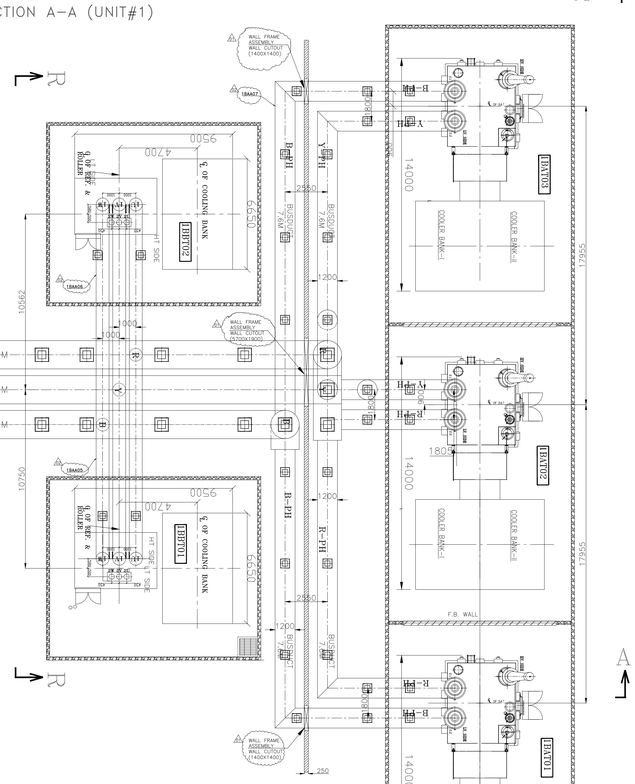
DRAWING NO.MAITREE-00-BAA-LD-500001-RDP
FIRST ANGLE PROJECTION
ALL DIMENSION IN MILIMETER
COPYRIGHT & CONFIDENTIAL THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY DETRIMENTAL TO THE INTREST OF THE COMPANY.

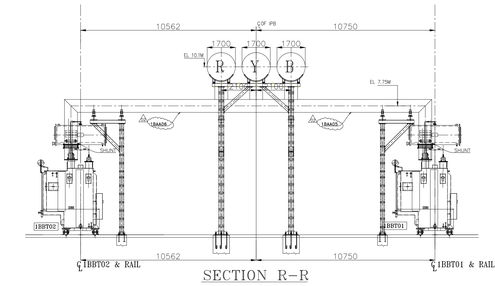


SECTION A-A (UNIT#1)

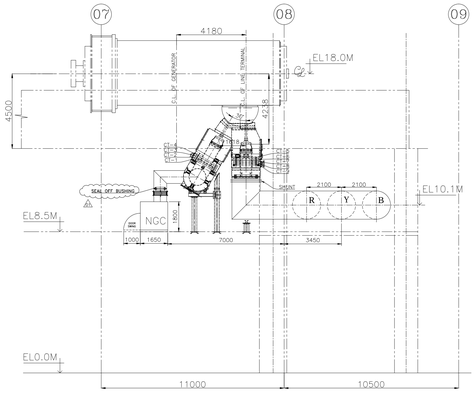


UNIT#01

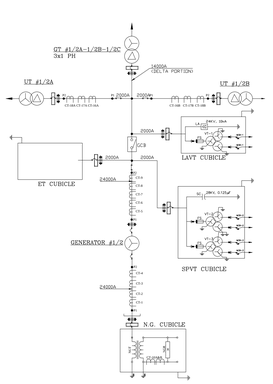




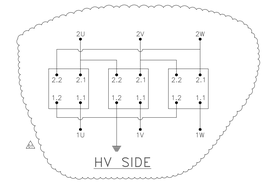
SECTION R-R

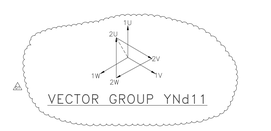


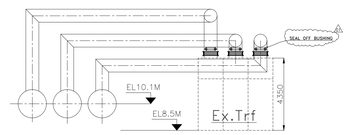
SECTION J-J



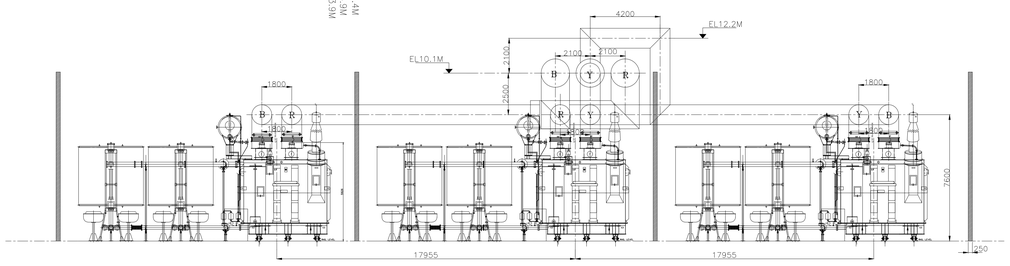
SLD







SECTION L-L



SECTION SS

REFERENCE DRAWINGS:

1. TRANSFORMER YARD LAYOUT --- MAITREE-00-BTW-EDB-105024-PEM
2. GENERATOR OGA --- MAITREE-00-MKA-LU-140014-HWR
3. GENERATOR TRF OGA --- MAITREE-0-BAT-EE-225123-BPL
4. GA OF GCB --- MAITREE-00-BTW-EDB-105084-PEM
5. TG FOUNDATION GA --- MAITREE-00-UMA-LC-100713-PEM
6. OGA OF UT --- MAITREE-00-BBT-EE-425017-JHS
7. OGA OF ET --- MAITREE-00-CJN-EDA-400154-EDN
8. OGA OF LAVT --- MAITREE-00-BAA-LU-500007-RDP
9. OGA OF SPVT --- MAITREE-00-BAA-LU-500008-RDP
10. OGA OF NG -- MAITREE-00-BAA-LU-500009-RDP

LEGEND

- SEAL-OFF-BUSHING
- RUBBER BELLOW
- FLEXIBLE JOINT
- CURRENT TRANSFORMER
- SHUNT
- EARTHING

02	12.01.19	MUKESH	PIYUSH	ARVIND	DOCUMENT REVISED AS PER COMMENTS DATED 19.12.18
01	24.11.18	PIYUSH	PIYUSH	ARVIND	DOCUMENT REVISED AS PER COMMENTS DATED 29.11.18
	DATE	ALTERED	CHECKED	APPROVED	NOTE

PROJECT
2 X 660 MW MAITREE SUPER THREMAL POWER PROJECT, RAMPAL, BANGLADESH

OWNER CONSULTANT
FICHTNER
M/s FICHTNER Gmbh & Co KG, Stuttgart, GERMANY

OWNER
BANGLADESH – INDIA FRIENDSHIP POWER COMPANY (PVT.) LTD, BANGLADESH

BHARAT HEAVY ELECTRICALS LIMITED
RUDRAPUR

SCALE
SHEETS- 01 OF 04

	DATE	NAME
DGN.	11.10.18	SACHIN
CKD.	12.10.18	PIYUSH
APPD.	12.10.18	ARVIND
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM:		

VENDOR

TITLE LAYOUT OF ISOLATED PHASE BUSDUCT FOR UNIT - 1 & 2
1BAA03, 1BAA05, 1BAA06, 1BAA07 2BAA03, 2BAA05, 2BAA06, 2BAA07

SIZE- A0 | PROJECT NO:- | FILE-

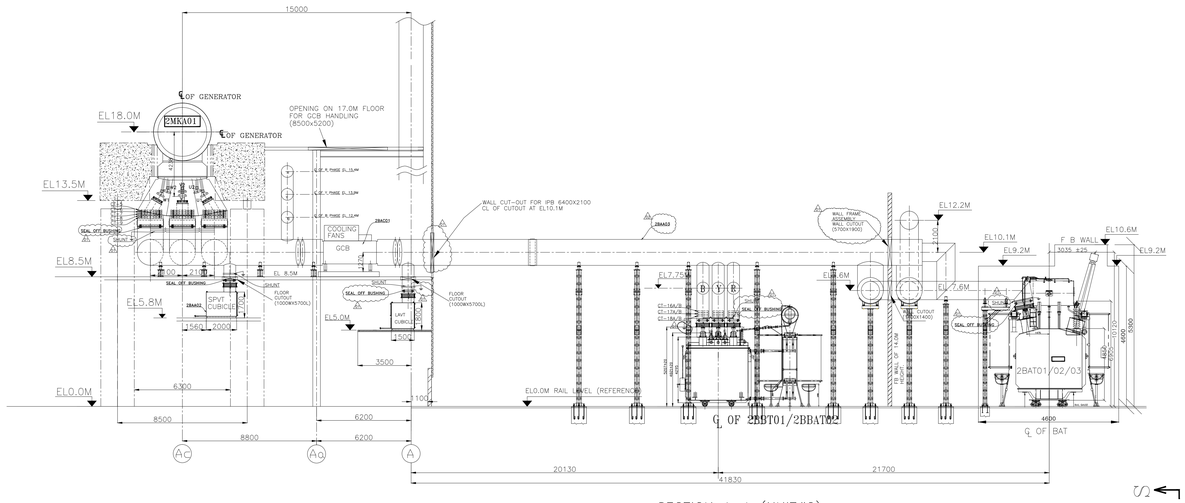
ANNEX- | DOC. NO-MAITREE-00-BAA-LD-500001-RDP | REV:- 02

APPROVED
Checked and Approved.

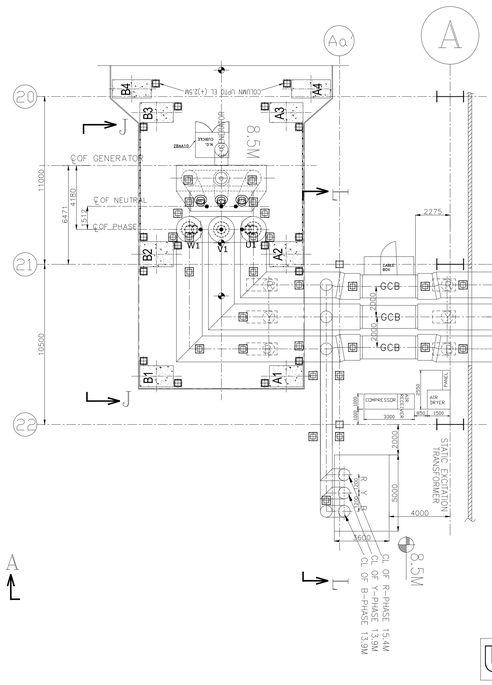
Date: 09-Feb-2019

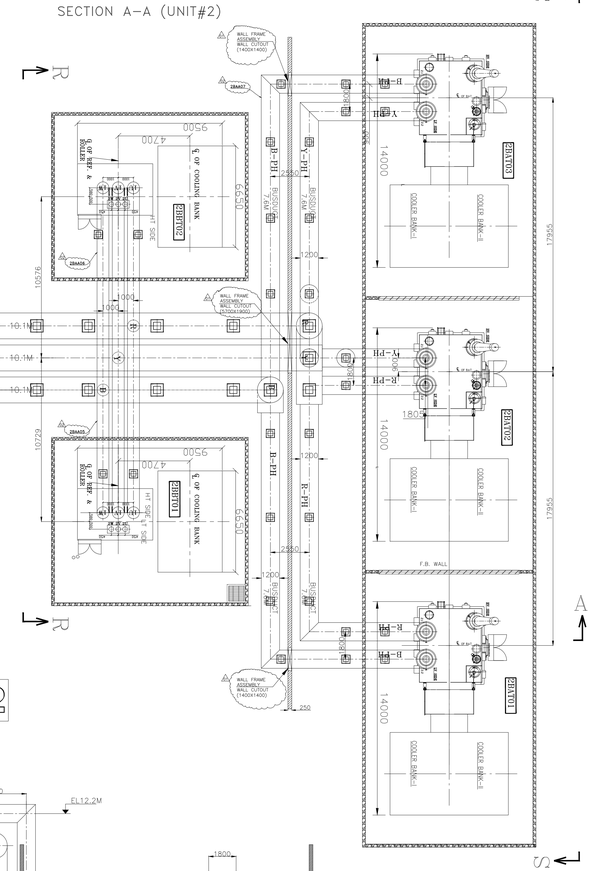
"Approval doesn't absolve the EPC contractor of its responsibility as specified in the Contract."

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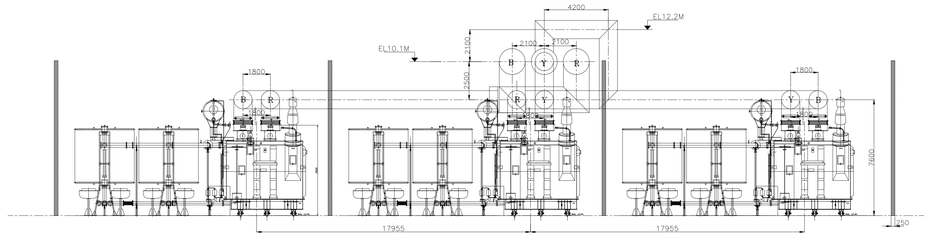


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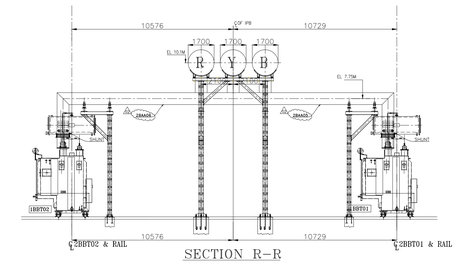


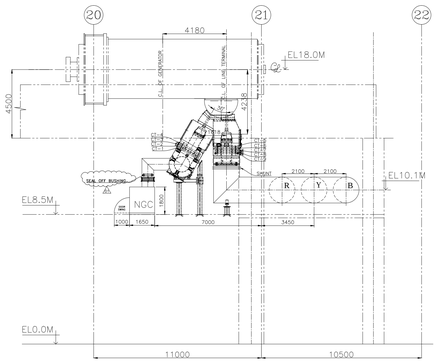


UNIT#02

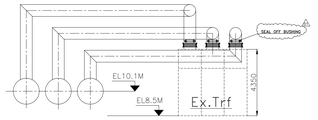


SECTION SS

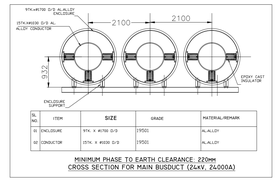




SECTION J–J

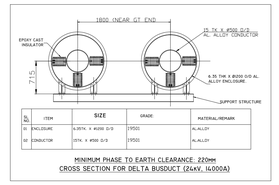


SECTION L–L



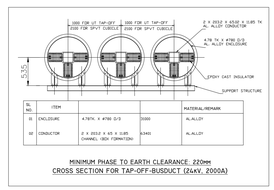
SL NO	ITEM	SIZE	GRADE	MATERIAL/REMARK
01	ENCLOSURE	574.4 X 4678 D/S	19500	AL.ALLOY
02	CONDUCTOR	1574.4 X 4550 D/S	19500	AL.ALLOY

MINIMUM PHASE TO EARTH CLEARANCE 220mm
CROSS SECTION FOR MAIN BUSDUCT (24kV, 24,000A)



SL NO	ITEM	SIZE	GRADE	MATERIAL/REMARK
01	ENCLOSURE	6.35TH. X 4550 D/S	19500	AL.ALLOY
02	CONDUCTOR	15TH. X 4150 D/S	19500	AL.ALLOY

MINIMUM PHASE TO EARTH CLEARANCE 220mm
CROSS SECTION FOR DELTA BUSDUCT (24kV, 16,000A)



SL NO	ITEM			MATERIAL/REMARK
01	ENCLOSURE	4.76TH. X 4780 D/S	5000	AL.ALLOY
02	CONDUCTOR	2 X 2012.2 X 10 X 0.815 CHANNEL CROSS CONNECTION	63401	AL.ALLOY

MINIMUM PHASE TO EARTH CLEARANCE 220mm
CROSS SECTION FOR TAP-OFF-BUSDUCT (24kV, 2000A)

LEGEND
- SEAL-OFF-BUSHING
- RUBBER BELLOW
- FLEXIBLE JOINT
- CURRENT TRANSFORMER
- SHUNT
- EARTHING

NO	DATE	ALTERED	CHECKED	APPROVED	NOTE
02	12.01.19	MUKESH	PIYUSH	ARVIND	DOCUMENT REVISED AS PER COMMENTS DATED 19.12.18
01	24.11.18	PIYUSH	PIYUSH	ARVIND	DOCUMENT REVISED AS PER COMMENTS DATED 29.11.18

PROJECT
2 X 660 MW MAITREE SUPER THREMAL POWER PROJECT, RAMPAL, BANGLADESH

OWNER
BANGLADESH – INDIA FRIENDSHIP POWER COMPANY (PVT.) LTD, BANGLADESH

OWNER'S ENGINEER
BHARAT HEAVY ELECTRICALS LIMITED
RUDRAPUR

OWNER CONSULTANT
FICHTNER
M/s FICHTNER Gmbh & Co KG, Stuttgart, GERMANY

	DATE	NAME
DSN.	11.10.18	SACHIN
CKD.	12.10.18	PIYUSH
APPD.	12.10.18	ARVIND

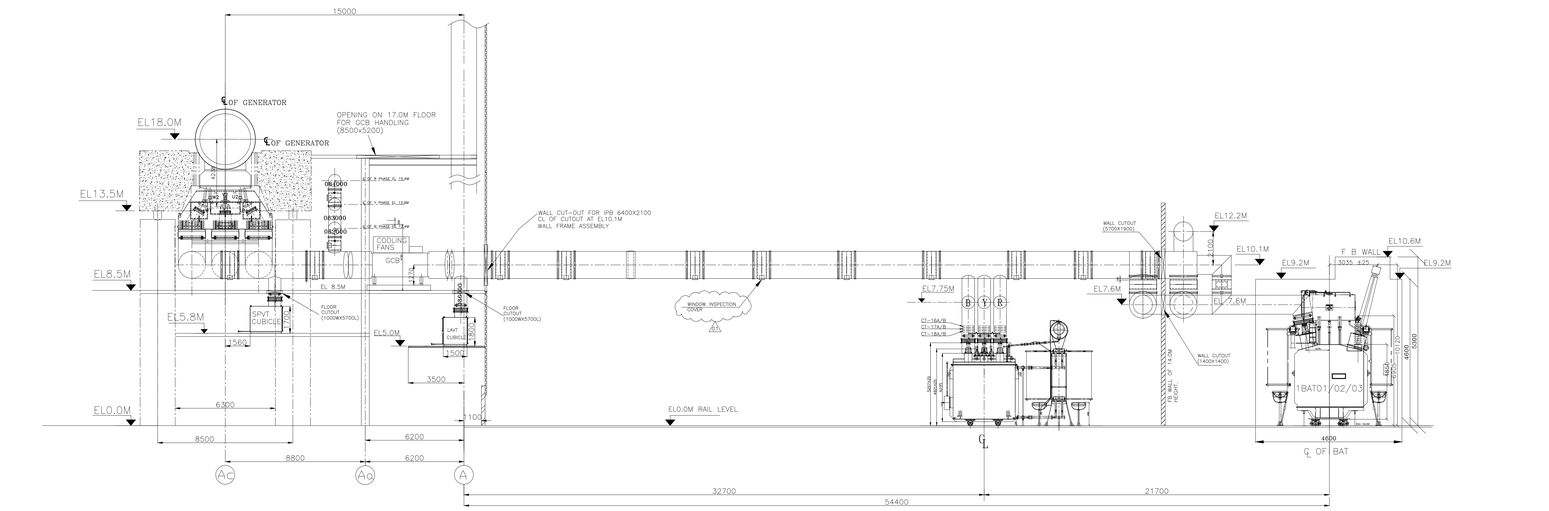
VENDOR

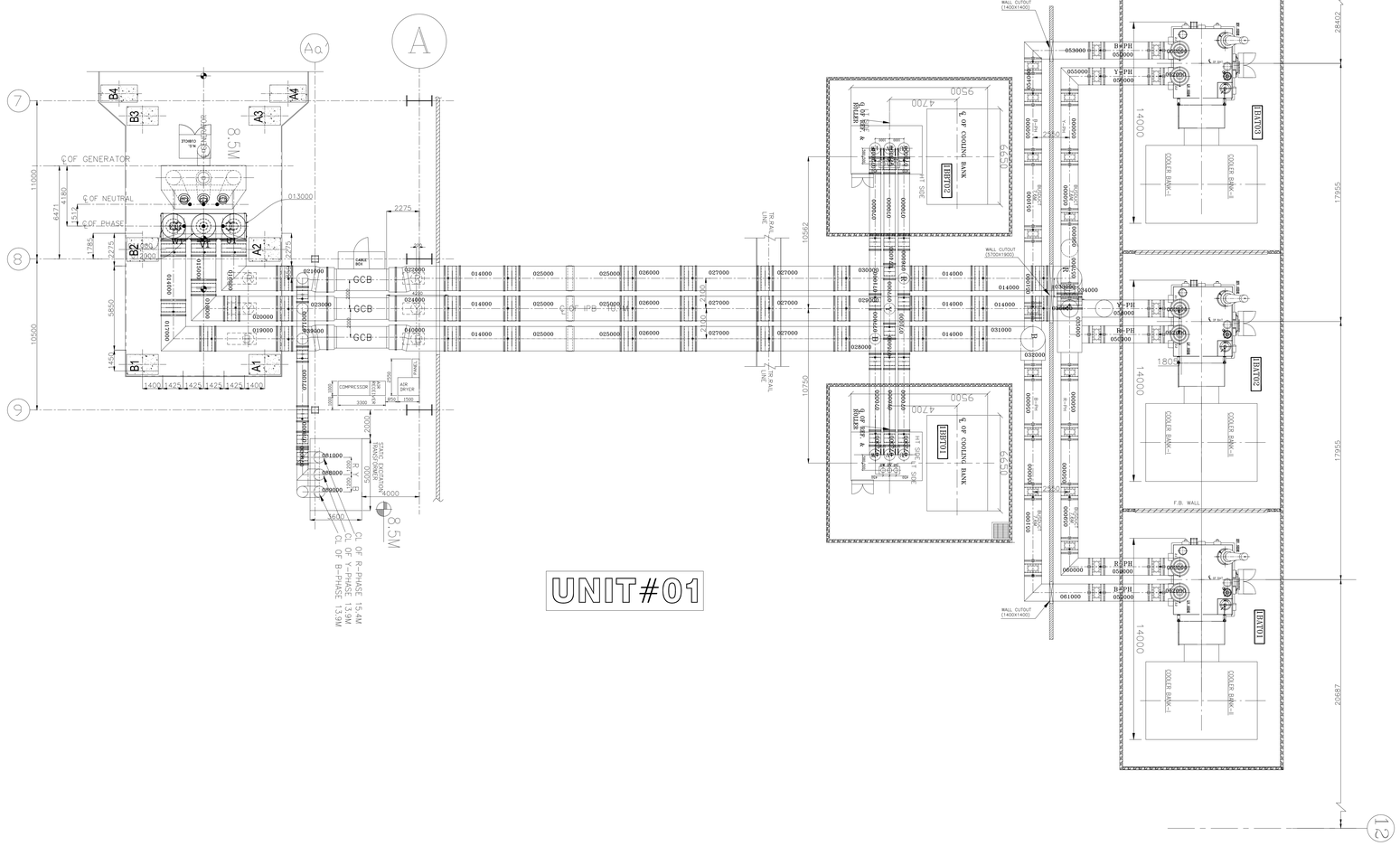
TITLE: LAYOUT OF ISOLATED PHASE BUSDUCT FOR UNIT - 1 & 2
1BAA03, 1BAA05, 1BAA06, 1BAA07 2BAA03, 2BAA05, 2BAA06, 2BAA07

SUPERSEDES:
SUPERSEDED BY:
SYSTEM:
SIZE– A0
PROJECT NO:–
FILE–
ANNEX–
DOC. NO.–MAITREE–00–BAA–LD–500001–RDP
REV.– 02
SHEETS– 02 OF 04

Annexure
Checked and Approved.
Date: 09-Feb-2019
"Approval doesn't absolve the EPC contractor of its responsibility as specified in the Contract."

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S. No.	BOM NO	ITEM DESCRIPTION	TOTAL QTY. (UNIT#1 + UNIT#2)
1	011 000	Assy. Of Duct (Encl. & Cond.)	002
2	012 000	Assy. Of Duct (Encl. & Cond.)	002
3	013 000	Assy. Of Duct (Encl. & Cond.)	002
4	014 000	Assy. Of Duct (Encl. & Cond.)	015
5	015 000	Assy. Of Duct (Encl. & Cond.)	002
6	016 000	Assy. Of Duct (Encl. & Cond.)	002
7	017 000	Assy. Of Duct (Encl. & Cond.)	002
8	018 000	Assy. Of Duct (Encl. & Cond.)	002
9	019 000	Assy. Of Duct (Encl. & Cond.)	002
10	020 000	Assy. Of Duct (Encl. & Cond.)	002
11	021 000	Assy. Of Duct (Encl. & Cond.)	002
12	022 000	Assy. Of Duct (Encl. & Cond.)	002
13	023 000	Assy. Of Duct (Encl. & Cond.)	002
14	024 000	Assy. Of Duct (Encl. & Cond.)	002
15	025 000	Assy. Of Duct (Encl. & Cond.)	006
16	026 000	Assy. Of Duct (Encl. & Cond.)	003
17	027 000	Assy. Of Duct (Encl. & Cond.)	009
18	028 000	Assy. Of Duct (Encl. & Cond.)	002
19	029 000	Assy. Of Duct (Encl. & Cond.)	002
20	030 000	Assy. Of Duct (Encl. & Cond.)	002
21	031 000	Assy. Of Duct (Encl. & Cond.)	002
22	032 000	Assy. Of Duct (Encl. & Cond.)	002
23	033 000	Assy. Of Duct (Encl. & Cond.)	002
24	034 000	Assy. Of Duct (Encl. & Cond.)	002
25	035 000	Assy. Of Duct (Encl. & Cond.)	002
26	036 000	Assy. Of Duct (Encl. & Cond.)	002
27	037 000	Assy. Of Duct (Encl. & Cond.)	003
28	038 000	Assy. Of Duct (Encl. & Cond.)	003
29	039 000	Assy. Of Duct (Encl. & Cond.)	002
30	040 000	Assy. Of Duct (Encl. & Cond.)	002
31	050 000	Assy. Of Duct (Encl. & Cond.)	024
32	051 000	Assy. Of Duct (Encl. & Cond.)	006
33	052 000	Assy. Of Duct (Encl. & Cond.)	012
34	053 000	Assy. Of Duct (Encl. & Cond.)	002
35	054 000	Assy. Of Duct (Encl. & Cond.)	002
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37	056 000	Assy. Of Duct (Encl. & Cond.)	002
38	057 000	Assy. Of Duct (Encl. & Cond.)	002
39	058 000	Assy. Of Duct (Encl. & Cond.)	002
40	059 000	Assy. Of Duct (Encl. & Cond.)	002
41	060 000	Assy. Of Duct (Encl. & Cond.)	002
42	061 000	Assy. Of Duct (Encl. & Cond.)	002
43	062 000	Assy. Of GT Hood	012
44	070 000	Assy. Of Duct (Encl. & Cond.)	012
45	071 000	Assy. Of Duct (Encl. & Cond.)	012
46	072 000	Assy. Of Duct (Encl. & Cond.)	006
47	073 000	Assy. Of Duct (Encl. & Cond.)	006
48	074 000	Assy. Of Duct (Encl. & Cond.)	002
49	075 000	Assy. Of Duct (Encl. & Cond.)	002
50	076 000	Assy. Of Duct (Encl. & Cond.)	002
51	077 000	Assy. Of Duct (Encl. & Cond.)	004
52	078 000	Assy. Of Duct (Encl. & Cond.)	002
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54	080 000	Assy. Of Duct (Encl. & Cond.)	002
55	081 000	Assy. Of Duct (Encl. & Cond.)	002
56	082 000	Assy. Of Duct (Encl. & Cond.)	004
57	083 000	Assy. Of Duct (Encl. & Cond.)	002
58	084 000	Assy. Of Duct (Encl. & Cond.)	002
59	085 000	Assy. Of Duct (Encl. & Cond.)	002
60	086 000	Assy. Of Duct (Encl. & Cond.)	006
61	087 000	Assy. Of Duct (Encl. & Cond.)	002
62	088 000	Assy. Of Duct (Encl. & Cond.)	002
63	089 000	Assy. Of Duct (Encl. & Cond.)	002
64	090 000	Assy. Of UT Hood	012
65	110 000	Assy. Of Line Side Chamber	002
66	111 000	Assy. Of Neutral Side Chamber	002
67	112 000	Flange Adopter for Generator Terminal Box	002
68	113 000	Bushing Cover For Generator Adopter Chamber Neutral Side	002
69	200 000	Make Up Piece Assy. (MAIN), Ø 1700, 9 TK	069
70	201 000	Make Up Piece Plain (MAIN), Ø 1700, 9 TK	069
71	210 000	Make Up Piece Assy. (DELTA), Ø 1200, 6.35 TK	060
72	211 000	Make Up Piece Plain (DELTA), Ø 1200, 6.35 TK	060
73	220 000	Make Up Piece Assy. (TAP-OFF), Ø 780, 4.78 TK	078
74	221 000	Make Up Piece Plain (TAP-OFF), Ø 780, 4.78 TK	078
75	230 000	Shunt (MAIN) Ø 1700, 9tk, Phase Spacing 2100 mm	2 SETS
76	240 000	Shunt (MAIN) Ø 1200, 6.35tk, Phase Spacing 1800 mm	6 SETS
77	250 000	Shunt (TAP-OFF) Ø 780 SPVT & LAVT End, 4.78 tk, Phase Spacing 2100 mm	4 SETS
78	251 000	Shunt (TAP-OFF) Ø 780 UT End, 4.78tk, Phase Spacing 1000 mm	4 SETS
79	252 000	Shunt (TAP-OFF) Ø 780 ET End, 4.78tk, Phase Spacing 1500 mm	2 SETS
80	270 000	Al Welded Flexible Connection	6 SETS
81	280 000	Flexible connection for Line & Neutral side	12 SETS
82	281 000	Flexible connection for GT End	12 SETS
83	282 000	Flexible connection for UT End	12 SETS
84	283 000	Flexible connection for ET End	6 SETS
85	284 000	Flexible connection for SPVT End	6 SETS
86	285 000	Flexible connection for LAVT End	6 SETS
87	286 000	Flexible connection for NG End	2 SETS
88	300 000	Assy. Of SPVT Cubicle 3-Phase	2 SETS
89	300 100	VT-2	006
90	300 200	VT-3	006
91	300 300	Surge Capacitor	006
92	301 000	Assy. Of LAVT Cubicle 3-Phase	2 SETS
93	301 100	VT-1	006
94	301 200	Lightening Arrester	006
95	350 000	Assy. Of NG Cubicle	2 SETS
96	350 100	NGT	002
97	350 200	NGR	002
98	420 000	Al. wall frame assembly for Main Run	002
99	420 100	Al. wall frame assembly for Main Run(Near Delta)	002
100	420 200	Al. wall frame assembly for Delta Run	004
101	600 000	Rubber Bellow (Main Run)	006
102	601 000	Mettalic Bellow (Main Run)	006
103	600 100	Rubber Bellow (Delta Run)	012
104	600 200	Rubber Bellow (Tap-Off Run)	032
105	650 000	Seal Off Bushing (Main Run)	006
106	650 100	Seal Off Bushing (Delta Run)	012
107	650 200	Seal Off Bushing (Tap-Off Run)	032
108	700 001	CT-1	006
109	700 002	CT-2	006
110	700 003	CT-3	006
111	700 004	CT-4	006
112	700 005	CT-5	006
113	700 006	CT-6	006
114	700 007	CT-7	006
115	700 008	CT-8	006
116	700 009	CT-9	006
117	700 010	CT-10A	002
118	700 011	CT-10B	002
119	700 012	CT-16A	006
120	700 013	CT-16B	006
121	700 014	CT-17A	006
122	700 015	CT-17B	006
123	700 016	CT-18A	006
124	700 017	CT-18B	006

PROJECT
2 X 660 MW MAITREE SUPER THREMAL POWER PROJECT, RAMPAL, BANGLADESH

OWNER CONSULTANT
FICHTNER
M/s FICHTNER Gmbh & Co KG, Stuttgart, GERMANY

OWNER
BANGLADESH – INDIA FRIENDSHIP POWER COMPANY (PVT.) LTD, BANGLADESH

BHARAT HEAVY ELECTRICALS LIMITED
RUDRAPUR

SCALE
SHEETS- 03 OF 04

	DATE	NAME
DSN.	11.10.18	SACHIN
CKD.	12.10.18	PIYUSH
APPD.	12.10.18	ARVIND
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM:		

VENDOR

TITLE LAYOUT OF ISOLATED PHASE BUSDUCT FOR UNIT - 1 & 2
1BAA03, 1BAA05, 1BAA06, 1BAA07 2BAA03, 2BAA05, 2BAA06, 2BAA07

SIZE- A0 PROJECT NO.- FILE-

ANNEX- DOC. NO.- MAITREE-00-BAA-LD-500001-RDP REV.- 02

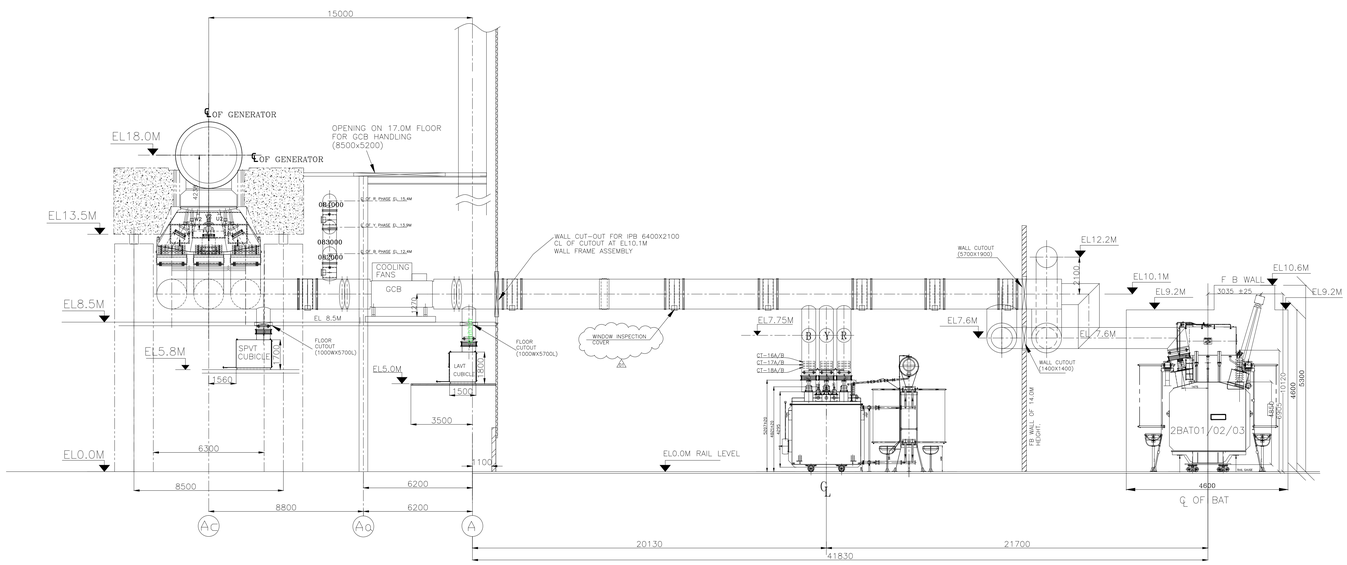
	DATE	ALTERED	CHECKED	APPROVED	NOTE
02	12.01.19	MUKESH	PIYUSH	ARVIND	DOCUMENT REVISED AS PER COMMENTS DATED 19.12.18
01	24.11.18	PIYUSH	PIYUSH	ARVIND	DOCUMENT REVISED AS PER COMMENTS DATED 29.11.18

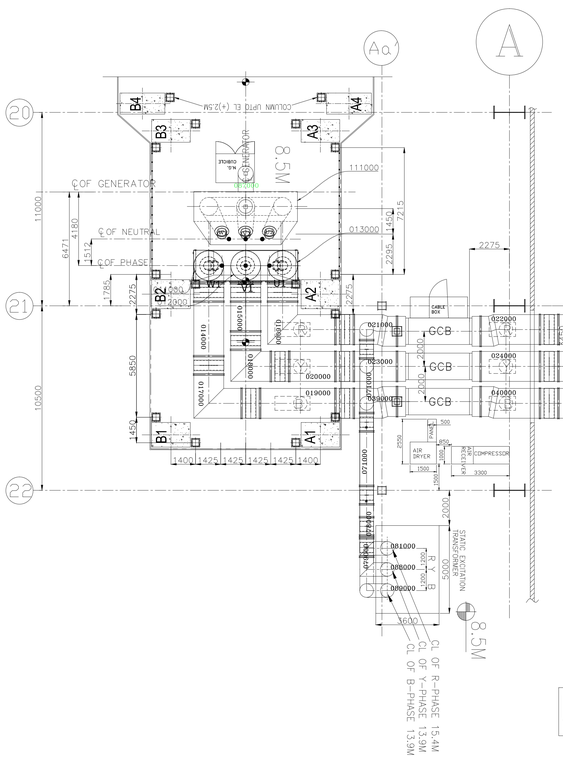
APPROVED
Checked and Approved.

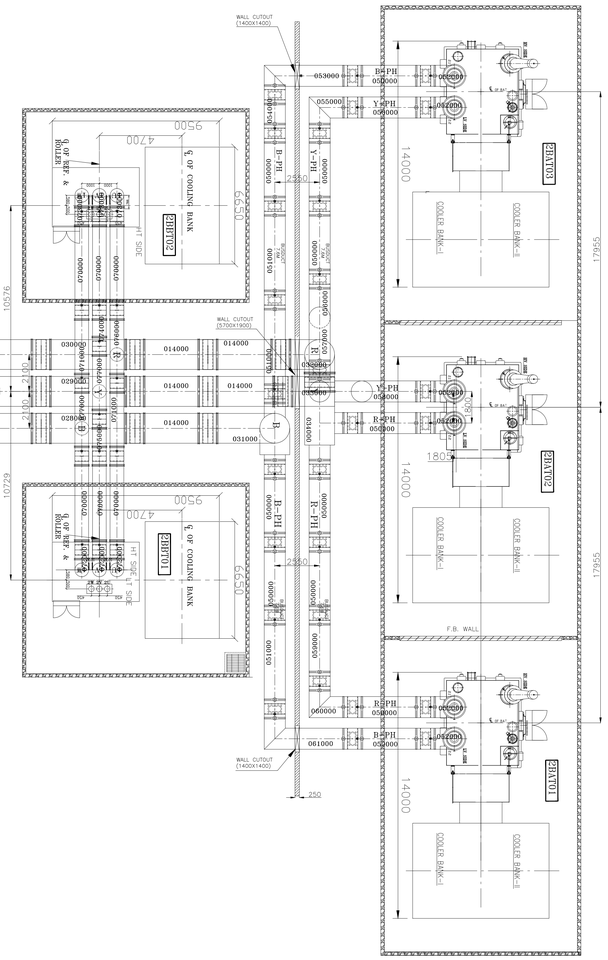
Date: 09-Feb-2019

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UNIT#02

S. No.	BOM NO	ITEM DESCRIPTION	TOTAL QTY. (UNIT#1 + UNIT#2)
1	011 000	Assy. Of Duct (Encl. & Cond.)	002
2	012 000	Assy. Of Duct (Encl. & Cond.)	002
3	013 000	Assy. Of Duct (Encl. & Cond.)	002
4	014 000	Assy. Of Duct (Encl. & Cond.)	015
5	015 000	Assy. Of Duct (Encl. & Cond.)	002
6	016 000	Assy. Of Duct (Encl. & Cond.)	002
7	017 000	Assy. Of Duct (Encl. & Cond.)	002
8	018 000	Assy. Of Duct (Encl. & Cond.)	002
9	019 000	Assy. Of Duct (Encl. & Cond.)	002
10	020 000	Assy. Of Duct (Encl. & Cond.)	002
11	021 000	Assy. Of Duct (Encl. & Cond.)	002
12	022 000	Assy. Of Duct (Encl. & Cond.)	002
13	023 000	Assy. Of Duct (Encl. & Cond.)	002
14	024 000	Assy. Of Duct (Encl. & Cond.)	002
15	025 000	Assy. Of Duct (Encl. & Cond.)	006
16	026 000	Assy. Of Duct (Encl. & Cond.)	003
17	027 000	Assy. Of Duct (Encl. & Cond.)	009
18	028 000	Assy. Of Duct (Encl. & Cond.)	002
19	029 000	Assy. Of Duct (Encl. & Cond.)	002
20	030 000	Assy. Of Duct (Encl. & Cond.)	002
21	031 000	Assy. Of Duct (Encl. & Cond.)	002
22	032 000	Assy. Of Duct (Encl. & Cond.)	002
23	033 000	Assy. Of Duct (Encl. & Cond.)	002
24	034 000	Assy. Of Duct (Encl. & Cond.)	002
25	035 000	Assy. Of Duct (Encl. & Cond.)	002
26	036 000	Assy. Of Duct (Encl. & Cond.)	002
27	037 000	Assy. Of Duct (Encl. & Cond.)	003
28	038 000	Assy. Of Duct (Encl. & Cond.)	003
29	039 000	Assy. Of Duct (Encl. & Cond.)	002
30	040 000	Assy. Of Duct (Encl. & Cond.)	002
31	050 000	Assy. Of Duct (Encl. & Cond.)	024
32	051 000	Assy. Of Duct (Encl. & Cond.)	006
33	052 000	Assy. Of Duct (Encl. & Cond.)	012
34	053 000	Assy. Of Duct (Encl. & Cond.)	002
35	054 000	Assy. Of Duct (Encl. & Cond.)	002
36	055 000	Assy. Of Duct (Encl. & Cond.)	002
37	056 000	Assy. Of Duct (Encl. & Cond.)	002
38	057 000	Assy. Of Duct (Encl. & Cond.)	002
39	058 000	Assy. Of Duct (Encl. & Cond.)	002
40	059 000	Assy. Of Duct (Encl. & Cond.)	002
41	060 000	Assy. Of Duct (Encl. & Cond.)	002
42	061 000	Assy. Of Duct (Encl. & Cond.)	002
43	062 000	Assy. Of GT Hood	012
44	070 000	Assy. Of Duct (Encl. & Cond.)	012
45	071 000	Assy. Of Duct (Encl. & Cond.)	012
46	072 000	Assy. Of Duct (Encl. & Cond.)	006
47	073 000	Assy. Of Duct (Encl. & Cond.)	006
48	074 000	Assy. Of Duct (Encl. & Cond.)	002
49	075 000	Assy. Of Duct (Encl. & Cond.)	002
50	076 000	Assy. Of Duct (Encl. & Cond.)	002
51	077 000	Assy. Of Duct (Encl. & Cond.)	004
52	078 000	Assy. Of Duct (Encl. & Cond.)	002
53	079 000	Assy. Of Duct (Encl. & Cond.)	004
54	080 000	Assy. Of Duct (Encl. & Cond.)	002
55	081 000	Assy. Of Duct (Encl. & Cond.)	002
56	082 000	Assy. Of Duct (Encl. & Cond.)	004
57	083 000	Assy. Of Duct (Encl. & Cond.)	002
58	084 000	Assy. Of Duct (Encl. & Cond.)	002
59	085 000	Assy. Of Duct (Encl. & Cond.)	002
60	086 000	Assy. Of Duct (Encl. & Cond.)	006
61	087 000	Assy. Of Duct (Encl. & Cond.)	002
62	088 000	Assy. Of Duct (Encl. & Cond.)	002
63	089 000	Assy. Of Duct (Encl. & Cond.)	002
64	090 000	Assy. Of UT Hood	012
65	110 000	Assy. Of Line Side Chamber	002
66	111 000	Assy. Of Neutral Side Chamber	002
67	112 000	Flange Adopter for Generator Terminal Box	002
68	113 000	Bushing Cover For Generator Adopter Chamber Neutral Side	002
69	200 000	Make Up Piece Assy. (MAIN), Ø 1700, 9 TK.	069
70	201 000	Make Up Piece Plain (MAIN), Ø 1700, 9 TK.	069
71	210 000	Make Up Piece Assy. (DELTA), Ø 1200, 6.35 TK	060
72	211 000	Make Up Piece Plain (DELTA), Ø 1200, 6.35 TK	060
73	220 000	Make Up Piece Assy. (TAP-OFF), Ø 780, 4.78 TK	078
74	221 000	Make Up Piece Plain (TAP-OFF), Ø 780, 4.78 TK	078
75	230 000	Shunt (MAIN) Ø 1700, 9tk, Phase Spacing 2100 mm	2 SETS
76	240 000	Shunt (MAIN) Ø 1200, 6.35tk, Phase Spacing 1800 mm	6 SETS
77	250 000	Shunt (TAP-OFF) Ø 780 SPVT & LAVT End, 4.78 tk, Phase Spacing 2100 mm	4 SETS
78	251 000	Shunt (TAP-OFF) Ø 780 UT End, 4.78tk, Phase Spacing 1000 mm	4 SETS
79	252 000	Shunt (TAP-OFF) Ø 780 ET End, 4.78tk, Phase Spacing 1500 mm	2 SETS
80	270 000	Al.Welded Flexible Connection	6 SETS
81	280 000	Flexible connection for Line & Neutral side	12 SETS
82	281 000	Flexible connection for GT End	12 SETS
83	282 000	Flexible connection for UT End	12 SETS
84	283 000	Flexible connection for ET End	6 SETS
85	284 000	Flexible connection for SPVT End	6 SETS
86	285 000	Flexible connection for LAVT End	6 SETS
87	286 000	Flexible connection for NG End	2 SETS
88	300 000	Assy. Of SPVT Cubicle 3-Phase	2 SETS
89	300 100	VT-2	006
90	300 200	VT-3	006
91	300 300	Surge Capacitor	006
92	301 000	Assy. Of LAVT Cubicle 3-Phase	2 SETS
93	301 100	VT-1	006
94	301 200	Lightening Arrester	006
95	350 000	Assy. Of NG Cubicle	2 SETS
96	350 100	NGT	002
97	350 200	NGR	002
98	420 000	Al. wall frame assembly for Main Run	002
99	420 100	Al. wall frame assembly for Main Run(Near Delta)	002
100	420 200	Al. wall frame assembly for Delta Run	004
101	600 000	Rubber Bellow (Main Run)	006
102	601 000	Mettalic Bellow (Main Run)	006
103	600 100	Rubber Bellow (Delta Run)	012
104	600 200	Rubber Bellow (Tap-Off Run)	032
105	650 000	Seal Off Bushing (Main Run)	006
106	650 100	Seal Off Bushing (Delta Run)	012
107	650 200	Seal Off Bushing (Tap-Off Run)	032
108	700 001	CT-1	006
109	700 002	CT-2	006
110	700 003	CT-3	006
111	700 004	CT-4	006
112	700 005	CT-5	006
113	700 006	CT-6	006
114	700 007	CT-7	006
115	700 008	CT-8	006
116	700 009	CT-9	006
117	700 010	CT-10A	002
118	700 011	CT-10B	002
119	700 012	CT-16A	006
120	700 013	CT-16B	006
121	700 014	CT-17A	006
122	700 015	CT-17B	006
123	700 016	CT-18A	006
124	700 017	CT-18B	006

02	12.01.19	MUKESH	PIYUSH	ARVIND	DOCUMENT REVISED AS PER COMMENTS DATED 19.12.18
01	24.11.18	PIYUSH	PIYUSH	ARVIND	DOCUMENT REVISED AS PER COMMENTS DATED 29.11.18
	DATE	ALTERED	CHECKED	APPROVED	NOTE

PROJECT
2 X 660 MW MAITREE SUPER THREMAL POWER PROJECT, RAMPAL, BANGLADESH

OWNER CONSULTANT
FICHTNER
M/s FICHTNER Gmbh & Co KG, Stuttgart, GERMANY

OWNER
BANGLADESH – INDIA FRIENDSHIP POWER COMPANY (PVT.) LTD, BANGLADESH

BHARAT HEAVY ELECTRICALS LIMITED
RUDRAPUR

SCALE
SHEETS- 04 OF 04

	DATE	NAME
DSN.	11.10.18	SACHIN
CKD.	12.10.18	PIYUSH
APPD.	12.10.18	ARVIND

VENDOR

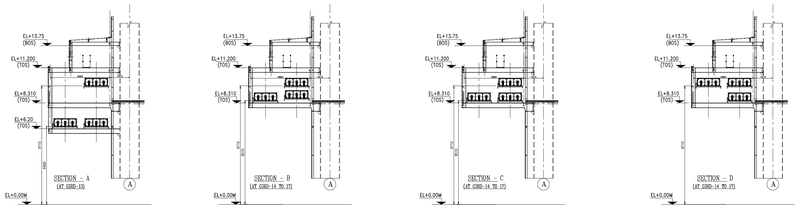
TITLE
LAYOUT OF ISOLATED PHASE BUSDUCT FOR UNIT - 1 & 2
1BAA03, 1BAA05, 1BAA06, 1BAA07 2BAA03, 2BAA05, 2BAA06, 2BAA07

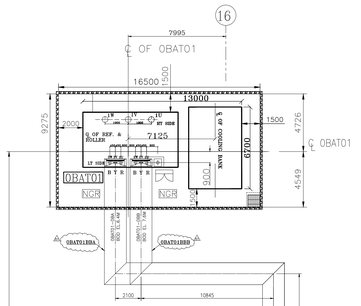
SUPERSEDES:
SUPERSEDED BY:
SYSTEM:
SIZE- A0 PROJECT NO.- FILE-
ANNEX- DOC. NO.-MAITREE-00-BAA-LD-500001-RDP REV.- 02

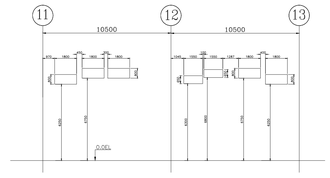
APPROVED
Checked and Approved.
Date: 02-May-2019
"Approved doesn't absolve the EPC contractor of it's responsibility as specified in the Contract."

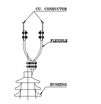
FIRST ANGLE PROJECTION
ALL DIMENSSION IN MILIMETER
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DRAWING NO. MAITREE-00-BAA-LD-500003-RDP

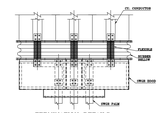




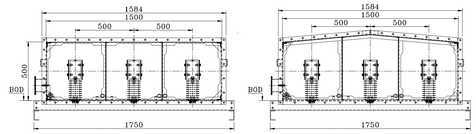




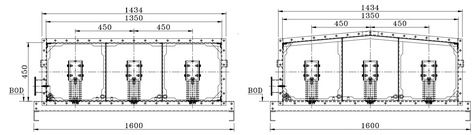
TERMINATION DETAILS OF SAT,UAT,UT



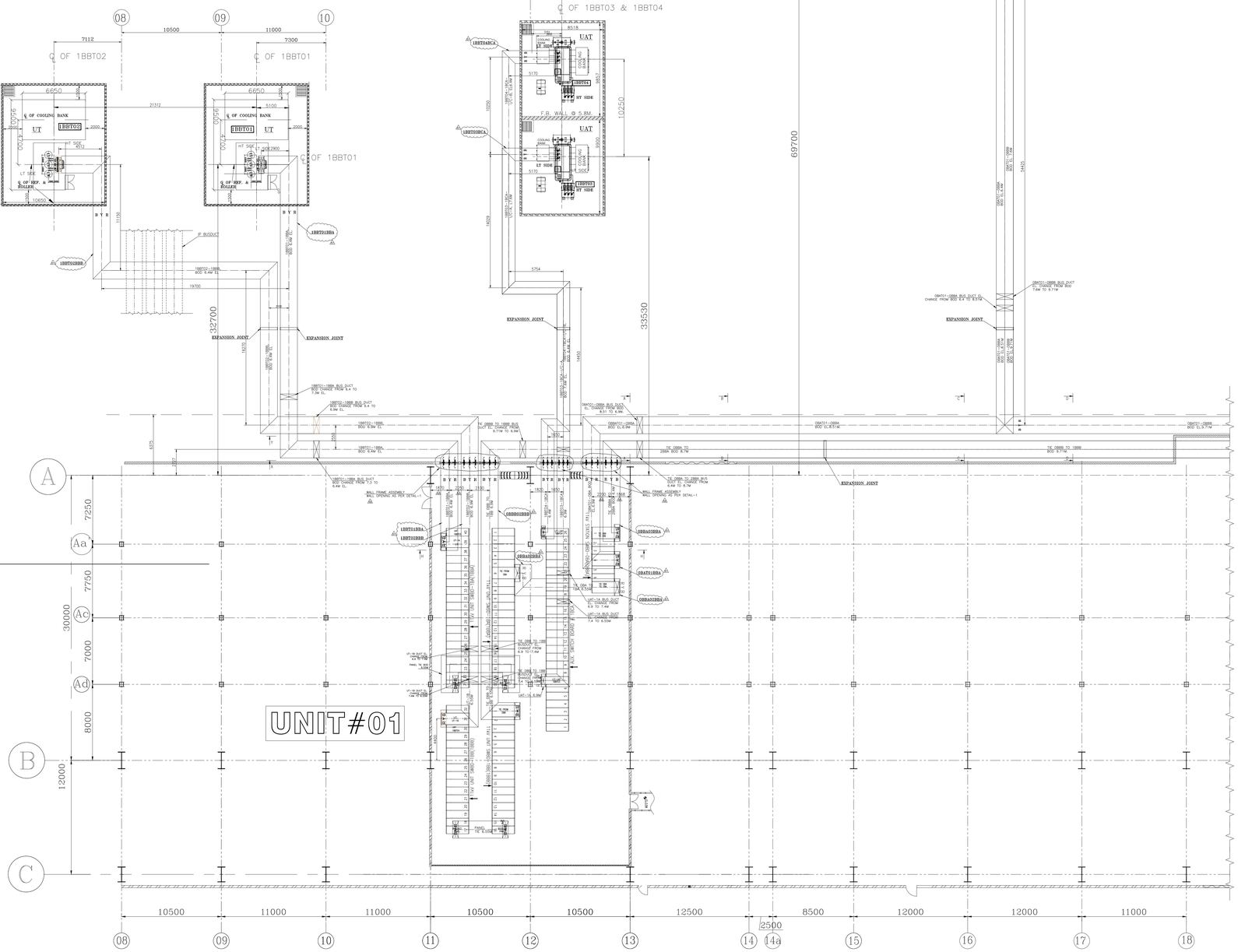
TERMINATION DETAILS OF SWGR



CROSS SECTION OF SPBD 11kV,4000A & 3500A



CROSS SECTION OF SPBD 3.3kV,3150A



GENERAL NOTES: –

1. Where steel is used for supports it will be galvanized to EN ISO 1461. Painting and finishing will be according approved Painting Procedure Doc. No.: MAITREE–00–BFA–PF–100000–GEN and color shade will be according approved General Power Plant Coloring Concept Doc. No.: MAITREE–00–BFA–FF–100001–GEN.
2. Each length of conductor between joints will, unless otherwise approved, be supported on not less than two sets of insulators. Positive contact will be made at all times between the conductor and the insulator top cap.
3. The busbar earthing facilties will be provided with facilities for connection to the station earthing system.
4. All holes in ceilings, floors and wall made for SPBD routing must be sealed fire–resistant, when the segragated phase bus duct have been installed.

REFERENCE DRAWINGS: –

1. BUSDUCT SUPPORTING STRUCTURE DRG. NO. MAITREE–00–UMA–LC–103912–PEM
2. UT OGA DRG. NO. MAITREE–00–BBT–EE–425017–JHS
3. SUT OGA DRG. NO. MAITREE–00–BBT–EE–425003–JHS
4. UAT OGA DRG. NO. MAITREE–00–BCT–EE–425030–JHS
5. SWGR PANNEL DRGS:
   a) MAITREE–0–BBA–EE–225140–BPL (1BBA)
   b) MAITREE–0–BBA–EE–225141–BPL (2BBA)
   c) MAITREE–0–BBA–EE–225142–BPL (1BBB)
   d) MAITREE–0–BBA–EE–225143–BPL (2BBB)
   e) MAITREE–0–BBA–EE–225144–BPL (0BBA)
   f) MAITREE–0–BBA–EE–225145–BPL (0BBB)
   g) MAITREE–0–BBA–EE–225146–BPL (1BCA)
   h) MAITREE–0–BBA–EE–225147–BPL (2BCA)
6. SWGR ROOM DRG NO. MAITREE–01–BTW–EDB–105020–PEM
7. TRF. YARD LAYOUT DRG NO. MAITREE–00–BTW–EDB–105024–PEM

REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED	REV.	DATE	ALTERED / CHECKED
						03	09.04.19	MUKESH / PIYUSH	02	14.01.19	MUKESH / PIYUSH	01	17.12.18	MUKESH / PIYUSH
						REVISED AS PER CUSTOMER COMMENTS DATED 09.02.19			REVISED AS PER CUSTOMER COMMENTS DATED 02.01.19			REVISED AS PER CUSTOMER COMMENTS.		

PROJECT
2 X 660 MW MAITREE SUPER THREMAL POWER PROJECT, RAMPAL, BANGLADESH

OWNER CONSULTANT
FICHTNER
M/s FICHTNER Gmbh & Co KG, Stuttgart, GERMANY

OWNER
BANGLADESH – INDIA FRIENDSHIP POWER COMPANY (PVT.) LTD, BANGLADESH

BHARAT HEAVY ELECTRICALS LIMITED
RUDRAPUR

	DATE	NAME
DGN.	05.11.18	MUKESH
CKD.	06.11.18	PIYUSH
APPD.	06.11.18	ARVIND

SCALE –
SHEETS– 1 OF 5
VENDOR – – – –
SUPERSEDED:
SUPERSEDED BY:
SYSTEM:
SIZE– A0
PROJECT NO:–
FILE:–
ANNEX:–
DOC. NO.–MAITREE–00–BAA–LD–500003–RDP REV:– 03

TITLE
Layout of Segregated Phase Busduct for Unit – 1&2

Approved
Checked and Approved.

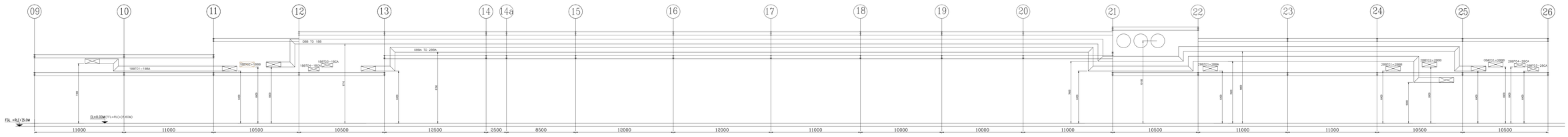
Date: 02-May-2019

"Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract."

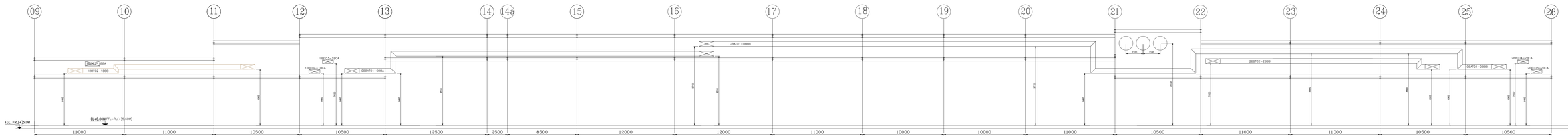
FIRST ANGLE PROJECTION

ALL DIMENSION IN MILIMETER

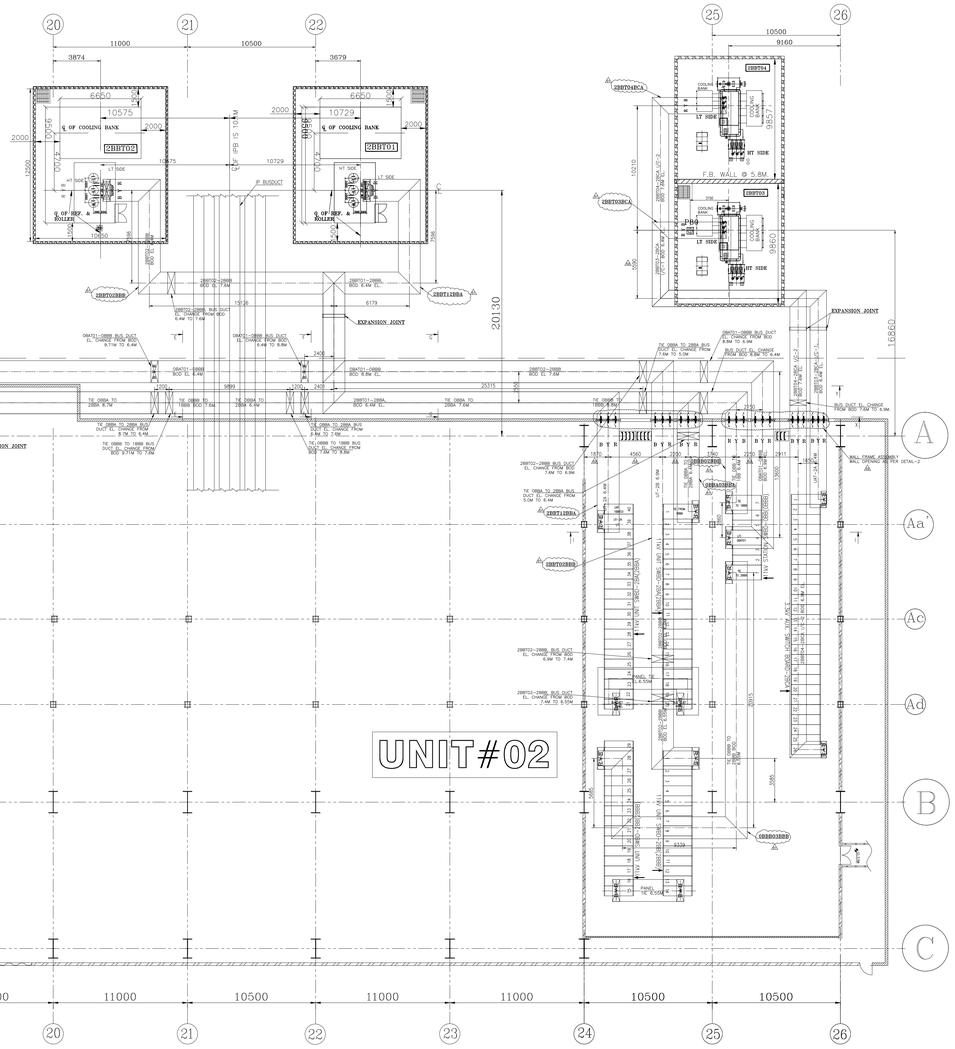
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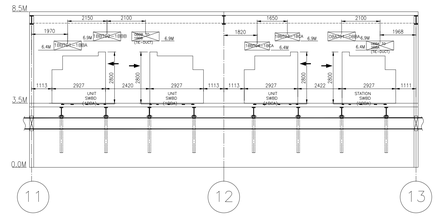


SECTION X-X

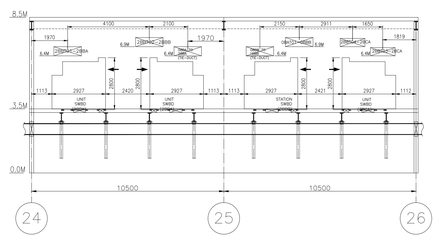


SECTION Y-Y

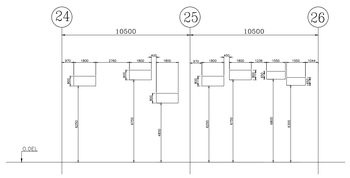




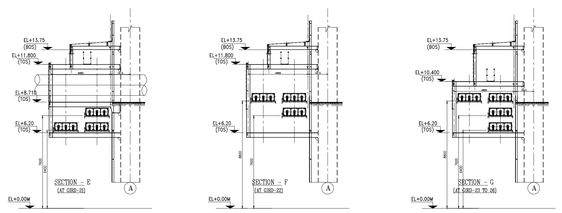
SECTION H-H



SECTION I-I



WALL OPENING DETAIL-2



LEGEND

RUBBER BELLOW

FLEXIBLE JOINT

SEAL OF BUSHING

S. No.	ROUTE DESCRIPTION	RATING
1	UT (1BBT01) TO UNIT SWBD 1 BBA	11 kV, 4000 A
2	UT (1BBT02) TO UNIT SWBD 1 BBB	11 kV, 4000 A
3	UAT (1BBT03) TO AUX SWBD 1 BCA	3.3kV, 3150 A
4	UAT (1BBT04) TO AUX SWBD 1 BCA	3.3kV, 3150 A
5	SUT (0BAT01) TO STN SWBD 0BBB	11 kV, 3500 A
6	SUT (0BAT01) TO STN SWBD 0BBA	11 kV, 3500 A
7	UT (2BBT01) TO UNIT SWBD 2 BBA	11 kV, 4000 A
8	UT (2BBT02) TO UNIT SWBD 2 BBB	11 kV, 4000 A
9	UAT (2BBT03) TO AUX SWBD 2 BCA	3.3kV, 3150 A
10	UAT (2BBT04) TO AUX SWBD 2 BCA	3.3kV, 3150 A
11	SPBD TIE FOR 1BBA	11 kV, 3500 A
12	SPBD TIE FOR 1BBB	11 kV, 3500 A
13	SPBD TIE (1BBA TO 0BBA)	11 kV, 3500 A
14	SPBD TIE (1BBB TO 0BBB)	11 kV, 3500 A
15	SPBD TIE (0BBA TO 2BBA)	11 kV, 3500 A
16	SPBD TIE FOR 2BBA	11 kV, 3500 A
17	SPBD TIE FOR 2BBB	11 kV, 3500 A
18	SPBD TIE (2BBB TO 0BBB)	11 kV, 3500 A

REV.	DATE	ALTERED / CHECKED
03	09.04.19	ALTERED MUKESH / CHECKED PIYUSH
		REVISED AS PER CUSTOMER COMMENTS DATED 09.02.19
02	14.01.19	ALTERED MUKESH / CHECKED PIYUSH
		REVISED AS PER CUSTOMER COMMENTS DATED 02.01.19
01	17.12.18	ALTERED MUKESH / CHECKED PIYUSH
		REVISED AS PER CUSTOMER COMMENTS.

PROJECT: 2 X 660 MW MAITREE SUPER THREMAL POWER PROJECT, RAMPAL, BANGLADESH

OWNER CONSULTANT: FICHTNER, M/s FICHTNER Gmbh & Co KG, Stuttgart, GERMANY

OWNER: BANGLADESH – INDIA FRIENDSHIP POWER COMPANY (PVT.) LTD, BANGLADESH

BHARAT HEAVY ELECTRICALS LIMITED, RUDRAPUR

	DATE	NAME
DGN.	05.11.18	MUKESH
CKD.	06.11.18	PIYUSH
APPD.	06.11.18	ARVIND

SUPERSEDES:

SUPERSEDED BY:

SYSTEM:

SCALE:

SHEETS- 2 OF 5

VENDOR

TITLE: Layout of Segregated Phase Busduct for Unit – 1&2

SIZE- A0 | PROJECT NO.- | FILE-

ANNEX- | DOC. NO.-MAITREE-00-BAA-LD-500003-RDP | REV.- 03

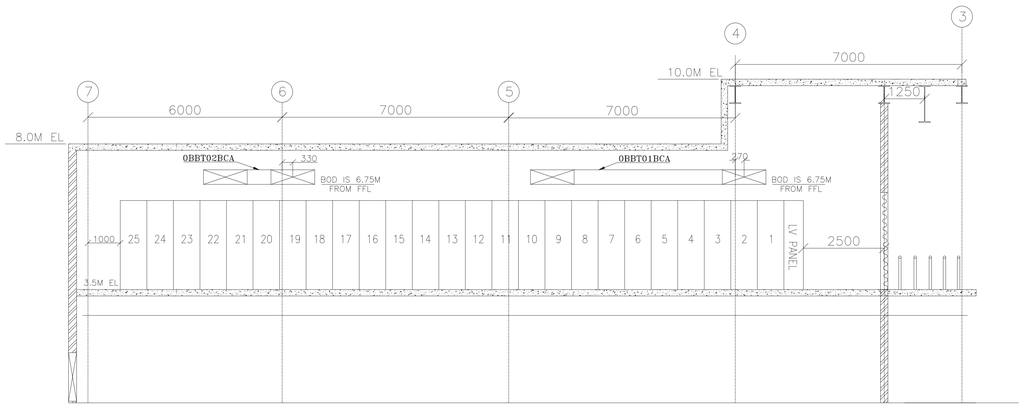
APPROVED
Checked and Approved.
Date: 06.11.18
"Approval is only for conformity with the basic concept of the design and does not relieve the EPC contractor of his responsibility to meet all the requirements of the Contract Documents."

First Angle Projection

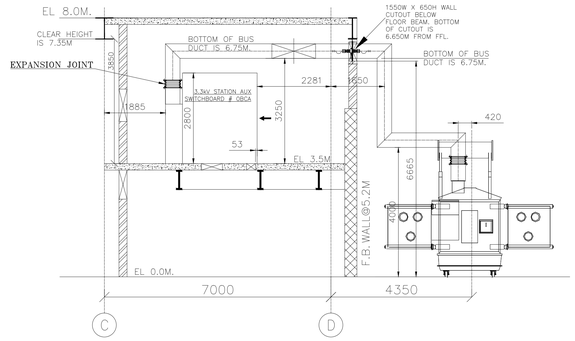
All Dimensions in 'mm'

DRAWING NO. MAITREE-00-BAA-LD-500003-RDP

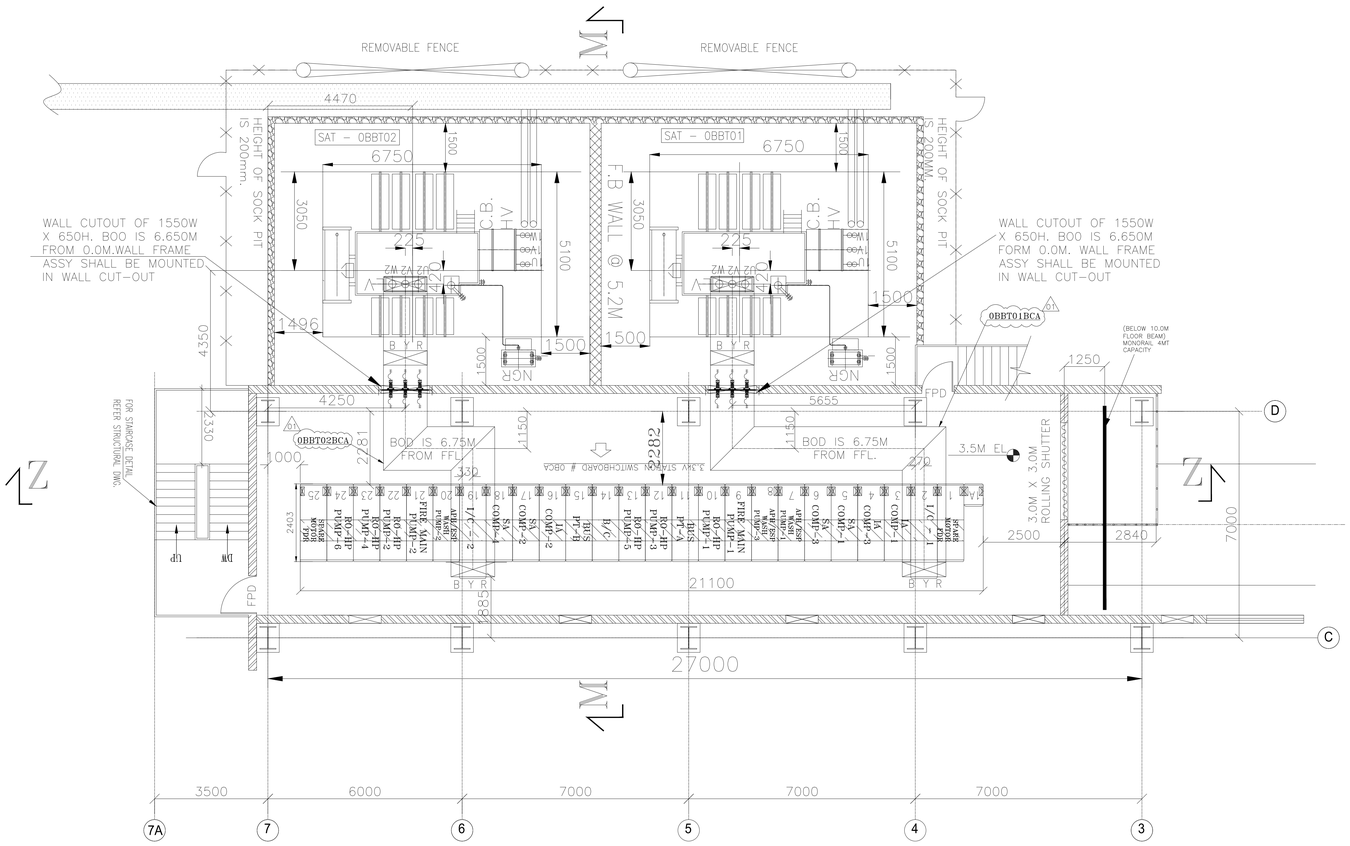
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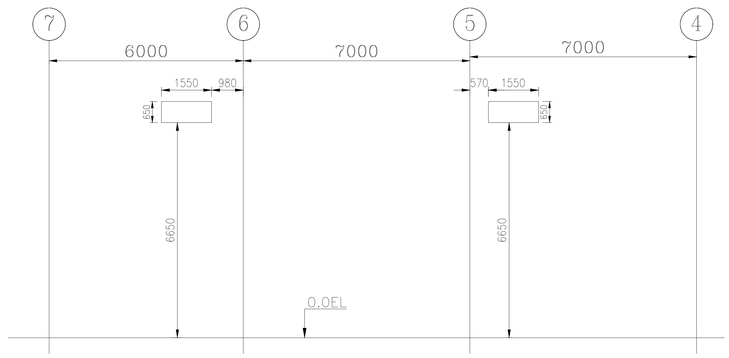
SECTION Z-Z



SECTION M-M



PLAN @ 3.5M



WALL OPENING DETAIL

SAT LAYOUT

REV.	DATE	ALTERED MUKESH / CHECKED PIYUSH	REV.	DATE	ALTERED MUKESH / CHECKED PIYUSH	REV.	DATE	ALTERED MUKESH / CHECKED PIYUSH
03	09.04.19		02	14.01.19		01	17.12.18	
REVISED AS PER CUSTOMER COMMENTS DATED 09.02.19.			REVISED AS PER CUSTOMER COMMENTS DATED 02.01.19.			REVISED AS PER CUSTOMER COMMENTS.		

PROJECT
2 X 660 MW MAITREE SUPER THREMAL POWER PROJECT, RAMPAL, BANGLADESH

OWNER CONSULTANT
FICHTNER
M/s FICHTNER Gmbh & Co KG, Stuttgart, GERMANY

OWNER
BANGLADESH – INDIA FRIENDSHIP POWER COMPANY (PVT.) LTD, BANGLADESH

BHARAT HEAVY ELECTRICALS LIMITED
RUDRAPUR

SCALE
SHEETS– 3 OF 5

	DATE	NAME
DGN.	05.11.18	MUKESH
CKD.	06.11.18	PIYUSH
APPD.	06.11.18	ARVIND

SUPERSEDES:
SUPERSEDED BY:
SYSTEM:

VENDOR

TITLE
Layout of Segregated Phase Busduct for Unit – 1&2

SIZE– A0 | PROJECT NO:– | FILE:–
ANNEX– | DOC. NO.– MAITREE-00-BAA-LD-500003-RDP | REV:– 03

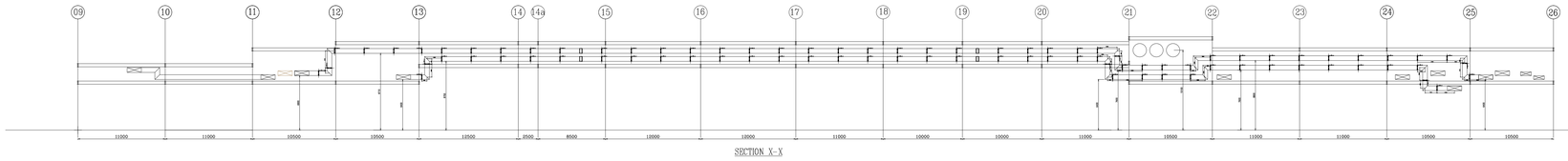
INVENTORY NO. | SIGN. & DATE | REF. DRG. NO.

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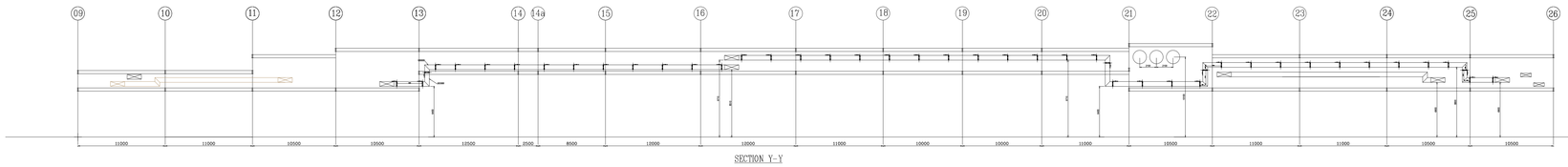
ANNEXURE
Checked and Approved.
Date: 02-May-2019
"Approved doesn't absolve the EPC contractor of it's responsibility as specified in the Contract."

FIRST ANGLE PROJECTION
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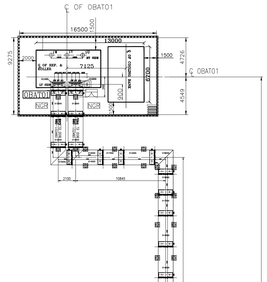
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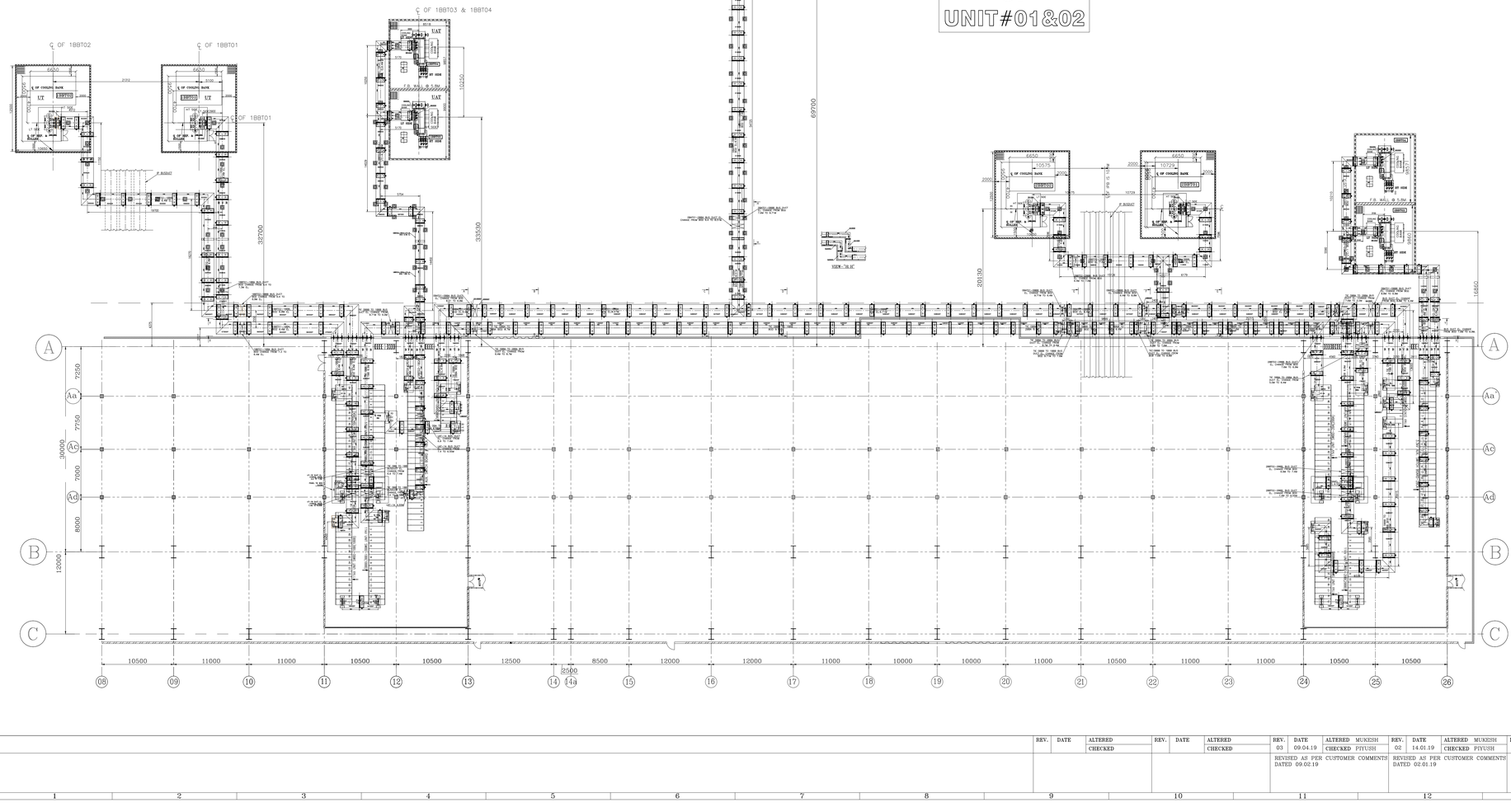


SECTION X-X



SECTION Y-Y





ITEMISED OF UNIT#01&02

BILL OF MATERIAL FOR SP BUSDUCT FOR 2X660 MW MAITREE STPS

S. No.	BOM NO	ITEM DESCRIPTION	TOTAL QTY. (UNIT#1&2)	S. No.	BOM NO	ITEM DESCRIPTION	TOTAL QTY. (UNIT#1&2)
1	011 000	Assy. Of Duct (Encl. & Cond.)	1	97	117 000	Assy. Of Duct (Encl. & Cond.)	1
2	012 000	Assy. Of Duct (Encl. & Cond.)	1	98	121 000	Assy. Of Duct (Encl. & Cond.)	1
3	013 000	Assy. Of Duct (Encl. & Cond.)	2	99	122 000	Assy. Of Duct (Encl. & Cond.)	2
4	014 000	Assy. Of Duct (Encl. & Cond.)	23	100	123 000	Assy. Of Duct (Encl. & Cond.)	1
5	015 000	Assy. Of Duct (Encl. & Cond.)	1	101	124 000	Assy. Of Duct (Encl. & Cond.)	2
6	016 000	Assy. Of Duct (Encl. & Cond.)	1	102	125 000	Assy. Of Duct (Encl. & Cond.)	1
7	017 000	Assy. Of Duct (Encl. & Cond.)	8	103	131 000	Assy. Of Duct (Encl. & Cond.)	1
8	018 000	Assy. Of Duct (Encl. & Cond.)	2	104	132 000	Assy. Of Duct (Encl. & Cond.)	1
9	019 000	Assy. Of Duct (Encl. & Cond.)	2	105	133 000	Assy. Of Duct (Encl. & Cond.)	1
10	020 000	Assy. Of Duct (Encl. & Cond.)	1	106	134 000	Assy. Of Duct (Encl. & Cond.)	1
11	021 000	Assy. Of Duct (Encl. & Cond.)	1	107	135 000	Assy. Of Duct (Encl. & Cond.)	1
12	022 000	Assy. Of Duct (Encl. & Cond.)	1	108	136 000	Assy. Of Duct (Encl. & Cond.)	4
13	023 000	Assy. Of Duct (Encl. & Cond.)	1	109	137 000	Assy. Of Duct (Encl. & Cond.)	4
14	024 000	Assy. Of Duct (Encl. & Cond.)	2	110	138 000	Assy. Of Duct (Encl. & Cond.)	1
15	025 000	Assy. Of Duct (Encl. & Cond.)	2	111	139 000	Assy. Of Duct (Encl. & Cond.)	1
16	026 000	Assy. Of Duct (Encl. & Cond.)	1	112	140 000	Assy. Of Duct (Encl. & Cond.)	2
17	027 000	Assy. Of Duct (Encl. & Cond.)	3	113	141 000	Assy. Of Duct (Encl. & Cond.)	1
18	028 000	Assy. Of Duct (Encl. & Cond.)	92	114	142 000	Assy. Of Duct (Encl. & Cond.)	1
19	029 000	Assy. Of Duct (Encl. & Cond.)	16	115	143 000	Assy. Of Duct (Encl. & Cond.)	1
20	030 000	Assy. Of Duct (Encl. & Cond.)	1	116	144 000	Assy. Of Duct (Encl. & Cond.)	1
21	031 000	Assy. Of Duct (Encl. & Cond.)	1	117	145 000	Assy. Of Duct (Encl. & Cond.)	1
22	032 000	Assy. Of Duct (Encl. & Cond.)	1	118	146 000	Assy. Of Duct (Encl. & Cond.)	1
23	033 000	Assy. Of Duct (Encl. & Cond.)	1	119	147 000	Assy. Of Duct (Encl. & Cond.)	1
24	034 000	Assy. Of Duct (Encl. & Cond.)	1	120	148 000	Assy. Of Duct (Encl. & Cond.)	1
25	035 000	Assy. Of Duct (Encl. & Cond.)	1	121	149 000	Assy. Of Duct (Encl. & Cond.)	1
26	036 000	Assy. Of Duct (Encl. & Cond.)	1	122	150 000	Assy. Of Duct (Encl. & Cond.)	1
27	037 000	Assy. Of Duct (Encl. & Cond.)	1	123	151 000	Assy. Of Duct (Encl. & Cond.)	1
28	038 000	Assy. Of Duct (Encl. & Cond.)	1	124	152 000	Assy. Of Duct (Encl. & Cond.)	1
29	039 000	Assy. Of Duct (Encl. & Cond.)	1	125	153 000	Assy. Of Duct (Encl. & Cond.)	1
30	040 000	Assy. Of Duct (Encl. & Cond.)	1	126	155 000	Assy. Of Duct (Encl. & Cond.)	1
31	041 000	Assy. Of Duct (Encl. & Cond.)	1	127	156 000	Assy. Of Duct (Encl. & Cond.)	2
32	042 000	Assy. Of Duct (Encl. & Cond.)	1	128	157 000	Assy. Of Duct (Encl. & Cond.)	2
33	043 000	Assy. Of Duct (Encl. & Cond.)	1	129	158 000	Assy. Of Duct (Encl. & Cond.)	2
34	044 000	Assy. Of ST Hood	2	130	159 000	Assy. Of Duct (Encl. & Cond.)	2
35	045 000	Assy. Of Switchgear Hood (ST & TIE)	10	131	160 000	Assy. Of Duct (Encl. & Cond.)	2
36	051 000	Assy. Of Duct (Encl. & Cond.)	4	132	161 000	Assy. Of Duct (Encl. & Cond.)	2
37	052 000	Assy. Of Duct (Encl. & Cond.)	1	133	162 000	Assy. Of Duct (Encl. & Cond.)	1
38	053 000	Assy. Of Duct (Encl. & Cond.)	2	134	163 000	Assy. Of Duct (Encl. & Cond.)	1
39	054 000	Assy. Of Duct (Encl. & Cond.)	10	135	164 000	Assy. Of Duct (Encl. & Cond.)	1
40	055 000	Assy. Of Duct (Encl. & Cond.)	1	136	165 000	Assy. Of Duct (Encl. & Cond.)	1
41	056 000	Assy. Of Duct (Encl. & Cond.)	1	137	166 000	Assy. Of Duct (Encl. & Cond.)	4
42	057 000	Assy. Of Duct (Encl. & Cond.)	1	138	167 000	Assy. Of Duct (Encl. & Cond.)	1
43	058 000	Assy. Of Duct (Encl. & Cond.)	4	139	168 000	Assy. Of Duct (Encl. & Cond.)	3
44	059 000	Assy. Of Duct (Encl. & Cond.)	1	140	169 000	Assy. Of Switchgear Hood (For Bridging Busduct)	8
45	060 000	Assy. Of Duct (Encl. & Cond.)	1	141	170 000	Assy. Of Duct (Encl. & Cond.)	1
46	061 000	Assy. Of Duct (Encl. & Cond.)	1	142	171 000	Assy. Of Duct (Encl. & Cond.)	1
47	062 000	Assy. Of Duct (Encl. & Cond.)	1	143	172 000	Assy. Of Duct (Encl. & Cond.)	1
48	063 000	Assy. Of Duct (Encl. & Cond.)	3	144	173 000	Assy. Of Duct (Encl. & Cond.)	1
49	064 000	Assy. Of Duct (Encl. & Cond.)	21	145	174 000	Assy. Of Duct (Encl. & Cond.)	1
50	065 000	Assy. Of Duct (Encl. & Cond.)	3	146	175 000	Assy. Of Duct (Encl. & Cond.)	1
51	066 000	Assy. Of Duct (Encl. & Cond.)	1	147	176 000	Assy. Of Duct (Encl. & Cond.)	1
52	067 000	Assy. Of Duct (Encl. & Cond.)	1	148	177 000	Assy. Of Duct (Encl. & Cond.)	1
53	068 000	Assy. Of Duct (Encl. & Cond.)	2	149	178 000	Assy. Of Duct (Encl. & Cond.)	1
54	069 000	Assy. Of Duct (Encl. & Cond.)	1	150	179 000	Assy. Of Duct (Encl. & Cond.)	4
55	070 000	Assy. Of Duct (Encl. & Cond.)	1	151	180 000	Assy. Of Duct (Encl. & Cond.)	1
56	071 000	Assy. Of Duct (Encl. & Cond.)	1	152	181 000	Assy. Of Duct (Encl. & Cond.)	2
57	072 000	Assy. Of Duct (Encl. & Cond.)	1	153	182 000	Assy. Of Duct (Encl. & Cond.)	1
58	073 000	Assy. Of Duct (Encl. & Cond.)	1	154	183 000	Assy. Of Duct (Encl. & Cond.)	1
59	074 000	Assy. Of Duct (Encl. & Cond.)	1	155	184 000	Assy. Of Duct (Encl. & Cond.)	1
60	075 000	Assy. Of Duct (Encl. & Cond.)	1	156	185 000	Assy. Of Duct (Encl. & Cond.)	2
61	076 000	Assy. Of UT Hood	4	157	186 000	Assy. Of Duct (Encl. & Cond.)	1
62	077 000	Assy. Of Switchgear Hood (UT)	4	158	187 000	Assy. Of Duct (Encl. & Cond.)	1
63	081 000	Assy. Of Duct (Encl. & Cond.)	2	159	188 000	Assy. Of Duct (Encl. & Cond.)	1
64	082 000	Assy. Of Duct (Encl. & Cond.)	4	160	189 000	Assy. Of Duct (Encl. & Cond.)	1
65	083 000	Assy. Of Duct (Encl. & Cond.)	4	161	190 000	Assy. Of Duct (Encl. & Cond.)	4
66	084 000	Assy. Of Duct (Encl. & Cond.)	16	162	191 000	Assy. Of Duct (Encl. & Cond.)	1
67	085 000	Assy. Of Duct (Encl. & Cond.)	1	163	192 000	Assy. Of Duct (Encl. & Cond.)	1
68	086 000	Assy. Of Duct (Encl. & Cond.)	2	164	193 000	Assy. Of Duct (Encl. & Cond.)	9
69	087 000	Assy. Of Duct (Encl. & Cond.)	4	165	194 000	Assy. Of Duct (Encl. & Cond.)	1
70	088 000	Assy. Of Duct (Encl. & Cond.)	2	166	195 000	Assy. Of Duct (Encl. & Cond.)	1
71	089 000	Assy. Of Duct (Encl. & Cond.)	4	167	196 000	Assy. Of Duct (Encl. & Cond.)	2
72	090 000	Assy. Of Duct (Encl. & Cond.)	3	168	197 000	Assy. Of Duct (Encl. & Cond.)	1
73	091 000	Assy. Of Duct (Encl. & Cond.)	1	169	198 000	Assy. Of Duct (Encl. & Cond.)	1
74	092 000	Assy. Of Duct (Encl. & Cond.)	2	170	199 000	Assy. Of Duct (Encl. & Cond.)	1
75	093 000	Assy. Of Duct (Encl. & Cond.)	2	171	200 000	Assy. Of Duct (Encl. & Cond.)	1
76	094 000	Assy. Of Duct (Encl. & Cond.)	1	172	201 000	Assy. Of Duct (Encl. & Cond.)	1
77	095 000	Assy. Of Duct (Encl. & Cond.)	3	173	280 000	Cu Braided Flexible connection at ST end	6 SETS
78	096 000	Assy. Of Duct (Encl. & Cond.)	2	174	281 000	Cu Braided Flexible connection at UT end	12 SETS
79	097 000	Assy. Of UAT Hood	4	175	282 000	Cu Braided Flexible connection at UAT end	12 SETS
80	098 000	Assy. Of Switchgear Hood (UAT)	4	176	283 000	Cu Braided Flexible connection at SOB end (4000A)	12 SETS
81	101 000	Assy. Of Duct (Encl. & Cond.)	2	177	284 000	Cu Braided Flexible connection at SOB end (3500A)	18 SETS
82	102 000	Assy. Of Duct (Encl. & Cond.)	2	178	285 000	Cu Braided Flexible connection at SOB end (3150A)	12 SETS
83	103 000	Assy. Of Duct (Encl. & Cond.)	1	179	286 000	Cu Braided Flexible connection at Rubber Bellow (4000A)	12 SETS
84	104 000	Assy. Of Duct (Encl. & Cond.)	1	180	287 000	Cu Braided Flexible connection at Rubber Bellow (3500A)	18 SETS
85	105 000	Assy. Of Duct (Encl. & Cond.)	1	181	288 000	Cu Braided Flexible connection at Rubber Bellow (3150A)	12 SETS
86	106 000	Assy. Of Duct (Encl. & Cond.)	1	182	289 000	Cu Braided Flexible connection at Switchgear end (4000A)	12 SETS
87	107 000	Assy. Of Duct (Encl. & Cond.)	1	183	290 000	Cu Braided Flexible connection at Switchgear end (3500A)	54 SETS
88	108 000	Assy. Of Duct (Encl. & Cond.)	1	184	291 000	Cu Braided Flexible connection at Switchgear end (3150A)	12 SETS
89	109 000	Assy. Of Duct (Encl. & Cond.)	1	185	420 000	Wall Frame for 500x1500 SPBD	10 SETS
90	110 000	Assy. Of Duct (Encl. & Cond.)	1	186	421 000	Wall Frame for 450x1350 SPBD	4 SETS
91	111 000	Assy. Of Duct (Encl. & Cond.)	1	187	460 000	Earthing Arrangement	1 SET
92	112 000	Assy. Of Duct (Encl. & Cond.)	1	188	470 000	Silica Gel Breather Mouting Arrangement	1 SET
93	113 000	Assy. Of Duct (Encl. & Cond.)	1	189	600 000	RUBBER BELLOW (450X1350)	012
94	114 000	Assy. Of Duct (Encl. & Cond.)	1	190	600 100	RUBBER BELLOW (500X1500)	038
95	115 000	Assy. Of Duct (Encl. & Cond.)	1	191	650 000	SEAL-OFF BUSHING (For 4000 A & 3500 A)	030
96	116 000	Assy. Of Duct (Encl. & Cond.)	1	192	650 100	SEAL-OFF BUSHING (For 3150 A and below)	012
				193	900 100	GALV. STEEL SUPPORT STRUCTURE	1 SET

REV.	DATE	ALTERED	CHECKED
03	09.04.19	MUKESH	PIYUSH
REVISED AS PER CUSTOMER COMMENTS DATED 09.02.19			
02	14.01.19	MUKESH	PIYUSH
REVISED AS PER CUSTOMER COMMENTS DATED 02.01.19			
01	17.12.18	MUKESH	PIYUSH
REVISED AS PER CUSTOMER COMMENTS.			

PROJECT
2 X 660 MW MAITREE SUPER THREMAL POWER PROJECT, RAMPAL, BANGLADESH

OWNER CONSULTANT
FICHTNER
M/s FICHTNER Gmbh & Co KG, Stuttgart, GERMANY

OWNER
BANGLADESH – INDIA FRIENDSHIP POWER COMPANY (PVT.) LTD, BANGLADESH

BHARAT HEAVY ELECTRICALS LIMITED
RUDRAPUR

SCALE
SHEETS- 4 OF 5

VENDOR

	DATE	NAME
DGN.	05.11.18	MUKESH
CHD.	06.11.18	PIYUSH
APPD.	06.11.18	ARVIND

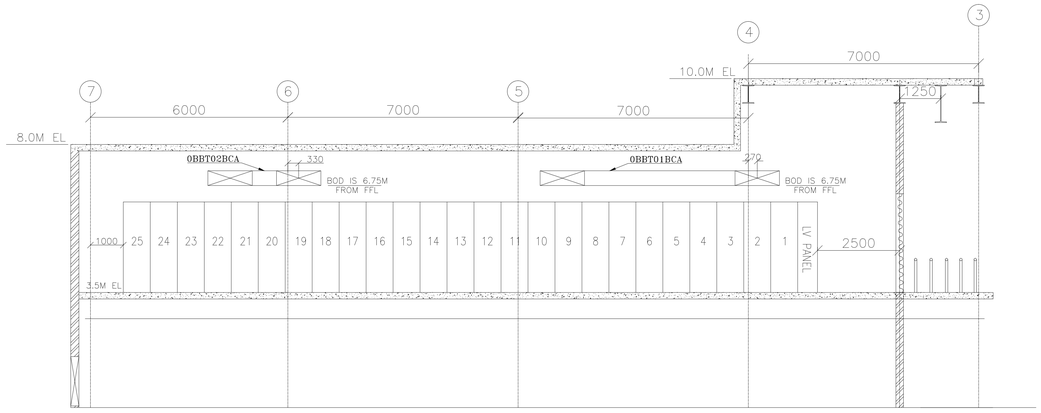
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SUPERSEDED BY:
SYSTEM:

TITLE
Layout of Segregated Phase Busduct for Unit – 1&2

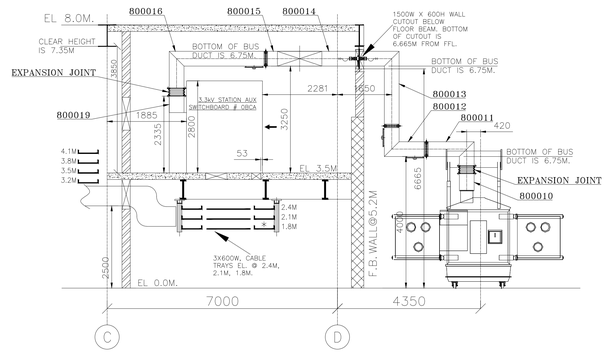
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ANNEX- | DOC. NO.-MAITREE-00-BAA-LD-500003-RDP | REV- 03

APPROVED
Checked and Approved.
Date: 06.11.2018
"Approved with comments" shall be read as per comments, subject to incorporation of comments in the next revision.

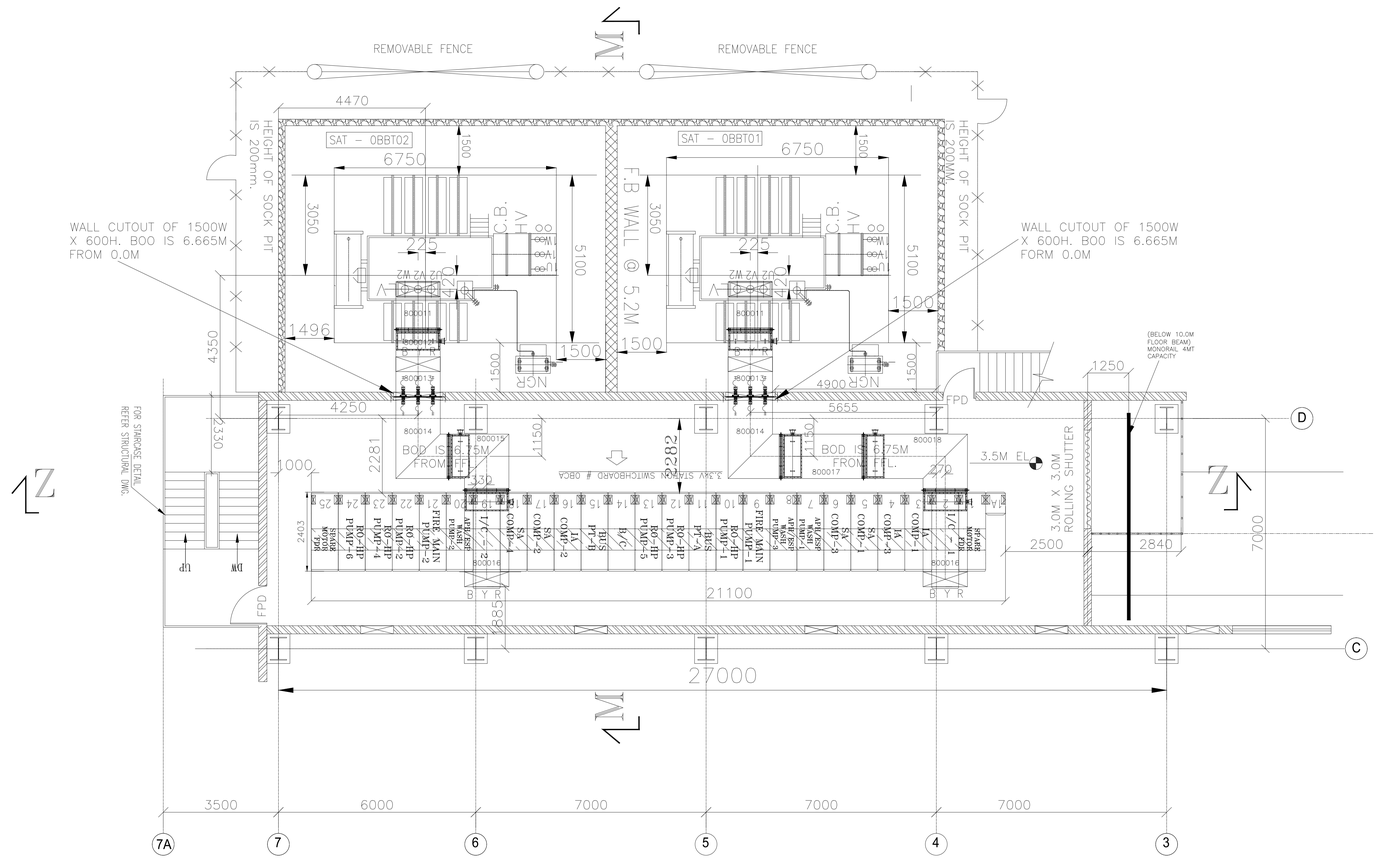
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SECTION Z-Z



SECTION M-M



PLAN @ 3.5M

BILL OF MATERIAL FOR SAT BUSDUCT FOR 2X660 MW MAITREE STPS

S. No.	BOM NO	ITEM DESCRIPTION	TOTAL QTY. (UNIT#1&2)
1	800 010	Assy. Of SAT Hood	2
2	800 011	Assy. Of Duct (Encl. & Cond.)	2
3	800 012	Assy. Of Duct (Encl. & Cond.)	2
4	800 013	Assy. Of Duct (Encl. & Cond.)	2
5	800 014	Assy. Of Duct (Encl. & Cond.)	2
6	800 015	Assy. Of Duct (Encl. & Cond.)	2
7	800 016	Assy. Of Duct (Encl. & Cond.)	2
8	800 017	Assy. Of Duct (Encl. & Cond.)	1
9	800 018	Assy. Of Duct (Encl. & Cond.)	1
10	800 019	Assy. Of SWGR Hood	2
11	292 000	Cu Braided Flexible connection at SAT end	6 SETS
12	293 000	Cu Braided Flexible connection at SOB end	6 SETS
13	294 000	Cu Braided Flexible connection at Switchgear end	6 SETS
14	421 000	Wall Frame for 450x1350 SPBD	2 SETS
15	460 000	Earthing Arrangement	1 SET
16	470 000	Silica Gel Breather Mouting Arrangement	1 SET
17	600 000	RUBBER BELLOW (450X1350)	4
18	650 100	SEAL-OFF BUSHING (For 3150 A and below)	6
19	900 100	GALV. STEEL SUPPORT STRUCTURE	1 SET

SAT ITEMISED

REV.	DATE	ALTERED MUKESH / CHECKED PIYUSH	REMARKS
03	09.04.19		REVISED AS PER CUSTOMER COMMENTS DATED 09.02.19.
02	14.01.19		REVISED AS PER CUSTOMER COMMENTS DATED 02.01.19.
01	17.12.18		REVISED AS PER CUSTOMER COMMENTS.

PROJECT
2 X 660 MW MAITREE SUPER THREMAL POWER PROJECT, RAMPAL, BANGLADESH

OWNER CONSULTANT
FICHTNER
M/s FICHTNER Gmbh & Co KG, Stuttgart, GERMANY

OWNER
BANGLADESH – INDIA FRIENDSHIP POWER COMPANY (PVT.) LTD, BANGLADESH

BHARAT HEAVY ELECTRICALS LIMITED
RUDRAPUR

SCALE
SHEETS– 5 OF 5

	DATE	NAME
DGN.	05.11.18	MUKESH
CKD.	06.11.18	PIYUSH
APPD.	06.11.18	ARVIND
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM:		

VENDOR

TITLE
Layout of Segregated Phase Busduct for Unit – 1&2

SIZE– A0 | PROJECT NO:– | FILE:–
ANNEX– | DOC. NO.– MAITREE-00-BAA-LD-500003-RDP | REV:– 03

INVENTORY NO. | SIGN. & DATE | REF. DRG. NO.
Computer File:– PC: piyush Path: H:\PROJECTS\27 MAITREE\903\SPBD LAYOUT\MAITREE SPBD LAYOUT Rev.03.dwg Printed On :09-04-2019 16:35:36

TENDER NO: PSER:SCT:KLN-E2060:20

VOLUME -IF

TECHNICAL CONDITIONS OF CONTRACT

(TCC)

FOR

Erection, Testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears, HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1, FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP, Rampal, Bangladesh.

BHARAT HEAVY ELECTRICALS LIMITED

(A GOVT. OF INDIA UNDERTAKING)
POWER SECTOR – EASTERN REGION
PLOT NO. – 9 / 1, DJ – BLOCK,
SECTOR – II, KARUNAMOYEE,
SALT LAKE CITY,
KOLKATA – 700091.

CONTENT

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1.0	PROJECT SYNOPSIS AND GENERAL INFORMATION
2.0	NAME OF WORK
3.0	EVALUATION OF BID
4.0	BROAD SCOPE OF WORK
5.0	SITE VISIT
6.0	DEVIATION/CLARIFICATION
7.0	DEWATERING
8.0	GENERAL TECHNICAL REQUIREMENT (CODES AND STANDARDS)
9.0	GENERAL SERVICES TO BE RENDERED BY BIDDER
10.0	PROTECTION
11.0	GENERAL GUIDELINES FOR FIELD ACTIVITIES
12.0	QUALITY CONTROL & QUALITY ASSURANCE
13.0	DELETED
14.0	HEALTH, SAFETY & ENVIRONMENT
15.0	DELETED
16.0	CIVIL WORKS, FOUNDATIONS AND GROUTING
17.0	CLEANLINESS
18.0	OTHER FACILITIES TO BE PROVIDED BY SUCCESSFUL BIDDER
19.0	RESPONSIBILITIES WITH REGARD TO EMPLOYMENT OF LABOUR, ETC
20.0	DELETED
21.0	AS BUILT DRAWING
22.0	PROJECT MANAGEMENT/ CONSTRUCTION MANAGEMENT
23.0	LAND
24.0	WATER
25.0	ELECTRICITY
26.0	CONSTRUCTION OF TEMPORARY OFFICE, STORES, ETC
27.0	CONSUMABLE
28.0	MEASURING AND MONITORING DEVICE (MMD)
29.0	TOOLS & PLANTS TO BE PROVIDED BY BHEL
30.0	ISSUE OF T&P
31.0	TEST CERTIFICATE FOR T&P
32.0	T&P, MMD TO BE PROVIDED BY SUCCESSFUL BIDDER
33.0	INSURANCE
34.0	REPORTING DAMAGES AND CARRYING OUT REPAIRS
35.0	ISSUE & HANDLING, USEAGE, RECONCILIATION, RECOVERY, ETC OF BHEL'S FREE ISSUED EQUIPMENT/ MATERIALS
36.0	COMPLETION PERIOD
37.0	CONSTRUCTION SCHEDULE
38.0	CERTIFICATE TOWARDS COMPLETION
39.0	EXTENSION OF COMPLETION PERIOD
40.0	SECURITY DEPOSIT & PERFORMANCE BOND
41.0	TAXES, DUTIES, ETC
42.0	TERMS OF PAYMENT
43.0	BILLING BREAK-UP
44.0	RETENTION AMOUNT
45.0	INTEREST BEARING RECOVERABLE ADVANCE/MOBILISATION ADVANCE
46.0	OVER RUN CHARGE (ORC)
47.0	REVISION ON ACCEPTED CONTRACT RATE

48.0	**PRICE VARIATION CLAUSE/ ESCALATION (PVC)**
49.0	**EXTRA/ ADDITIONAL ITEMS OF WORK**
50.0	**LIQUIDATED DAMAGE**
51.0	**GUARANTEE**
52.0	**CUSTOMS CLEARANCE**
53.0	**IDENTIFICATION OF CONTRACTOR'S EMPLOYEES, VEHICLES AND BUILDINGS**
54.0	**EXPATRIATE PERSONNEL**
55.0	**BANK DETAILS**
56.0	**LAWS AND REGULATIONS**
57.0	**CONTRACT PRICE**
58.0	**OTHER TERMS**
59.0	**ANNEXURE-I**
60.0	**ANNEXURE-II**
61.0	**ANNEXURE-III**

This volume shall be construed as part of tender document and shall be read along-with others volumes of tender. Unless otherwise specified, in case of any confusion of any clause/ provision of this volume or any conflict/ inconsistency of any clause/ provision of this volume with that of other volume, the same shall be brought out by the bidder in writing to BHEL for clarification or during pre-bid discussions, if applicable, failing which most stringent interpretation in favour of BHEL shall be adopted and the same shall be binding to the bidder. Unless otherwise specified, all terms & conditions shall be applicable for entire scope and for each part/ package of tender.

CLAUSE NO	DESCRIPTION
1.0	**PROJECT SYNOPSIS AND GENERAL INFORMATION**
1.1	PROJECT SYNOPSIS
	The 2x660 MW MAITREE SUPER THERMAL POWER PROJECT is located in Moithara Village, Rampal Upazila, Bagerhat District, Bangladesh. The Bidder shall acquaint himself by a visit to the site, with the conditions prevailing at site before submission of the bid. The information given here in under is for general guidance and shall not be contractually binding on the Owner. All relevant site data / information as may be necessary shall have to be obtained / collected by the Bidder.  LOCATION MAP:2X660MW MAITREE RAMPAL PROJECT

	 LOCATION MAP:2X660MW MAITREE RAMPAL PROJECT
1.2	APPROACH TO SITE
	The nearest town Khulna is at a distance of 23 km from project site. The site is Connected by road from Mangla- Khulna Highway. Nearest Domestic airport is Jessor, Bangladesh at a distance of about 93 KM and international airport is Dhaka at a distance of 263 KM, Bangladesh
1.3	OWNER
	Bangladesh-India Friendship Power Company (Pvt.) Limited (BIFPCL) is the owner which is a 50:50 joint venture company of NTPC, India and Bangladesh Power Development Board BPDB, Bangladesh.
	OWNER'S ENGINEER (CONSULTANT)
	FICHTNER GmbH & Co. KG, Stuttgart, Germany is the Owner's Engineer i.e. consultant of the Owner
2.0	**NAME OF WORK**
2.1	ETC OF ELECTRICAL PKG OF Main Plant Area-U#1 and BOP Area-Common for U#1&2.
	Providing labour, supervision, T&Ps, consumables, etc for receipt from store/ storage yard, watch & ward, transportation to site, pre-assembly (as required), erection, testing, commissioning, trial run, handing over, etc, as required and receipt, storage, etc of self-supplied materials, etc for total scope defined in tender and terms & conditions of tender, taking into account of all clarifications, confirmations, agreements till date for complete work of generator transformer, station transformer, unit auxiliary transformer,Unit Transformers, Station Aux. Transformers, other misc transformer, HT/ LT bus duct, DG set, associated equipments/ items/ panel, cable tray & accessories; cabling; various panel;motor; earthing and lightening protection, HT/ LT switch gear, other misc equipment; etc for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bagerhat, Bangladesh.

2.1.1	BOP Area –Common for Unit# 1,2 {as mentioned in cl. no. 2.1 above} will be mainly as below – • Electrical items pertaining to Balance of Plants area like 'AC System', 'Ventilation System', 'Compressed Air Sys.', 'Fuel Oil System','Fire Protection System', 'Gas Chlorination Sys.', 'Hydrogen Plant area', 'Cooling Tower', 'DM Plant', 'PT Plant','CW Treatment Plant 'CPU Package', 'Sewage Treatment Plant', 'Effluent Treatment Plant', 'Mill Reject', 'etc. • Raw water System • DG Sets • Any other item/area common to both the Units.
3.0	**EVALUATION OF BID**
3.1	Bidders should quote prices strictly as per prescribed format of Price Schedule, Volume-III (Latest revision) of the tender.
3.2	Bid shall be evaluated based on modalities enumerated in this volume or elsewhere in the tender, ie in technical specification/ SCC/ Price Schedule, as applicable.
4.0	**BROAD SCOPE OF WORK**
4.1	Intent of this tender is to provide services for execution of work according to most modern & proven techniques & codes. Omission of specific reference to any method, equipment or material necessary for proper & efficient services towards installation of the equipment shall not relieve successful bidder of the responsibility of providing such services/ facilities to complete the work or portion of work awarded to him. Accepted rates/ price shall deem to be inclusive of all such contingencies.
4.2	It is not the intent of this tender to specify herein all the details of erection, commissioning, etc. However, the system shall conform in all respects to high standards of quality & workmanship for performing the required duties in a manner acceptable to BHEL/ purchaser who will interpret the meaning of drawings, specifications and shall be entitled to reject any work or material, which in his judgments is not in full accordance herewith.
4.3	Omission of specific reference to any method, equipment or material necessary for proper & efficient working of the plant shall not relieve successful bidder of the responsibility of providing such facilities to complete the work at accepted rates. Any mismatch/ defect found due to mistake in work shall have to be rectified by successful bidder free of cost. Inspection by BHEL/ customer does not relieve successful bidder of responsibility of executing quality erection.
4.4	Following shall be the responsibility of successful bidder and have to be provided within accepted rates/ prices.
4.4.1	Provision as required of all types of labour, supervisors, engineers, watch & ward, tools & tackles, calibrated MMD as specified and otherwise required for the work, consumables for erection, testing, commissioning, etc including handling.
4.4.2	Proper out-turn as per BHEL plan and commitment.
4.4.3	Completion of work as per BHEL/ project schedule.
4.4.4	Good quality and accurate workmanship for proper performance of equipment.
4.4.5	Repair and rectification.
4.4.6	Preservation/ re-conservation of all components during storage, erection, commissioning till handing over.
4.5	Dismantling, removal of debris, leveling etc of all temporary buildings, structures, pipelines, cables, etc as per instruction of BHEL/ customer on completion of work. If successful bidder fails to do so, BHEL will get the job done through other agency and the cost along with applicable overhead will be recovered from successful bidder. Decision of BHEL in this regard shall be final & binding on successful

	bidder. However, the scope of dismantling & leveling the area is limited only to successful bidder's site office, yard, other spaces occupied by successful bidder.
4.6	BHEL - Power Sector (ER) is ISO 9001-2008 certified company. Quality of work, to customer's satisfaction and as per system requirements are the essence of ISO:9001-2008 certification. The bidder in all respects will organise his work, systems, environment, process control documentation, T&Ps, measuring and monitoring devices (MMDs) etc as per instructions of BHEL engineer.
4.7	Successful bidder shall comply with HSE (Health, Safety & Environment) requirements of BHEL and follow all applicable Operational Control Procedures (OCPs) within quoted rate/ price.
4.8	Successful bidder shall construct closed/ semi closed/ open stores shed for proper storage of items received by them without extra cost.
4.9	Successful bidder should use fire proof tarpaulin only to cover any material either in open or at a covered area.
4.10	Successful bidder should deploy portable fire extinguishers of required number in his office, stores and work areas.
4.11	Earthing of equipment including instruments is also included under his scope.
4.12	Successful bidder shall take the full responsibility of testing, pre-commissioning and commissioning of the equipment being installed by him or installed by others but being commissioned by him under the overall supervision of BHEL. It shall be the responsibility of successful bidder to arrange all the testing/ measuring instruments and complete all testing, pre-commissioning, commissioning activities for the particular equipment as per relevant standards, code of practice, manufacturer's instructions, applicable quality plans for installation, testing, commissioning and BHEL norms. All these will be witnessed by BHEL/ representative of BHEL/ customer and reports signed jointly. Successful bidder shall submit a check list to BHEL prior to taking up testing, commissioning activities which shall be approved by BHEL and the activities shall be carried out in accordance with the check list.
4.13	Successful bidder has to arrange all safety appliances required during acid filling/ charging of battery and other items like sp gravity meter, thermometer, jerry cans, funnels, etc. Resistance box with all interconnecting cables, PVC drums for water loads, etc of suitable rating/ capacity for carrying out capacity/ discharge test of batteries shall be arranged. Also, maintenance of battery parameters, after commissioning till handing over to owner shall be carried out.
4.14	Rotation of motor terminal boxes and minor modification to suit cable termination, if required shall be carried out at no extra cost.
4.15	For soot blowers, valves and dampers, operated through associated MCCs, entire commissioning including setting of limit/ torque switch and position feedback unit, electrical control gear of actuators of MOVs & damper, is included in the scope of successful bidder.
4.16	Before starting erection job, successful bidder shall ensure that the area is sufficiently cleaned against ingress of dust & water, and all debris are cleared off from the floor to a designated area as per instruction of BHEL. Successful bidder shall arrange to get the working area and surroundings cleaned daily to ensure a dust free atmosphere for working.
4.17	The accuracy of all equipments, instruments and their functioning shall be established before they are permitted for use on the job. If the engineer doubts the accuracy of the precision tools any time during erection, successful bidder shall arrange the checking of tools/ equipment/ instruments at his cost.
4.18	Foundations for all equipment shall be provided by BHEL. Dimensions & locations of foundations, pockets, anchor bolt shall be checked by successful bidder for their correctness as per drawings/ documents. Further, top elevation of foundations shall be checked with respect to bench marks, etc. All minor adjustments of foundation level, dressing and chipping of foundation surfaces up to 50 mm, enlarging the

	pockets in foundations, etc as may be required for erection of equipment/ plants shall be carried out by successful bidder within the accepted rates/ price.
4.19	While on the job, care is essential to avoid too much chipping and resultant lowering of level. In case of excess chipping successful bidder has to arrange additional packing plates as per requirements provided it is allowed by BHEL engineer. When required by manufacturers, the embedded sub-sole plates shall be scraped and checked with Prussian blue to get the required contact with frames.
4.20	Successful bidder shall ensure perfect matching of packer plates including scraping and blue matching with foundation by dressing the foundation, as well as perfect matching between packer plates and base plate of equipment to the satisfaction of BHEL engineer.
4.21	All civil works, viz grouting/ excavation/ casting of foundation anchor points for derricks, winches, guy ropes, fastening, etc and foundations required for any other temporary supports/ works, as required for safe & efficient operation of tools & tackles, shall be successful bidder's responsibility. For these civil works all materials excluding normal cement and required facilities will have to be arranged by successful bidder at their own cost.
4.22	All minor civil works for main equipments including drilling, chipping, enlarging cutouts, foundation pockets, cable cut outs, etc will have to be carried out by successful bidder at no extra cost. Grouting of equipments erected by successful bidder as per procedure is included in the scope. Materials like special cement, sand aggregates, etc including shuttering, curing, etc shall be arranged without any extra cost.
4.23	All other points shall be as per the terms & conditions and specification along with aforesaid references together with amendments incorporated thereto.
5.0	**SITE VISIT**
	Bidder should visit site and acquire full knowledge & information about site conditions. The bidder must visit site, to acquaint themselves with the conditions prevailing at site and in & around the plant premises, together with all statutory, obligatory, mandatory requirements of various authorities before submission of bid.
6.0	**DEVIATION/CLARIFICATION**
	Normally no deviation with respect to tender is acceptable to BHEL. However, in case of unavoidable circumstances, the bidder may submit their query for seeking clarifications of BHEL as per modality stipulated in NIT or may submit the same along with offer as per prescribed schedule/ format without any ambiguity. Any assumptions, presumptions, deviations etc. indicated or implied anywhere by the bidder except those indicated in the deviation schedule/ format will not be recognized and will not form a part of consideration / offer. In the absence of such filled-up schedule/ format it will be understood and agreed that the bidder’s offer is based on strict conformance to the specification and no negotiation would be allowed in this regard. BHEL reserve the right not to recognize any / all deviations submitted after opening of the bid.
7.0	**DEWATERING**
	Successful bidder shall ensure at all times that their work area & approach/ access roads are free from accumulation of water, so that the materials are safe and the erection/ progress schedule are not affected. No separate claim in this regard shall be admitted by BHEL. No separate payments for dewatering of subsoil, surface water or catchments water, if required, at any time during execution of the work including monsoon period shall be considered by BHEL. All dewatering pumps including high capacity pumps and diesel engine driven pumps are to be provided by successful bidder within finally accepted rates.
8.0	**GENERAL TECHNICAL REQUIREMENT (CODES AND STANDARDS)**
8.1	The work must be performed according to the most recent relevant codes, standards, accident prevention regulations and local rules and legal regulations.

8.2	All materials and equipment supplied and all work carried out as well as calculation sheets, drawings, quality and class of goods, methods of inspection, specific design features of equipment and parts and acceptances of partial plants shall comply in every respect with the applicable standards, codes and regulations to be chosen from the following:
8.2.1	American Association of State Highway and transportation Officials AASHTO American Concrete Institute ACI American Gear Manufacturers Association AGMA American Institute of Steel Construction AISC American Iron & Steel Institute AISI American Moving and Conditioning Association AMCA American National Standards Institute ANSI American Petroleum Institute API American Public Health Association APHA American Society for Testing and Materials ASTM American Society of Civil Engineers ASCE American Society of Heating, Refrigeration & Air Conditioning Engineers ASHRAE American Society of Mechanical Engineers ASME American Water Works Association AWWA American Welding Society AWS American Wire Gauge AWG Anti-Friction Bearing Manufactures Association AFBMA Architectural Institute of Japan AIJ Association Francaise de Normalisation AFNOR British Standards Institute BS Chlorine Institute CI Crane Manufacturers Association of America CMAA Deutsches Institut für Normung DIN Diesel Engine Manufacturers Association DEMA European Norm EN Expansion Joint Manufacturer Association EJMA Fédération Européene de Manutention FEM Heat Exchanger Institute HEI Hydraulic Institute HI Illuminated Engineers Society IES Institute of Electrical and Electronics Engineers IEEE Instrument Society of America ISA Insulated Power Cable Engineers Association IPCEA International Electrotechnical Commission IEC International Standards Organization ISO Japanese Architectural Standard Specification JASS Japanese Electrical Manufacturers Association JEMA Japanese Electrotechnical Institute JEC Japanese Industrial Standards JIS Manufacturers Standardization Society MSS National Association of Corrosion Engineers NACE National Electrical Code (USA) NEC National Electrical Manufacturer Association (USA) NEMA National Electrical Safety Code NESC National Fire Protection Association NFPA National Structural Code for Building NSCB Occupation Safety and Health Administration OSHA Portland Cement Association PCA Properties of Water and Steam IFC

	Scientific Apparatus Manufacturers Association SAMA Society of Automotive Engineers ASE Standards of Japanese Electrotechnical Committee JEC Steel Structures Painting Council SSPC Technische Vereinigung der Grosskraftwerksbetreiber VGB Tubular Exchanger Manufacturers Association TEMA Underwriters Laboratory UL Uniform Building Code UBC Verband Deutscher Elektrotechniker VDE Verein Deutscher Ingenieure VDI Vereinigung Deutscher Elektrizitätswerke (Association of German Power Plants) VDEW Water Pollution Control Federation WPCF
8.3	Generally, all internationally and nationally recognized standards as above will be applied, except if specific standards called for by:
8.3.1	a) Occupational Safety Board of Bangladesh b) Department of Inspection for Factories and Establishments, Bangladesh c) Department of Environment, Bangladesh d) Bangladesh Power Development Board e) Bangladesh Energy Regulatory Commission f) Ministry of Power, Energy and Mineral Resources g) Bangladesh Fire Service and Civil Defence Ministry h) All relevant Bangladesh National Statutory Regulations i) Bangladesh National Building Code j) Bangladesh Standards k) Local Authorities.
8.4	All steam boilers and unfired pressure vessels together with associated pipework and fittings shall comply with the Bangladesh Boiler Act, 1923 with amendments.
8.5	All pressure parts shall be designed in accordance with applicable ASME codes.
8.6	All services, supplies and works shall comply with the requirements of the relevant laws of Bangladesh and the IFC/World Bank Group Standards and Guidelines in their latest edition, including but not limited to:
8.6.1	Environmental Conservation Rules Bangladesh Energy Regulatory Commission Act; BERC Licensing Regulation BERC Technical Quality Standards; Bangladesh National Building Code; other applicable laws in Bangladesh; IFC Performance Standards on Environmental and Social Sustainability; IFC / World Bank Group Environmental, Health and Safety (EHS) General Guidelines; IFC / World Bank Group EHS Guidelines for Thermal Power Plants; IFC / World Bank Group EHS Guidelines for Electric Power Transmission and Distribution.
8.7	It is contractor’s responsibility to provide sufficient evidence that any national or other standard the Contractor proposes (other than those mentioned above) will ensure an equivalent or higher standard.
8.8	Except where otherwise specified, the plant/equipment shall comply with the appropriate agreed internationally accepted Standard Specification as mentioned elsewhere in contract specifications, each incorporating the latest revisions at the time of tendering. Where no internationally accepted standard is applicable, the Successful bidder shall give all particulars and details as necessary; to enable BHEL to identify all of the plant/equipment in the same detail as would be possible had there been a Standard Specification.

8.9	Where the Successful bidder proposes alternative codes or standards he shall include in his tender one copy (in English) of each Standard Specification to which materials offered shall comply. In such case, the adopted alternative standard shall be equivalent or superior to the standards mentioned in the specification.
8.10	In case bidder proposes any IS code, it shall be verified by reputed institutions like IIT that the proposed code is equivalent or superior to the codes mentioned above. Comparison report shall be established and provided to BHEL/Owner for information. Such report shall highlight the main items of the code, including material composition, material properties, design clauses and others as required. Report shall identify deviations of both codes and give justification for this deviation.
8.11	The bidder shall ensure that design will consider material properties as per approved code.
8.12	In the event of any conflict between the codes & standards referred above, and requirements of this specification, the requirements which are more stringent shall govern.
8.13	Wherever specified or required the plant/equipment shall conform to various applicable statutory regulations at Bangladesh. Wherever required, obtaining approval for plant/ equipment supplied under the specification from statutory authorities shall be the responsibility of the successful bidder.
8.14	Following codes have been accepted by BIFPCL for use in the project:
8.14.1	IS-2062 for Structural Steel
9.0	**GENERAL SERVICES TO BE RENDERED BY BIDDER**
	Services for construction, fabrication, erection, testing, trial run, commissioning/ completion of various equipment & accessories/ items under the contract shall include but not be limited to the following.
9.1	Collecting materials from store/open yard from time to time for fabrication/ erection as per construction program and unloading as per flow of consignment. Successful bidder shall be custodian of all materials issued till the plant/ equipment is officially taken over by BHEL/ customer after complete erection, commissioning/ completion. Successful bidder shall maintain adequate security personnel and security measures for proper precaution and safety of material.
9.2	Trial run, commissioning of individual equipment/ sub-systems to the satisfaction of BHEL/ BHEL's advisor/ owner.
9.3	Deployment of all skilled & unskilled manpower required for erection supervision, watch & ward, commissioning/ completion and other services to be rendered under this tender.
9.4	Deployment of all erection tools & tackle, construction machinery, transportation vehicles and all other implements in adequate number and size, appropriate for erection work to be handled under scope of this tender except otherwise specified.
9.5	Supply of all consumables, eg welding electrodes, gases for gas cutting job, etc as well as materials required for temporary supports, scaffolding etc as necessary for such construction work, unless specified otherwise.
9.6	Providing support services for successful bidder's erection staff eg construction of site offices, temporary stores, residential accommodation and transport to work site for erection personnel, watch and ward for security and safety of the materials under successful bidder's custody etc, as required.
9.7	Maintaining proper documentation of all site activities undertaken by successful bidder as per proforma, mutually agreed with BHEL, submitting monthly progress reports as also any such document as & when desired by BHEL/ customer, taking approval of all statutory authorities eg, Electrical Inspector, Factory Inspector, Provident Fund authority etc. for respective portions of work under the jurisdiction of such statutes of laws.
9.8	All the materials issued to the bidder by BHEL shall be reconciled by the bidder and

	the unused materials have to be returned back to BHEL stores/ yard or any other place as specified by BHEL. A material reconciliation statement showing the details of materials issue/return duly signed by BHEL engineer shall have to be submitted by the bidder.
9.9	As part of overall project management activity, successful bidder shall be responsible for proper co-ordination of erection activities during various phases of execution of the contract. Successful bidder shall identify a person designated as Site Incharge, with whom BHEL shall interact on matters related to execution of the contract. The Site Incharge shall be the single point contact person on behalf of successful bidder. BHEL shall interact with the Site Incharge only on all matters on co-ordination between BHEL and successful bidder. For timely completion of work successful bidder may have to work in one or more shifts. He will not be eligible for any extra charge on this account.
9.10	Successful bidder shall confine all their field operations to those works which can be performed without subjecting the equipment and materials to adverse effects, during inclement weather conditions, like monsoon, storms, etc and during other unfavourable construction conditions. No field activities shall be performed by successful bidder under conditions which might adversely affect quality & efficiency thereof, unless special precautions or measures are taken by successful bidder in proper & satisfactory manner in performance of such works and with concurrence of BHEL. Such unfavourable construction conditions in no way relieve successful bidder of their responsibility to perform work as per schedule.
9.11	Successful bidder shall supply all skilled workmen like mill-wright fitters, welders, gas cutters, electricians, riggers, sarangs, erectors, carpenters, pipe fitters, masons, laggers, tin-smiths, instrument technicians/machanics etc, as required, in addition to other skilled, semi-skilled and unskilled workmen required for all works of handling, transportation from site store to erection site, erection, testing, commissioning/ completion contemplated under this tender. Only fully trained and competent men with previous experience on the job shall be employed. They shall hold valid certificates wherever necessary. BHEL reserve the right to decide on suitability of workers and other personnel who will be employed by successful bidder. BHEL reserves the right to insist on removal of any employee of successful bidder at any time, if found unsuitable and successful bidder shall forthwith remove him.
9.12	Supervisory staff employed by successful bidder shall be technically qualified and experienced in the area of work. They shall ensure proper out turn of work and discipline on the part of labour put on the job by successful bidder and in general see that the works are carried out in a safe & proper manner and in coordination with other labour and staff employed directly by BHEL or other successful bidders of BHEL and BHEL's client.
9.13	Successful bidder shall also furnish daily labour report showing by classification the number of employees engaged in various categories of work a progress report of work as required by BHEL.
9.14	The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. Successful bidder and their personnel shall co-operate with other personnel, and other successful bidders, co-ordinating their work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.
9.15	Successful bidder's supervisory staff shall execute the work in the most substantial & workman like manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. Successful bidder shall be responsible to ensure that assembly and workmanship conform to the dimensions and tolerance given in the drawing/ instruction given by BHEL from time to time.
9.16	It is the responsibility of successful bidder to engage their workman in shifts or on

	overtime basis for achieving target set by BHEL during erection, commissioning/ completion, testing. Bidder's quoted rate shall include all these contingencies.
9.17	Any other service, although not specifically called for but required for a contract of the size and nature indicated in the tender.
9.18	After completion of commissioning activity of equipment/ systems, successful bidder shall prepare test reports/protocols which shall include all relevant information related to various commissioning checks, tests carried out, any deviations/ commissioning noticed wrt intended design requirements, sequence of various commissioning activities as actually adopted vis-à-vis as recommended in the procedures, program schedule achieved and any other such information as required .These test reports/protocols shall be submitted in requisite number of copies to BHEL/ BHEL's advisor/ owner during the commissioning activities.
10.0	**PROTECTION**
10.1	Equipment having anti-friction or sleeve bearings shall be protected by weather tight enclosures. Coated surfaces shall be protected against impact, abrasion, discoloration and other damages. Surfaces which are damaged shall be repainted.
10.2	Electrical equipments, controls and insulations shall be protected against moisture and water damages. All external gasket surfaces and flange faces, couplings, rotating equipment shafts, bearings and like items shall be thoroughly cleaned and coated with rust preventive compound and protected with suitable wood, metal or other substantial type covering to ensure their full protection. All exposed threaded parts shall be greased & protected with metallic or other substantial type protectors
10.3	All piping, tubing and conduit connections on equipment and equipment openings shall be closed with rough usage covers or plugs. Female threaded openings shall be closed with rough usage covers or plugs or forged steel plugs. The closures shall be taped to seal the interior of the equipment. Open ends of piping, tubing and conduit shall be sealed and taped.
10.4	All other consumables including wire brush, emery papers, painting brush, CRC, petrol/diesel for cleaning etc to be supplied by successful bidder within accepted rate.
11.0	**GENERAL GUIDELINES FOR FIELD ACTIVITIES**
11.1	Successful bidder shall execute the works in a professional manner so as to achieve the target schedule without any sacrifice on quality and maintaining highest standards of safety and cleanliness.
11.2	Successful bidder shall co-operate with BHEL/ owner and other successful bidders working in site and arrange to perform their work in a manner so as to minimise interference with other successful bidder's works. BHEL shall be notified promptly of any defect in other successful bidders' works that could affect successful bidder's work. If rescheduling of successful bidder's work is requested by BHEL/ customer in the interest of overall site activities, the same shall be compiled with by successful bidder. In all cases of controversy, the decision of BHEL shall be final & binding on successful bidder without any commercial implication.
11.3	BHEL shall hold weekly meeting of all successful bidders working at site at a time and a place to be designated by the engineer. Successful bidder shall attend such meetings and take notes of discussions during the meeting and the decisions of BHEL and shall strictly adhere to those decisions in performing this work. In addition to weekly meeting, BHEL may call for other meetings either with individual successful bidders or with selected number of successful bidders and in such a case successful bidder, if called will also attend such meetings.
11.4	Time is the essence of the contract and successful bidder shall be responsible for performance of their work in accordance with the specified completion period and construction schedule. If at any time successful bidder fall behind schedule, they shall take necessary action to recover such delays by increasing their workforce and T&Ps to comply with the time/ schedule and shall communicate such action in

	writing to BHEL, satisfying that their action will compensate for the delay. Successful bidder shall not be allowed any extra compensation for such action.
11.5	BHEL shall however not be responsible for provision of additional labour and or materials or supply of any other services to successful bidder except for the co-ordination work between various agencies' as set out earlier.
11.6	The works under execution shall be open to inspection & supervision by BHEL/ customer at all times. Successful bidder shall give reasonable notice to BHEL before covering up or otherwise placing beyond the reach of inspection any work, in order that same may be verified, if so desired by BHEL/ customer.
11.7	Every effort shall be made to maintain the highest quality of workmanship by stringent supervision and inspection at every stage of execution. Manufacturer's instruction manual and guidelines on sequence of erection and precautions shall be strictly followed. Should any error or ambiguity be discovered in such documents the same shall be brought to the notice of BHEL. Manufacturer's interpretation in such cases shall be binding on successful bidder.
11.8	Successful bidder shall comply with all the rules & regulations of local authorities, all statutory laws including Minimum Wages, Workmen Compensation etc. All registration and statutory inspection fees, if any, in respect of the work executed by successful bidder shall be to their account.
11.9	All the works such as cleaning, checking, levelling, blue matching, aligning, assembling, temporary erection for alignment, opening, dismantling of certain equipment for checking & cleaning, surface preparation, edge preparation, fabrication of tubes and pipes as per general engineering practice at site, cutting, grinding, straightening, chamfering, filling, chipping, drilling, reaming, scrapping, shaping, fitting-up, bolting/ welding, etc as may be applicable in such erection and necessary to complete the work satisfactorily, are to be treated as incidental and the same shall be carried out by successful bidder as part of the work.
11.10	It is the responsibility of successful bidder to do the alignment etc if necessary, repeatedly to satisfy engineer, with all the necessary tools & tackles, manpower etc. The alignment will be complete only when jointly certified so, by successful bidder's engineer and BHEL. Also successful bidder should ensure that the alignment is not disturbed afterwards.
11.11	Equipment and material, in case wrongly installed, shall be removed and reinstalled to comply with the design requirement at successful bidder expense, to the satisfaction of BHEL/ customer.
11.12	After identification of erection materials by BHEL at BHEL's store/ storage yard, it shall be the responsibility of successful bidder to take delivery of materials from BHEL's store/ storage yard by successful bidder's own manpower and re-stack the leftover materials as per erection sequence at BHEL store at their own cost. The entire activities are to be carried out under supervision of BHEL.
11.13	In case of successful bidder's failure to meet any of the aforesaid requirements, BHEL will get the same done and cost towards this, along with BHEL's applicable overhead will be recovered from successful bidder's RA bill.
12.0	**QUALITY CONTROL & QUALITY ASSURANCE**
12.1	**INSPECTION & FIELD QUALITY ASSURANCE**
12.1.1	Contractor shall carry out all activities conforming to the approved Field Quality Plan (FQP) & technical instructions as revised from time to time. 'Total Quality' shall be the watchword of the work and contractor shall strive to achieve the quality standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and quality standards. Contractor shall provide the services of quality assurance engineer as per the relevant clauses.

12.1.2	Preparation of quality assurance log sheets and protocols with customer / consultants / statutory authority, welding logs, NDE records, testing & calibration records and other quality control and quality assurance documentation as per BHEL engineer's instructions, is within the scope of work / specification. These records shall be submitted to BHEL / customer for approval from time to time.
12.1.3	The protocols between contractor and customer / BHEL shall be made for correctness of foundations, materials, procedures, at each stage of installation, generally as per the requirement of customer / BHEL. This is necessary to ensure elimination of errors and to avoid accumulation and multiplication of errors.
12.1.4	A daily log book (with proper indexing) should be maintained by every supervisor / engineer of contractor, for respective area of work, on the job for detailing and incorporating alignment/ clearance / centering / levelling readings and inspection details of various equipment, etc. This log book shall be always accessible to BHEL engineers. High pressure welding (as applicable under the scope of this contract) details like serial number of weld joints, welders name, date of welding, details of repair, heat treatment etc. will be documented in welding log as per BHEL Engineer's instructions. Record of radiography (as applicable under the scope of this contract) containing details like serial number of weld joints, date of radiography, repairs, if any, re-shots etc shall also be maintained as per BHEL Engineer's instructions. Record of heat treatments (as applicable under the scope of this contract) performed shall be maintained as prescribed by BHEL.
12.1.5	The performance of welders (as applicable under the scope of this contract) will be reviewed from time to time as per the BHEL standards. Welders' performance record shall be furnished periodically for scrutiny of BHEL's Engineer. Corrective action as informed by BHEL shall be taken in respect of those welders not conforming to these standards. This may include removal/ discontinuance of concerned welder(s).Contractor shall arrange for the alternate welders immediately.
12.1.6	Only welders duly authorized by BHEL / customer / consultant after welder qualification test as per ASME Sec-Ix / AWS D1.1 (as applicable) shall be engaged on the work. All the welders shall carry identity cards as per the proforma prescribed by BHEL / Customer / Consultant.
12.1.7	Any re-laying or re-termination of cables / re-erection of instruments / recalibration of instruments etc. required due to contractor's mistake and found at any stage inspection, shall be carried out by the contractor at no extra cost. Repair / rectification procedure to be adopted to make any job acceptable shall be subject to the approval of BHEL.
12.1.8	Weekly Quality Review Meeting at site shall be organised by BHEL to discuss quality issues and next weeks' inspection plans. Site in-charge of the contractor along with QAEs of the contractor must be present in the meeting with closure report of the issues raised by BHEL in the previous meetings.
12.2	**REQUIREMENT OF ISO 9001**
12.2.1	BHEL: PSER is accredited with ISO 9001 certification and as such this work is subject to various audits to meet ISO 9001 requirements.
12.2.2	The basic philosophy of the Quality Management System under ISO 9001 is to define the organizational responsibility, work as per documented procedures, verify the output with respect to acceptance norms, identify the non-conforming product / procedure and take corrective action for removal of non-conformance specifying the steps for avoiding recurrence of such non-conformities, & maintain the relevant quality records. The non-conformities are to be identified through the conduct of periodical audit of implementation of quality systems at various locations/stages of work. Suppliers / vendors of various products / services contributing in the work are also considered as part of the quality management system.

	As such the contractor is expected not only to conform to the quality management system of BHEL but also it is desirable that they themselves are accredited under any quality management system standard.
12.2.3	BHEL reserves the right to carry out quarterly quality audits and quality surveillance of the systems and procedures of contractor's quality management. Contractor shall provide all necessary assistance to enable BHEL to carry out such audit & surveillance.
12.2.4	Quality audits / approval of the results of test & inspection will not prejudice the right of BHEL to reject an equipment service not giving desired performance and shall not in no way limit the liabilities and responsibilities of the contractor in earning satisfactory performances of equipment / service as per specification.
12.3	**MMEs / MMRs**
12.3.1	Contractor shall ensure deployment of reliable and calibrated MMEs (Measuring and Monitoring Equipment). The MMEs shall have test /calibration certificates from authorised / Government approved / Accredited agencies traceable to National / International Standards. Retesting / re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such MMEs so that work does not suffer when the particular equipment /instrument is sent for calibration. Also if any MMEs not found fit for use, BHEL shall have the right to stop the use of such item and instruct the contractor to deploy proper item and recall i.e. repeat the readings taken by that instrument, failing which BHEL may deploy MME and retake the readings at Contractor's cost.
12.3.2	Contractor shall provide all the Measuring Monitoring Equipment (MMEs) required for completion of the work satisfactorily. These MMEs shall be of brand, quality and accuracy specified by BHEL Engineer and should have necessary calibration and other certificates as per the requirement of BHEL Engineer. Decision of BHEL Engineer regarding acceptance or otherwise of the measuring instruments / gauges / tools for the work under this specification, is final and binding on the contractor. BHEL shall give an indicative list of MMEs required for this work else where in this contract and to be made available by the contractor. The list will be reviewed by BHEL site as per the requirement of approved FQPs and the contractor shall meet any augmentation needed wherever required.
12.3.3	It is the responsibility of the contractor to prove the accuracy of the testing / measuring / calibrating equipment brought by him based on the periodicity of calibration as called for in the BHEL's quality assurance standards/BHEL Engineer's instructions.
12.3.4	Re-work necessitated on account of use of invalid MMEs shall be entirely to the contractor's account. He shall be responsible to take all corrective actions, including resource augmentation if any, as specified by BHEL to make-up for the loss of time.
12.3.5	In the courses of erection, it may become necessary to carry repeated checks of the work with instruments recently calibrated, re-calibrated. BHEL may counter / finally check the measurements with their own MMEs. Contractor shall render all assistance in conduct of such counter /final measurements.
12.4	**INSPECTION BY TS / FES / QA ENGINEERS OF BHEL UNITS / ENGINEERING CENTRES**
12.4.1	Apart from day-to-day inspection by BHEL Engineers stationed at Site and Customer's Engineers, stage inspection of equipment under erection and commissioning at various stages may also be conducted by teams of Engineers from Field Engineering Services of BHEL's Manufacturing Units, Quality Assurance teams from Field Quality Assurance, Unit/Factory Quality Assurance and Commissioning Engineers from Technical Services etc. Contractor shall arrange all labour, tools and tackles etc along with proper access for such stage inspections freeof cost.

12.4.2	Any modifications suggested by BHEL FES and QA Engineers' team shall be carried out. Claims of contractor, if any, shall be dealt as per applicable clause of the contract, and provided such modifications have not arisen for reasons attributable to the contractor.		
12.5	**CONFORMANCE TO THE STATUTORY REQUIREMENTS (AS APPLICABLE UNDER THE SCOPE OF THE CONTRACT)**		
12.5.1	The work to be executed under these specifications has to be offered for inspection, at appropriate stages of work completion, to various statutory authorities for compliance with applicable regulations. The work related statutory inspections, though not limited to, are as under: 1) Electrical Inspector 2) Factory Inspector, Labour Commissioner, PF Commissioner and other authorities connected to this project work. The scope includes getting the approvals from the statutory authorities, which includes arranging for inspection visits of statutory authority periodically as per BHEL Engineer's instructions, arranging materials for ground inspection, taking rub outs for stamping of the pressure parts / pipes to be offered for inspection, submitting co-related inspection reports, documents, radiographs etc and following up the matter with them. Contractor shall also make all arrangements for offering the Products / Systems for inspection at location, as applicable, to the concerned authority.		
12.6	**STORAGE & PRESERVATION OF WELDING ELECTRODES & OTHER BHEL-ISSUED MATERIAL**		
12.6.1	The contractor shall be responsible for storage & preservation of welding electrodes & other BHEL-issued materials as per BHEL Storage & Preservation Guidelines / Instructions.		
12.7	**PENALTIES ON VENDORS / SUB-CONTRACTORS AGAINST NON-COMPLIANCE OF QUALITY NORMS**		
Sl No.	**Nature of Non-compliance**	**Penalty**	**Remarks**
GENERAL			
12.7.1	Unavailability of QAE deployment schedule (duly approved by BHEL Site) matching with manpower requirement of approved L2 schedule	0.10%	Against each RA bill
12.7.2	Unavailability of required number of QAE with proper experience & NDT certification as per the requirement of the Contract	$16.00	Per person per day
12.7.3	Not attending quality meeting of BHEL by nominated member of vendor / sub-contractor	$32.00	Per meeting
CALIBRATION			
12.7.4	Use of MMEs without valid calibration certificate.	$16.00	Per equipment per instance
12.7.5	Use of NDT equipment, welding equipment without having valid calibration certificate / condition not as per	$16.00	Per equipment per instance

	requirement		
WELDING & NDT			
12.7.6	Unqualified welders carrying out welding / tack welding	$16.00	Per welder per instance.(Gatepass of the person shall be withheld)
12.7.7	Not using portable oven for welding consumables	$8.00	Per welder per instance. (The consumables in the oven shall be confiscated)
12.7.8	Not using electrodes pre-baked in baking oven	$8.00	Per instance. (The subject consumables shall be confiscated)
12.7.9	Not using welding consumables of approved make & not using correct type of electrode as per approved EWS / Drawing / WPS	$16.00	Per instance. (The subject consumables shall be confiscated)
12.7.10	Non-removal of welding slag and spatters after welding	$8.00	Per joint
12.7.11	Not using NDT equipment as prescribed in the manual / FQP / guidelines / Contract	$16.00	Per equipment per instance
12.7.12	Welder doing welding without valid job card	$8.00	Per instance
12.7.13	Discrepancy observed in the weld joints identified by BHEL / Customer for RT vs RT film offered	$32.00	per joint
MATERIAL MANAGEMENT			
12.7.14	Non-maintenance of grid pillar marking	$3.00	Per location week
12.7.15	Mismatch of location of material in store area w.r.t. location mentioned in stock register	$8.00	Per instance
12.7.16	Non-compliance of Preservation of material as per storage & preservation manuals	$16.00	Per equipment
12.7.17	Not offering received material for verification within stipulated time as per contract	$8.00	Per instance
PAINTING & ALLIED WORKS			
12.7.18	Not using primer / paints of approved make and as per Specifications	$16.00	Per instance
12.7.19	Painting without proper surface preparation as per approved schedule / drawing / FQP	$8.00	Per instance
PROTOCOLS & LOG SHEETS			
12.7.20	Delay in preparation of Protocols / Logsheets as per approved FQP within 3 days of completion of checks	$3.00	Per protocol per day delay
INSPECTION OF BOUGHT-OUT ITEMS / CONSUMABLES			
12.7.21	Delay in offering inspection of Bought-out Items / Consumables / Aggregates (for items which need site	1% of the item	per item per day delay after receipt of material

	inspection as per approved QP) within 3 days of receipt of material at site	value of the LOT	
12.7.22	Delay in submission of required documents (viz. Invoice, Inspection Release Note, COC, MDCC, MTC as the case may be) of Bought-out Items (shop inspection items / consumables) with in 3 days of receipt of material at site.	1% of the item value of the LOT	per item per day delay after receipt of material
NOTE: Any non-conformity requiring dismantling / rework, attributable to vendor / sub-contractor, shall be penalised at a rate mentioned above or cost to BHEL,which ever is higher.			
14.0	**HEALTH, SAFETY & ENVIRONMENT**		
14.1	HSE shall be guided by a separate volume (DOCUMENT NO HSEP:14-MAITREE: VENDOR DATE:05.05.16) , over and above the below mentioned terms and conditions.		
14.2	Round the clock experienced paramedical personnel with first aid facility & ambulance including driver, fuel, etc., at site, shall be arranged by BHEL through other sub-contractors at site. However, expenditure towards above facilities shall be shared by BHEL's sub-contractors working at site (actual cost distribution amongst all successful bidders shall be on pro rata basis proportionate to their contract prices). In case of any dispute, Construction Manager decisions in this regard shall be binding.		
15.0	**DELETED**		
16.0	**CIVIL WORKS, FOUNDATIONS AND GROUTING**		
16.1	Foundations for all equipment shall be provided by BHEL. The dimensions & locations of the foundations, pockets, anchor bolt shall be checked by successful bidder for their correctness as per drawings. Further, top elevation of foundations shall be checked with respect to bench marks, etc. All minor adjustments of foundation level, dressing & chipping of foundation surfaces up to 50 mm, enlarging the pockets in foundations, etc as may be required for erection of equipment/ plants shall be carried out by successful bidder within accepted rates/ price.		
16.2	While on the job, care is essential to avoid too much chipping and resultant lowering of level. In case of excess chipping, successful bidder has to arrange additional packing plates as per requirements provided it is allowed by BHEL. When required by manufacturers, the embedded sub-sole plates shall be scraped and checked with Prussian blue to get the required contact with frames.		
16.3	Successful bidder shall ensure perfect matching of packer plates including scraping & blue matching with foundation by dressing foundation, as well as perfect matching between packer plates & base plate of equipment to BHEL's satisfaction.		
16.4	All civil works, viz grouting/ excavation/ casting of foundation anchor points for derricks, winches, guy ropes, fastening, etc and foundations required for any other temporary supports/ works, as required for safe & efficient operation of tools & tackles, shall be the successful bidder's responsibility. For these civil works all materials excluding cement and required facilities will have to be arranged by successful bidder at their own cost.		
16.5	All minor civil works for main equipments including drilling, chipping, enlarging cutouts, column foundation pockets, cable cut outs, etc will have to be carried out by successful bidder at no extra cost. Grouting of equipments erected by successful bidder as per procedure is included in scope. Providing & grouting of pocket holes, under base-plates of structural steel/ machinery including roughening of surface, cleaning, ramming, curing, etc, all complete with CONBEXTRA GP-1 or equivalent		

	like Sika is included in scope. Materials like grouting compound, cement, sand, aggregates, etc shall be arranged by successful bidder at no extra cost to BHEL.
17.0	**CLEANLINESS**
17.1	Successful bidder shall be responsible for keeping the entire area allotted to him clean & free from rubbish, debris, etc during the period of contract. Successful bidder shall employ enough number of special personnel to thoroughly clean his work-area at least once in a day. All such rubbish & scrap material shall be stacked or disposed in a place to be identified by BHEL/ customer. Materials and stores shall be so arranged to permit easy cleaning of area. In areas where equipment might drip oil and cause damage to floor surface, a suitable protective cover of a flame resistant, oil proof sheet shall be provided to protect floor from such damage.
17.2	Similarly, labor colony, the offices and the residential areas of successful bidder's employees and workmen shall be kept clean and neat to the entire satisfaction of BHEL/ customer. Proper sanitary arrangements shall be provided by successful bidder, in the work-areas, office and residential areas of successful bidder.
18.0	**OTHER FACILITIES TO BE PROVIDED BY SUCCESSFUL BIDDER**
18.1	All tools & tackles, machinery, equipment, instruments, etc, unless otherwise specified in the tender, required for work have to be arranged by successful bidder including its transportation to & from site, and including storage, insurance etc.
18.2	All tools & tackles to be deployed by successful bidder for the work shall have the prior approval of BHEL with regard to brand, quality and specification.
18.3	Successful bidder shall provide all necessary scaffolding materials, temporary structures, as may be required and necessary safety devices etc.
18.4	Successful bidder's responsibily with regard to operator, fuel, lubricants and daily upkeep of T&Ps provided by BHEL is further detailed in relevant section.
18.5	Timely deployment of adequate quantity of T&P is the responsibility of successful bidder. Successful bidder shall be prepared to augment the T& P at short notice to match the planned program and to achieve the milestones.
18.6	Successful bidder shall maintain & operate his tools & plants in such a way that major breakdowns are avoided. In the event of major breakdown, successful bidder shall make alternative arrangements expeditiously so that progress of work is not hampered.
18.7	The T&P to be arranged by successful bidder shall be in proper working condition and their operation shall not lead to unsafe condition. Movements of cranes, and other equipment should be such that no damage/ breakage occurs to foundations, other equipment, material, property and men. All arrangements for movement of the T&P, etc, shall be successful bidder's responsibility. Valid test certificate of all the applicable T&Ps are required to be produced at the time of deployment.
18.8	DELETED
18.9	For welding, use of welding generators/ rectifiers only is permitted.
18.10	Successful bidder at his cost shall carry out periodical testing of his construction equipments and calibration of measuring instruments (MMDs) and tests. Test/ calibration certificates shall be furnished to BHEL. MMDs shall be calibrated only at accredited laboratory as per list available with BHEL or any other laboratory approved by BHEL.
18.11	Temporary toilet blocks are to be constructed/ fabricated at different areas as per mutual agreement for maintaining proper sanitation.
18.12	Construction and maintenance of necessary approach & access roads surrounding the work area shall be in the scope of successful bidder within accepted rates.
19.0	**RESPONSIBILITIES WITH REGARD TO EMPLOYMENT OF LABOUR, ETC**
19.1	Successful bidder shall also comply with the requirements of local authorities (Govt. of Bangladesh) with regard to employment of labours/workers at project site.

	They shall comply with any other statutory requirement/ local authority requirement such as police verification of antecedents of the workmen, staff, etc. with regard to employment of labours/workers at project site. In case of workmen / supervisors deployed to project from INDIA / any other country, necessary statutory guidelines issued by Indian Govt./ concerned Govt. authorities shall be strictly complied with in addition to local laws. Skilled labour with experience in construction of large utility thermal power projects shall be deployed (preferably 80% of such skilled labours shall be sourced from India).
19.2	BHEL/ customer may insist for witnessing the regular payment to the labour. They may also like to verify relevant records for compliance with statutory requirements. Successful bidder shall enable such facilities to BHEL/ customer.
19.3	It is the responsibility of successful bidder to arrange gate pass for all his employees, T&P, etc for entering the project premises. Necessary co-ordination with customer officials is the responsibility of successful bidder. Successful bidder to follow all procedures laid down by customer for making gate pass. To work beyond normal working hours, successful bidder shall arrange necessary work permits for working beyond normal working hours.
19.4	If at any time during the execution of work, it is noticed that the work is suffering on account of non-availability/ shortfall of resources from successful bidder's side, BHEL will make suitable alternate arrangements at successful bidder's risk & cost. The expenditure incurred with overheads thereby shall be recovered from the successful bidder.
19.5	It is the responsibility of successful bidder to engage his workmen in shifts and or on overtime basis to achieve targets, to suit BHEL''s commitments to customer or to adjust date of completion of events or due to other reasons. Decision of BHEL in this regard will be final & binding on successful bidder.
19.6	Successful bidder shall deploy only qualified & experienced engineers/ supervisors. They shall have professional approach in executing the work.
19.7	Successful bidder's supervisory staff shall execute the work in the most professional manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that workmanship conform to dimensions & tolerances given in drawings/ instructions given by BHEL engineer from time to time.
19.8	The supervisory staff employed by successful bidder shall ensure proper outturn of work and discipline on the part of labour put on the job. Also in general they should see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other successful bidders of BHEL or BHEL''s client.
19.9	If at any time, it is found that successful bidder is not in a position to deploy required engineers/ supervisors/ workmen due to any reason, BHEL shall have the option to make alternate arrangements at successful bidder's risk & cost.
19.10	The successful bidder shall deploy all the skilled/semiskilled/ unskilled labour including highly skilled workmen etc. These workmen should have previous experience on similar job. They shall hold valid certificates wherever necessary. BHEL reserves the right to insist on removal of any employee of the successful bidder at any time if he is found to be unsuitable and the successful bidder shall forthwith remove him. Successful bidder should furnish a tentative deployment plan of his manpower as required in GCC. Also the actual deployment will be so as to satisfy the project schedule of erection and commissioning.
20.0	**DELETED**
21.0	**AS BUILT DRAWING**
	Successful bidder shall submit as-built drawing to BHEL/ customer after completion of work for acceptance/ approval. Successful bidder will be given 1 copy of working

	drawing based on which as-built drawing is to be prepared. However, the contractor has to make those `as-built drawing' from the modified drawing which is already followed in between the project work. The contractor has to submit required no. of as-built drawing as per the instruction of BHEL engineer after completion of jobs.
22.0	**PROJECT MANAGEMENT/ CONSTRUCTION MANAGEMENT**
	To meet the need of construction management at site, successful bidder shall provide the following services within accepted rates.
22.1	**PLANNING & MONITORING**
22.1.1	On the basis of accepted/ approved master schedule, on every month, the successful bidder shall submit to Construction Manager, BHEL schedule-wise plan vs actual status of erection, testing, commissioning, along with action plan to make-up delay, if any.
22.1.2	The project schedule might undergo revision/ modification periodically, for which the successful bidder may have to prepare/ modify schedule periodically in consultation with BHEL, so as to match with revised project milestones.
22.1.3	The successful bidder shall ensure monitoring of these activities at least on fortnight basis or at other frequency as mutually agreed with BHEL.
22.1.4	Successful bidder shall submit daily work program based on above schedule. Deferment of above schedule is not acceptable. Successful bidder will adhere to schedule & augment resources to ensure completion as per schedule.
22.1.5	Progress reviews on entire activities will be held periodically as per direction of BHEL, at site/ Kolkata. These meetings will be used as a forum for discussing all areas where progress needs to be expedited. The successful bidder shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.
22.2	INFRASTRUCTURE-
22.2.1	Successful bidder shall install 2 nos all in one PCs (multimedia PC work station Core-i3, 2.1 GHz or above, 500 GB HDD, 4 GB RAM, 100/ 1000 MBPS LAN card) of HP/ Compaq/ Lenevo or equivalent make with window 8 or 7 O/S and required software like MS Office 2010 Professional, AutoCAD 2009 or higher, PageMaker (7.0, etc), ADOBE PDF CREATOR and ONE NO. SCANNER (HP Scan Jet Pro 2500 or equivalent), one no laser jet printer compatible for A4 size printing (ink/ cartridge for which to be supplied as & when required) with power backup at places, as per instruction of BHEL for exclusive use of BHEL. These computers/ printers/scanners shall remain successful bidder's property and they will be allowed to take out the same after completion of contract period including extension. Successful bidder shall provide data/ information, etc in prescribed formats for periodical updating of progress reports, material management reports, updating of network pertaining to successful bidder's scope of work, etc Successful bidder shall provide 1 no computer operator and 1 number service staff for miscellaneous service for BHEL's use at site/ Kolkata for reconciliation, progress review & day-to-day planning purpose, documentation, etc. These facilities are to be provided within 15 days from date of start date till completion of scheduled contract period, including extension, if the reason for extension is attributable to successful bidder. In case successful bidder fails to provide computer/ printer or personnel as per requirement, for a continuous period of fifteen days or more, BHEL shall have the right to deduct as per following rates on prorate basis, from successful bidder's RA bill or any other dues.
22.2.1.1	@ USD 230/- (Two Hundred Thirty) per month for each computer operator or at actual rate +30%, whichever is lower.
22.2.1.2	@ USD 150 /- (One Hundred Fifty) per month for each computer with printer/scanner or at actual rate +30%, whichever is lower.
22.2.1.3	@ USD 185/- (One Hundred Eighty five) per month for each service staff or at

	actual rate +30%, whichever is lower.	
22.2.2	In case BHEL extends the service of computer operator or service staff beyond the aforesaid mandatory period, successful bidder shall extend the service to BHEL, for which BHEL will reimburse following rates.	
22.2.2.1	@ USD 230/- (Two Hundred Thirty) per month for each computer operator or at actual rate +30%, whichever is lower.	
22.2.2.2	@ USD 185/- (One Hundred Eighty five) per month for each service staff or at actual rate +30%, whichever is lower.	
22.2.3	Successful bidder's site office must have facilities of communications like, E-mail, and telephone with STD facility within a month from LOI.	
22.3	PROGRESS REPORTING	
22.3.1	The bidder shall submit daily, weekly and monthly progress reports for work force, materials reports, consumables (gases/electrodes) report and other reports as per pro-forma considered necessary by the BHEL. In case of any failure on successful bidder's part to comply with this, BHEL may at its discretion, consider to withhold part payment against their RA bills.	
22.3.2	The progress report shall indicate the progress achieved against planned with reasons indicating delays, if any, and shall give the remedial actions which successful bidder intends to take to make good the slippage or lost time, so that further works again proceed as per the original program and the slippages do not accumulate and effect the overall program.	
22.3.3	The daily work force reports shall clearly indicate the work force deployed, category-wise specifying also the activities in which they are engaged.	
22.3.4	Weekly progress review meetings will be held at site during which actual progress during the week vis-à-vis scheduled program shall be discussed or actions to be taken for achieving targets. For discussions, successful bidder shall present program of subsequent week. Successful bidder shall constantly update/revise their work program to meet the overall requirement.	
22.3.5	Periodic progress reviews on the entire activities of execution in respect of supply and works in scope of bidder will be held once in a month at Calcutta/site. These meetings will be attended by reasonably higher officials of successful bidder and will be used as a forum for discussing all areas where progress needs to be speeded up. Successful bidder shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.	
22.3.6	Successful bidder has to provide electronic/ computerized storing and re-production/ printing/ plotting of various data, log sheets, protocols, measurements etc. These may be stored in CD (as per requirement) and handed over to BHEL as per requirement.	
22.4	SITE ORGANIZATION	
22.4.1	Successful bidder shall maintain a site organization of adequate strength in respect of manpower, construction machinery and other implements at all time for smooth execution of the contract headed by Site Incharge for site operations with sufficient level of authority to take site decisions. Successful bidder will submit organization chart (showing the name of Site Incharge) with individual bio-data indicating various levels of experts to be posted for supervision in the fields of supervision and execution, quality, material management, planning, safety, etc. The organization shall be reinforced from time to time, as required to make up slippage (if any) from the schedule without any commercial implication to BHEL. The organization chart is to be submitted within 10 days from the date of LOI.	
22.4.2	Following (minimum) engineering manpower with power plant construction background to be deployed at site by successful bidder for proper execution.	
22.4.2.1	Qualified safety officers with assistants (exclusive for safety supervision for project jobs).	As per relevant HSE clause/ manual.

22.4.2.2	For planning function of entire scope of work.	1 no with sufficient experience.
22.4.2.3	For quality inspection function of entire scope.	1 no engineer. 1 no supervisor.
22.4.2.4	Material handling area for follow-up with BHEL for timely putting up material requirement, identification of material for receipt from BHEL store/ storage yard, etc for various systems, ie transformer, busduct, cable tray, vable, switchgear, panel, etc.	1 no engineer. 2 nos supervisor.
22.4.2.5	For transformer, busduct function.	1 no engineer. 1 no supervisor.
22.4.2.6	For cable tray, cabling function.	1 no enigineer. 4 nos supervisors.
22.4.2.7	For switchgear, panel, balance function.	1 no engineer. 2 nos supervisors.
22.4.3	Deputation of above man-power shall be jointly decided at site in line with construction schedule and front availability.	
22.4.4	Engineer/ supervisor for other functions like store & purchase, material management, planning, finance, administration, etc are to be provided as per site requirement and not considered above.	
22.4.5	In the event of non deputation of engineer/ supervisor by the bidder as per above agreed schedule, BHEL shall reserve the right to deduct USD 770 per man-month for engineer, USD 460 per man-month for the supervisor/ safety officer/ safety suprvisor/ chemist from RA bills. Further induction of manpower regarding site supervisor & site engineer will be decided at site as per requirement without any financial implication.	
22.4.6	BHEL reserves the right to reject or approve the list of personnel proposed by successful bidder. The persons whose bio-data have been approved by BHEL will have to be posted at site and deviation in this regard will not be permitted unless specific & reasonable justification is made.	
22.4.7	In addition to above, a well experienced qualified engineer to be designated, as ‘Project Co-ordinator’, shall be deployed by successful bidder. Such engineer shall have adequate exposure on the job and shall remain fully involved in all planning activities, guidance etc to successful bidder’s own team during the complete execution period of contract.	
22.4.8	Successful bidder should also submit to BHEL for approval a list of T&Ps along with their fitness certificates. The tools & tackles shall not be removed from site without written permission of BHEL.	
22.4.9	Successful bidder should also submit network programs for the erection of various items. These networks shall show BHEL/ customer hold points (CHP), which have to be cleared by BHEL/ customer, or their authorized representatives before further erection can take place. These programs for the erection would clearly identify responsibilities of successful bidder and BHEL/ customer. It is the responsibility of successful bidder to get the networks approved by BHEL within four weeks of the date of finalization of award of work/ placement of LOI.	
22.5	CONSTRUCTION MANAGEMENT	
22.5.1	Based on the approved program, successful bidder shall submit a program of construction/ erection/ commissioning for the implementation. These programs would be amplified showing start of erection and subsequent activities and shall form the basis for site execution and detail monitoring. The three monthly rolling program with the first month’s program being tentative based on the site condition would be prepared based on these programs. Successful bidder shall also be involved along with BHEL/ customer to tie up detailed resources mobilization plan over the period of the contract matching with the performance targets.	

22.5.2	The program would be jointly finalized by Site Incharge of successful bidder with BHEL/ customer as well as the site-planning representative. The erection program will also identify sequential events matching financial turnover.
22.5.3	Successful bidder is liable to furnish all documentary evidences towards payment of Works Contract Tax as and when required by BHEL.
23.0	**LAND**
23.1	Land will be provided free of cost by BHEL to the extent available/ considered necessary by BHEL to successful bidder for their office, store & labour colony within plant premises. Availability of land is very limited and successful bidder have to plan & use existing land considering use of land by other civil/ mechanical/ electrical successful bidders and storage of plant machineries & materials. The existing land shall be shared by all agencies deployed by BHEL at site.
23.2	BHEL shall hand over such allotted land to the successful bidder on as is where is condition. Successful bidder shall arrange at his own cost cleaning and grading of area allotted, construction of their temporary office, stores, godown, fabrication yards etc and also the watch & ward, etc as may be required.
23.3	All temporary roads for crane movement shall be constructed and maintained by BHEL.
23.4	Land, as available, may be provided for labour colony outside plant boundary, free of cost. Successful bidder should visit the site to assess site condition regarding feasibility of use of land for the purpose. The successful bidder to construct temporary labour colony/ hutment, toilets as per attached technical specifications and drawings after obtaining approval of formalities from statutory body.
23.5	Successful bidder shall provide adequate no of toilet in their labour colony.
23.6	On completion of work, all the temporary buildings, structures, pipelines, cables, etc, shall be dismantled & leveled and debris shall be removed as per instruction of BHEL by successful bidder at their cost. In the event of failure to do so, same will be removed and expenditure thereof will be recovered from successful bidder. Decision of BHEL in this regard shall be final & binding. However, the scope of dismantling & leveling the area is limited only to successful bidder's site office, yard and other spaces occupied by successful bidder.
24.0	**WATER**
24.1	BHEL will provide construction as well as potable water at one strategic point within plant premises, free of cost, to the successful bidder for their site office & store.
24.2	Further network for construction & potable water system for construction work shall be arranged by successful bidder at their own cost.
24.3	BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of water supply and successful bidder shall claim no compensation for delay in work for such interruption. Successful bidder may make standby arrangement for water for which no separate payment shall be made by BHEL.
24.4	Successful bidder will have to arrange for storage of water to meet day-to-day requirement.
24.5	Availability of water (construction as well as potable) in project site is limited. Successful bidder shall ensure that no water is wasted and shall take all necessary measures for any wastage & preservation of water. In this context, for proper utilisation & to avoid scarcity, successful bidder shall mandatorily construct storage facility of construction & potable water at site (Near work places). Any deviation from this shall lead to forthwith withdrawal of the facility.
24.6	Construction water, as available, may be provided for labour colony within the project premises free of cost. Successful bidder should visit site before quoting to assess site condition regarding feasibility of use of water source for the purpose. Further network for drinking water system for construction work shall be arranged by successful bidder at their own cost. Successful bidder shall take care of all

	precautions to avoid any sort of misuse, wastage of water. Any deviation from this shall lead to forthwith withdrawal of this facility.
24.7	Successful bidder shall make their own arrangement of potable water facility for labour colony, at their own cost.
24.8	Bidder to note that no ground water is allowed for construction purpose by the project authority.
25.0	**ELECTRICITY**
25.1	BHEL will provide construction power free of charges at 415 V level at one/ two strategic point(s) within plant premises. Successful bidder shall make their own distribution arrangement to draw electricity. General illumination system shall be provided by BHEL. However, provision of suitable temporary lights at different floors/ working areas for execution of the work & safety of workmen shall be provided by successful bidder, within accepted rate. Illumination should be such that minimum illumination requirement as specified by local statutory body / international standard for general illumination is maintained.
25.2	If any other voltage level (other than normally available) is required, the same shall be arranged by successful bidder from power supply as above. Successful bidder will have to provide at their own cost necessary calibrated energy meters (tamper proof, suitably housed in a weather proof box with lock & key arrangement) at point of power supply along with calibration certificate from authorized/ accredited agency for working out the power consumption. In case of recalibration required for any reason, necessary charges including replacement by calibrated meters is to be borne by successful bidder. Supply of electricity shall be governed by applicable Rules & Regulation in Bangladesh. In case of any major deviation from normally accepted norms is observed, BHEL will reserve the right to impose penalty as deemed fit for such cases.
25.3	Successful bidder shall have to provide earth leakage circuit breaker at each point wherever human operated electrical drives/ T&Ps are deployed.
25.4	The power supply will be from the available grid. BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of power supply/ variation in voltage level and no compensation for delay in work can be claimed by the successful bidder due to such non-supply on the grounds of idle labour, machinery or any other grounds.
25.5	Successful bidder shall arrange sufficient illumination at their own work areas.
25.6	Successful bidder should ensure that the work in critical areas is not held up in the event of power breakdown. In the event of breakdown in the electric supply, if the progress of work is hampered, it will be the responsibility of the successful bidder to step up the progress of work after restoration of electric supply so that overall progress of work is not affected.
25.7	Successful bidder has to make arrangement at their own cost for illumination for their working area for execution of the work & safety of workmen.
25.8	Though the construction power is provided free of charge, it is the responsibility of the successful bidder to ensure efficient utilization of electricity. Suitable audit shall be carried out jointly by BHEL & successful bidder on a periodic basis to ensure the same. In case at any point of time it is found that construction power is being used inefficiently or for any other purpose than the intended use, the successful bidder will be suitably penalized as per the provision of the contract. The maximum penalty that can be imposed on the successful bidder shall be limited to one month's electricity charges (as will be obtained from the energy meter point) per incident of inefficient use or misuse.
25.9	The contractor shall have to make arrangement of power, at their own cost, in labor colony. However, BHEL may provide the same on chargeable basis, for which

	successful bidder has to make necessary arrangements including installation of meter etc.
26.0	**CONSTRUCTION OF TEMPORARY OFFICE, STORES, ETC**
	Successful bidder shall arrange at their own cost cleaning & grading of area allotted, construction of their temporary office, stores, godown, fabrication yards, etc and also watch & ward
27.0	**CONSUMABLE**
27.1	Successful bidder shall provide within accepted rates/ price, all consumables like welding electrodes, cleaning agents, hole closing substance etc as necessary for such work.
27.2	It shall be responsibility of successful bidder to plan activities and store sufficient amount of consumables. Non availability of any specified consumable or equivalent suggested by BHEL can not be considered as reason for not attaining the required progress or for additional claim.
27.3	BHEL reserve the right to reject use of any consumable, like electrode, gas, lubricant/ special consumables, etc, if it is not found to be of required standard/ make, purity.
27.4	It shall be responsibility of successful bidder to obtain prior approval of BHEL regarding suppliers, type, etc, before procurement of welding electrode, TIG wire. On receipt of electrode at site, these shall be subjected to inspection & approval by BHEL. Successful bidder shall inform BHEL in details regarding type of electrodes, batch no, date of expiry, etc and produce test certificate for each lot/ batch with correlation of batch/ lot no with respective test certificate. No electrode will be allowed to be used without valid test certificate.
27.5	Shortage of any of the above electrodes/ filler wire or the equivalent suggested by BHEL shall not be quoted as reason for deficiency in progress or for additional rate.
27.6	All electrodes shall be dried in electrode drying oven to the temperature & period specified by BHEL or as mentioned in WPs before they are used in erection work and each welder should be provided with one portable electrode drying oven at work spot. Electrode drying oven and portable drying ovens shall be provided by successful bidder at their cost.
27.7	The electrode drying oven shall have thermometer for temperature indication. The thermostat and thermometer of oven shall be calibrated before use and also periodically as advised by BHEL and calibration test certificates (from authorised/ Govt approved/ accredited test house traceable to National/ International standards) will be submitted by successful bidder at their cost.
27.8	BHEL reserve the right to reject use of any electrode, filler wire or any other consumable at any stage, if found defective because of bad quality, improper storage, expiry date, unapproved make, etc. It shall be responsibility of successful bidder to replace the same without additional cost & time.
27.9	In case of improper arrangement for procurement of any consumables, BHEL reserve the right to procure the same from any source and recover the cost from the successful bidder's first subsequent bill at market value plus the departmental charges of BHEL from time to time (30% at present). Postponement of such recovery is normally not permitted. Decision of BHEL in this regard is final & binding on the successful bidder.
28.0	**MEASURING AND MONITORING DEVICE (MMD)**
28.1	Successful bidder shall provide within accepted rates/ price, all MMDs as necessary for such work.
28.2	Successful bidder shall ensure deployment of reliable & calibrated MMDs. The MMDs shall have valid calibration certificate from authorized/ Govt approved /NABL accredited agencies. Successful bidder shall also keep provision of alternate engagement for such MMDs so that the work does not suffer when a particular

	MMD is sent for calibration. Re-testing/ re-calibration shall also be arranged by successful bidder at their own cost at regular interval during the period of use as advised by BHEL.
28.3	In the event of failure of successful bidder to bring necessary and sufficient MMDs, BHEL may arrange for the same at the risk and cost of successful bidder. The entire cost towards this along-with overhead shall be paid by successful bidder or deducted from successful bidder's bills.
29.0	**TOOLS & PLANTS TO BE PROVIDED BY BHEL**
29.1	T&P as per relevant annexure of this volume of tender will be provided by BHEL to successful bidder free of any charges on sharing basis as per availability. The T&Ps shall be shared by various other successful bidders and successful bidder shall plan his activities accordingly in co-ordination with BHEL site engineers.
29.2	Successful bidder shall ensure that T&Ps provided to them is kept in good running condition, all along its use by them and after use, it is returned to BHEL in good condition. BHEL's decision regarding condition evaluation shall prevail.
29.3	Depending on availability, the cranes may be provided to successful bidder free of any charges. The cranes shall be shared by various other successful bidders and successful bidder shall plan their activities accordingly in co-ordination with BHEL site engineers. Required fuel for crane including mobil, grease, other consumables required for crane operation shall also be provided by BHEL free of charge. In the normal working hours, crane operator (along with helper, if any) will be provided by BHEL on free of cost basis. In the event, the deployed BHEL crane is used by successful bidder beyond 8 hours (In single/ multiple operation) in a day (working day/ holidays), successful bidder have to deploy their own operator & helper for crane operation during these extended hours. In case proficiency of successful bidder's crane operator is not found satisfactory for safe operation of the crane, BHEL's crane operator will be engaged for operation and in such case, successful bidder has to bear overtime charges of BHEL's crane operator (alongwith helper, if any) as per BHEL's standard charges. BHEL's decision in this regard will be final after judging the proficiency of successful bidder's crane operator.
29.4	Any damage/ breakdown maintenance of T&Ps arising out of improper handling by successful bidder shall be to the account of successful bidder. BHEL reserve the right to repaire the same to its own satisfaction at the cost of successful bidder. During such outage of T&P, BHEL shall not be responsible to provide any alternative. Successful bidder shall arrange for such alternative arrangement at their own cost.
29.5	Successful bidder shall return BHEL, T&Ps issued to them in good working condition as & when desired by BHEL (on completion or reduction of work load). If return of equipment is delayed by successful bidder, hire charges as applicable shall be levied by BHEL from time it was requisitioned till the time of actual return. Hire charges shall also be charged on T&P returned in damaged/ un-serviced condition to BHEL till its satisfactory repair. Equipment returned in damaged un-serviced condition shall be got repaired by BHEL at their discretion and entire cost of repair with BHEL overheads shall be recovered from successful bidder.
29.6	In case of any T&P (issued to successful bidder) remain idle without valid reason, BHEL shall withdraw the T&P immediately for allotment to other agency next in priority and no compensation shall be entertained on this account by BHEL.
29.7	The T&Ps will be issued on sharing basis and distribution of these shall be done at the discretion of Construction Manager, BHEL as per requirement/ priority of the job and availability of these items. In the event of non-availability of crane, BHEL may explore the possibility of providing alternate higher/ nearby capacity crane, found sparable with BHEL site. However, this is not a binding for BHEL. Such cranes of higher capacity (if provided by BHEL) will also be issued on same conditions as applicable to cranes listed in the relevant annexure.

29.8	In the event of any damage or theft occurring to the issued T&Ps, while in use with successful bidder, due to their negligence, the same shall be repaired/ replaced by successful bidder at their own cost within the time stipulated by Construction Manager, BHEL. Successful bidder's failure to do so shall entitle BHEL to get the above done through any agency and cost alongwith overheads shall be recovered from successful bidder's RA bill.
29.9	The items mentioned in relevant annexure are for general guidance only. Except the referred items, successful bidder has to deploy all other T&Ps required for proper & satisfactory completion of the job.
29.10	Increasing/ shortening of crane boom to suit work requirements shall have to be arranged by successful bidder at their cost. In case of non-availability of T&Ps to be provided by BHEL due to any reason, successful bidder shall plan/ amend/ alter their activities to meet erection/ commissioning targets in consultation with BHEL. No additional compensation will be given for this.
29.11	Normal/ schedule maintenance of T&P issued to successful bidder on shared basis shall be carried out by BHEL as per requirement. Successful bidder shall plan/ alter their activities in line with availability of cranes, issued by BHEL on sharing basis.
29.12	Actual use of T&P including marching as per entry in log-book duly certified by BHEL engineer shall be considered for calculation of overtime charges.
29.13	T&P issued shall be used only for designated scope of work as per direction of BHEL.
29.14	In the event successful bidder fails to use and/ or maintain BHEL T&P according to BHEL's instructions, BHEL reserve the right to withdraw such T&P without any notice and no claim in this regard shall be entertained and successful bidder shall be responsible for delay in execution on this account.
29.15	It shall be responsibility of successful bidder to take delivery of T&P from stores or place of use of T&P by other agencies at project site, transport the same to site and return the same to BHEL store/ place as intimated by BHEL at project site in good working conditions after use.
29.16	EOT CRANE
29.16.1	EOT crane shall be made available to successful bidder in TG hall free of charges for erection purpose as per availability on shared basis. As the operator will be from other agency, successful bidder will do necessary co-ordination.
29.16.2	Availability of EOT crane may be affected from time to time due to routine preventive maintenance or break down maintenance. Successful bidder have to make alternative arrangement or plan/ amend/ alter their actions to suit the above condition and successful bidder will not be entitled to any compensation due to this non-availability of the crane to maintain the schedule.
29.16.3	Services of EOT crane will be provided to other agencies working in power house building or adjacent area as required. Decision of BHEL engineer for allocation of EOT crane will be final. Successful bidder has to make adjustments accordingly.
29.17	It is not obligatory on the part of BHEL to provide any T&P or other materials other than those specifically agreed to do so by BHEL in the tender. However, depending upon availability & job requirement, BHEL/ customer may make available any T&P or other other material to successful bidder on chargeable basis. Hiring charge will be based on standard followed by BHEL/ customer, as applicable. Hire charge will be recovered from successful bidder’s RA bills/ security deposit or any other dues in one installment.
30.0	**ISSUE OF T&P**
30.1	In the event of BHEL’s issued T&P, measuring instruments, etc, successful bidder and BHEL shall maintain joint protocol about the condition of all T&P, instruments, etc taken from BHEL’s custody and return to BHEL after use. Successful bidder shall not use these equipments for purposes other than the scope of work given in

	this tender. Only T&Ps issued by BHEL as per relevant annexure will be free of charges and balance T&P, measuring instruments, etc, if issued to successful bidder, shall be on chargeable basis.
30.2	It is the responsibility of successful bidder to keep these equipments always in working condition and ensure their safe return in working condition to BHEL's store subject to normal wear & tear.
30.3	After use of T&P items issued by BHEL the same shall be returned to BHEL in good working condition subject to normal wear & tear failing which recoveries at the book value of the item or the market rate prevailing at the time of returning the items, whichever is higher, shall be made from the payments due to successful bidder from BHEL from this contract or from any other contract.
31.0	**TEST CERTIFICATE FOR T&P**
31.1	All T&Ps, MMDs, lifting tackles and pulling devices, wire rope, slings to be deployed by successful bidder must bear valid/ latest test certificates for their suitability, and the documents shall be preserved at site.
31.2	In case of expiry of validity of any test certificate during construction, successful bidder shall revalidate the same well in advance, so that construction activities do not suffer on account of non-availability of such test certificates.
31.3	Successful bidder shall submit to BHEL for approval a list of T&Ps along with their fitness certificates. The T&Ps, MMDs, etc shall not be removed from site without written permission of BHEL.
32.0	**T&P, MMD TO BE PROVIDED BY SUCCESSFUL BIDDER**
32.1	Tentative list of T&P to be deployed by successful bidder for successful completion of work is given in the relevant annexure of this tender.
32.2	It may be noted that the list is not exhaustive and is only for general guidance. Successful bidder shall provide all necessary T&P (other than those specified to be provided by BHEL, if any) MMD, handing equipments for timely completion of total work as per contract. In case of project requirement, some activities may have to pre-pone. In such case, successful bidder may have to deploy additional T&P. Accepted rate shall be inclusive of such requirements.
32.3	In the event of any failure on the part of successful bidder progress of work suffers, BHEL, at their discretion may also terminate the contract and take out any or whole amount of contract from the scope of successful bidder. In line with this, in the event of failure of successful bidder to deploy necessary & sufficient T&Ps, BHEL also reserve the right to arrange the same at the risk & cost of successful bidder including transportation cost of same from any of BHEL site/ other agency & charges, as applicable, in case progress of work is suffered. Decision of BHEL in this regard will be final & binding on successful bidder.
32.4	Mobilization schedule as mutually agreed at site for major T&Ps, have to be adhered to so as to meet the project requirement. Successful bidder will have to give give advance intimation & certification regarding capacity, etc prior to dispatch of heavy equipments. However, depending on project requirement, availability of inputs, the deployment schedule may be revised/ modified based on mutual agreement betweeb BHEL and successful bidder.
32.5	All T&P and MMDs, which are required for successful and timely execution of work covered under this tender, shall be arranged & provided by successful bidder at his own cost in working condition.
32.6	After completion of major quantum of work as to be agreed by BHEL, successful bidder may be permitted to take out any of his T&P, MMD progressively, if deemed fit by Construction Manager, BHEL based on review of work progress & balance work program. The same will be jointly agreed and recorded. BHEL's decision in this regard will be final & binding on successful bidder.
33.0	**INSURANCE**

33.1	BHEL shall arrange comprehensive MCE (marine cum erection) Insurance Policy for total project supply & services including balance of plant package covering transit risks & loss, destruction or damage during handling at Site, Storage, civil works ,erection, testing and commissioning up to trial operation completion of unit including theft, sabotage, fire, lightning and other natural calamities
33.2	Contractor shall report to BHEL in writing any damages to equipment/components on receipt, storing, and during withdrawal of the materials from stores, in transit to site and unloading at place of work and during erection and commissioning till trial operation completion including handing over. The above report shall be as prescribed by BHEL site management. Any consequential loss arising out of non-compliance of this stipulation will be borne by contractor.
33.3	The contractor will take necessary precautions/ due care to protect the material at Project site, while in his custody from any damage/ loss till the same is handed over to BHEL/ customer at Project site. For lodging/ processing of insurance claim the contractor will submit necessary documents. BHEL will reserve the right to recover the loss from the contractor as detailed below in case the damage/loss is due to negligence/ carelessness on the part of the contractor. In case of theft of material under contractor's custody, the same shall be reported to police by the contractor immediately and copy of FIR and subsequently police investigation report shall be submitted to BHEL/ customer for taking up with insurance. However, this will not relieve the contractor of his contractual obligation for the materials in his custody.
33.4	In case the damage/loss/theft of materials are attributable to negligence/failure in discharging the duties and obligations of the contractor, the expenses incurred for repair/replacement of such components in excess of the amount realized from the underwriters, limited to Normal Excess (Deductible Franchise) shall be recovered from the contractor.
34.0	**REPORTING DAMAGES AND CARRYING OUT REPAIRS**
34.1	Checking all components/ equipment at siding/ site and reporting to transport and/ or insurance authorities of any damages/ losses will be in the scope of successful bidder. Necessary assistance for verification/ survey and lodging claims with underwriters and follow up to logical conclusion will also be part of this tender.
34.2	Successful bidder shall render all help to BHEL in inspection including handling, opening packages, re-packing, re-stacking, assessing and preparing estimates for repairs of components damaged during transit, storage, erection, commissioning and preparing estimates for fabrication of materials lost/ damaged during transit, storage and erection. Successful bidder shall help BHEL to furnish all the data required by railways, insurance company or their surveyors.
34.3	Successful bidder shall report to BHEL in writing any lost/ damages to equipment/ components during drawl of the materials from stores, in transit to site and unloading at a place of work and during erection & commissioning. The above report shall be as prescribed by BHEL site. Any consequential loss arising out of noncompliance of this stipulation will be borne by successful bidder.
34.4	Successful bidder shall carry out fabrication of any material lost/ damages as per Instructions from BHEL.
34.5	BHEL, however, reserve the right to award or not to award to successful bidder any of the rectification/ rework/ repairs of damages and also fabrication of components.
34.6	All the repairs/ rectification/ rework of damages and fabrication of materials lost, if any, shall be carried out by a separately identifiable gang for certification of man-hours. Daily log sheets should be maintained for each work separately and be signed by successful bidder's representative & BHEL. Signing of log sheets does not necessarily mean acceptance of these as extra works for payment purpose.
34.7	All rectification, repairs, reworks and fabrication of components lost, which are minor and incidental to erection work (consuming up to 50 man-hours on each occasion) shall be treated as part of work without any extra cost.

34.8	In case the repairs/ rectification/ rework and fabrication of materials lost, the work has been done by more than one agency including successful bidder, payment towards extra charges will be on pro-rata basis and decision of BHEL in this regard is final & binding on the successful bidder.
35.0	**ISSUE & HANDLING, USEAGE, RECONCILIATION, RECOVERY, ETC OF BHEL'S FREE ISSUED EQUIPMENT/ MATERIALS**
35.1	ISSUE & HANDLING
35.1.1	BHEL will issue various equipment/ materials/ items free of cost to successful bidder as per the scope of this tender including BOQ of Volume-III.
35.1.2	Successful bidder shall maintain proper store account for all the BHEL issued materials and shall give requisite copies of monthly computerised reconciliation statement of such account to the BHEL.
35.1.3	Successful bidder shall solely be responsible for the safety & quality of material after it is handed over and issued to successful bidder by BHEL.
35.1.4	BHEL issued materials shall not under any circumstances taken out of the project site unless otherwise permitted by BHEL.
35.1.5	Necessary lifting tackles, cranes, tools & plants including tractors, trailers, trucks, pulley blocks, jacks, winches, wire ropes etc, of suitable capacities and other equipments incidental to carry out this work shall have to be arranged by successful bidder within the accepted rates/ price.. BHEL reserve the right to inspect lifting tackles and equipment before allowing their use. Such approval however shall not relieve successful bidder to ensure safe handling of equipment taking precaution to avoid any accident and damage to other equipment and personnel.
35.1.6	Successful bidder shall satisfy himself of the quality and quantity of the materials at the time of taking delivery from BHEL/ customer store/ storage yard. No claims whatsoever will be entertained by BHEL because of quality or quantity after the materials are taken by successful bidder from BHEL/ customer.
35.1.7	Successful bidder shall submit to BHEL, a statement indicating estimated quantity of equipment/ materials required atleast 1 month in advance.
35.1.8	Successful bidder shall ensure that no lamination materials are taken over by them from BHEL. Wastage, if any due to above, shall not be compensated by BHEL.
35.1.9	Successful bidder has to note that all fasteners like MS/ HT/ HSFG bolts/ nuts, lock nuts, washers, etc shall be supplied by successful bidder as per applicable item of price schedule of tender.
35.1.10	Successful bidder to note that steel required for their enabling job like store/ site office, etc shall be arranged at their own cost.
35.2	RETURN
35.2.1	All surplus equipment/ materials issued by BHEL shall be returned by successful bidder to BHEL/ customer store/ storage yard.
35.2.2	Surplus, unused and un-tampered materials shall be sorted and returned separately at a place directed by BHEL within project area; Return of such materials will not be entitled to any handling and incidental charges.
35.2.3	All wastage/ scrap (including wastage, unusable scrap) shall be returned to stores/ designated area and a receipt obtained from BHEL for material accounting purposes. Return of such material will not be entitled to any additional cost due handling and transportation and incidental charge.
35.2.4	Scrap for structural steel shall be returned separately.
35.3	USE AND WASTAGE
	Unless specified otherwise in the tender, following guidelines shall be applicable.
35.3.1	Theoretical consumption of various equipment/ materials shall be based on tender provision/ approved drawing/ guidelines/ mutual agreement with BHEL. No extra shall be payable for any deviation for two different procedures adopted for issue and calculation of the theoretical consumption.

35.3.2	Allowable wastage of the theoretical consumption shall be considered based on tender provision/ approved drawing/ guidelines/ mutual agreement with BHEL. Invisible wastage (loss of materials due to gas cutting, straightening of edges, etc) shall be limited to above specified guidelines and shall be considered for reconciliation purpose. But this invisible wastage shall be considered to be included in allowable wastage.	
35.3.3	All wastage shall be returned to BHEL.	
35.4	RECONCILIATION	
35.4.1	Successful bidder shall submit a reconciliation statement of equipment/ materials issued to him, once in two months. The same may be submitted alongwith RA bill.	
35.4.2	Successful bidder shall properly account for the material issued to him as specified herein to the satisfaction of BHEL certifying that the balance material are available with successful bidder's custody at site.	
35.4.3	If it is noticed by BHEL that the wastage is high and calls recovery at the penal rate, then BHEL will proceed for recovery for the excess wastage as per penal recovery rates as specified from RA bill.	
35.5	RECOVERY	
	If wastage exceeds the specified limit, recovery of excess wastage shall be made from monthly RA bill at the penal rate stipulated tender provision/ approved drawing/ guidelines/ mutual agreement with BHEL.	
36.0	**COMPLETION PERIOD**	
36.1	The entire work under the scope of tender shall be successfully completed in all respect within **17 (Seventeen) months**, from the date of start of work	
36.2	Successful bidder shall arrange to mobilise and start the work within 30 days from the date of intimation by BHEL.	
36.3	The actual date of start of work will be certified by Construction Manager, after adequate mobilisation of manpower, T&P by successful bidder. This certificate date will be deemed as start of work of respective units at site for purpose of the contract time schedule.	
37.0	**CONSTRUCTION SCHEDULE**	
37.1	Entire work shall be carried out in accordance with the broad project milestone schedule in conjunction with broad schedule of this package as furnished in the tender, within the stipulated completion period. This schedule will undergo review and based on progress vis-à-vis project requirement, successful bidder may have to submit revised schedule for approval of BHEL.	
37.2	Schedule of service of the subject job:	
	Event/ milestone	Schedule (From Start of Work)
37.2.1	Boiler Light Up of U#1 - **(M1)**	Within 3 months
37.2.2	Synchronisation of U#1	Within 7 months
37.2.3	Trial Operation of U#1- **(M2)**	Within 10 months
37.2.4	Completion of related BOP work for Synchronisation of U#2	Within 13 months
37.2.5	Completion of Work	Within 17 months
37.3	Sucessful bidder shall submit detail program identifying equipment & system mandatorily associated with each of aforesaid events/ milestones, to BHEL for approval.	
37.4	Successful bidder shall plan their work in such a manner so as to meet the above construction schedule & project schedule, in consultation with BHEL/ customer. **M1**& **M2 are the intermediate LD milestone. Successful bidder shall submit detailed L1/L2 schedule separately for the package after getting LOI from BHEL and prior to issuance of detailed work order**.	
37.5	Successful bidder shall submit daily work program based on above construction	

	schedule. Deferment of schedule is not acceptable, unless specifically called for by BHEL. Successful bidder will adhere to schedule and resource planning to be augmented to ensure completion as per schedule. Slippage from adheherence to this schedule will attract penalty/ LD as per tender provision.
37.6	Periodic progress reviews on the entire activities of execution in respect of supply & works in scope of successful bidder will be held once in a month at Kolkata/ site. These meetings will be attended by reasonably higher officials of successful bidder and will be used as a forum for discussing all areas where progress needs to be speeded up. Successful bidder shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings. Review fshall be done in applicable BHEL format (F-14 etc) and shall have to be signed jointly by BHEL engineer and site in-charge of vendor. This signed document shall form the basis for furure delay analysis of the project.
38.0	**CERTIFICATE TOWARDS COMPLETION**
	The work under the scope of successful bidder shall be deemed to have been completed in all respects only when so certified by BHEL/ customer. Decision of BHEL in this regard shall be final and binding on successful bidder.
39.0	**EXTENSION OF COMPLETION PERIOD**
39.1	Successful bidder shall submit detail work program (L-2 schedule) for approval of BHEL, as detailed in construction schedule. The approved schedule will be taken into account as basis for consideration of contract extension as per following detail.
39.2	If the completion of work as detailed in the scope of work gets delayed beyond the contract/ completion period, successful bidder shall request for an extension of the contract and BHEL at its discretion may extend the contract.
39.3	Based on the reviews jointly signed, the works balance at the end of original contract period less the backlog attributable to successful bidder shall be quantified, and the number of months of 'Time extension' required for completion of the same shall be jointly worked out. Within this period of 'Time extension', successful bidder is bound to complete the portion of backlog attributable to successful bidder. Any further 'Time extension' or 'Time extensions' at the end of the previous extension shall be worked out similarly.
39.4	However, if any 'Time extension' is granted to successful bidder to facilitate continuation of work and completion of contract, due to backlog attributable to successful bidder alone, then it shall be without prejudice to the rights of BHEL to impose penalty/ LD for the delays attributable to successful bidder, in addition to any other actions BHEL may wish to take at the risk & cost of successful bidder.
39.5	A joint programme shall be drawn for the balance amount of work to be completed during the period of 'Time Extension', along with matching resources to be deployed by successful bidder as per specified format. Review of the programme and record of shortfall shall be done.
39.6	During the period of 'Time extension', successful bidder shall maintain their resources as per mutually agreed program.
39.7	At the end of total work completion as certified by BHEL, and upon analysis of the total delay, the portion of time extensions attributable to (i) Successful bidder, (ii) Force majeure conditions, and (iii) BHEL, shall be worked out and shall be considered to be exhausted in the same order. The total period of time extensions shall be the sum of (i), (ii) and (iii) above and shall be equal to period between the scheduled date of completion and the actual date of completion of contract. LD shall be imposed/ levied for the portion of time extensions attributable to successful bidder and recoverable from the dues payable to successful bidder.
40.0	**SECURITY DEPOSIT & PERFORMANCE BOND**
40.1	Security deposit shall be applicable as per relevant clause of GCC (Volume-IB).
40.2	Performance bond is not applicable for this tender.

40.3	RELEASE OF SD BG AND FINAL BILL
	In addition to other provisions of tender regarding release of SD and final bill, following provisions shall also be governing to this tender.
40.3.1	For SD BG- further extension beyond date of acceptance of final bill will not be enforced if the following is fulfilled.
40.3.1.1	Successful bidder discharges their responsibility in r/o of submission of final bill along with absolute 'No Demand Certificate' and other documents as detailed below to the satisfaction of BHEL
40.3.1.2	Joint protocol of set of documents as submitted as detailed in below is certified by site & successful bidder's representative.
40.3.1.3	There is no negative value of the final bill (after release of SD BG) - site to certify the same before release of SD BG.
40.3.1.4	Successful bidder has returned the property belonging to BHEL - site to certify the same before release of SD BG.
40.3.1.5	Successful bidder has submitted joint protocol against `Delay analysis', if applicable for delayed execution of job.
40.3.2	List of documents to be submitted & jointly protocoled indicating acceptance of final bill by BHEL.
40.3.2.1	Final bill.
40.3.2.2	Measurement for final bill signed, jointly signed by BHEL & successful bidder's representative.
40.3.2.3	Statement having cumulative joint measurement for the contract, jointly signed by BHEL & successful bidder's representative.
40.3.2.4	Claim by successful bidder for refund of security deposit.
40.3.2.5	Jointly signed material reconciliation statement.
40.3.2.6	Statement of payment received from BHEL – Bill wise (Including RA/ PVC/ ORC/ rate revision/ extra work).
40.3.2.7	No claim certificate by successful bidder.
40.3.2.8	Clearance certificates wherever applicable, viz clearance certificates from customer, various statutory authorities, like Labour Department, PF Authorities, Commercial Department, etc.
40.3.2.9	Notarized Indemnity Bond as per prescribed format.
41.0	**TAXES, DUTIES, ETC**
41.1.0	**IMPORT DUTIES: (Applicable For All Bidders)**
41.1.1	Any taxes, duties, Cess etc. in the source country of the bidder shall be on bidder's account. However, the bidder must consider the duty drawback / export incentive in the source country while giving quotations.
41.1.2	Bidder may please note that import for the project shall be in the name of our Employer / Owner of the Plant / Project and such import other than Office and Household Equipment shall be exempted from payment of Customs Duty, VAT & Supplementary Duty as per Special Order 373/655 Date: 13/12/2018 of National Board of Revenue, Govt. of Bangladesh. Also Regulatory Duty(RD), Advance Trade VAT(ATV) & AIT are exempted / not applicable. Further, any documentation needed for facilitating the Imports like Bill of Entry, Bill of Lading, Packing List, Certificate of Origin etc. will be submitted by the bidder in reasonable time having regard to the time for delivery of the work and the time for completion.
41.1.3	However, if any of the taxes as mentioned above are paid by the bidder as

	per the extant law in force in Bangladesh, the same shall be reimbursed at actuals subject to production of documentary evidence in support of such payment. However, the bidder shall obtain prior approval of BHEL before deposition of such taxes.
41.1.4	Bidder shall note that the Commercial Invoice must contain the 'Bill to'; 'Ship to'; 'Consignee'; details as below: Bill to: - NAME Bharat Heavy Electricals Limited ADDRESS Power Sector Eastern Region, 2x660 MW Maitree Super Thermal Power Project Moidara Village, Rampal Upazila, Bagerhat District, Bangladesh Ship to / consignee Details:- Elsewhere mentioned in the Tender Document
41.1.5	The bidder should correctly and accurately classify all the materials, supplies, equipment, tools and other articles to be shipped under the subject purchase order as per the Harmonized Commodity Description and Coding System. The bidder may refer the website of Bangladesh Customs Authority in this regard (http://www.bangladeshcustoms.gov.bd/trade_info/operating_center).
41.1.6	The Bidder shall promptly unload the materials, supplies, equipment, tools and other articles.
41.1.7	The bidder shall be responsible for import of all permanent imported items including freight forwarding, custom clearance on both side at India & Bangladesh, port handling, port charges and C&F commission & their offer Price should consider Demurrage, Landing fee and Additional Border Charges, and various other charges / fees imposed by the Customs Authority, Port Authority or any other authority. No extra payment shall be paid by BHEL in this regard. The price shall be FO.R. Site as such and shall be inclusive of all such requirement. Any Taxes for exporting material from source country & as applicable in the source country shall be on supplier's account. However, supplier to take into consideration Duty Free Export Provisions in source country, as applicable, including that in GST in case of exports from India. As such, while offering the rates, the supplier may take into account the benefit of above provisions, as the cost of input to the supplier will be net of such taxes and adjust their offer price accordingly to make it more competitive. In case of supply from India Supplier to take into consideration applicable, Zero Rated Export Provisions under GST Law.
41.2.0	**BANGLADESH VAT (Applicable for Bidder From Bangladesh and India)**
41.2.1	The Bidder shall submit copy of VAT registration Certificate (Musak-8), TIN Certificate, Trade License to the BHEL site office immediately after receiving the Order but before raising the first Tax Invoice against this tender. The subject job shall be treated as "**Deemed Export"** as per Section **2(62)(b**) of the **Bangladesh VAT and Supplementary Duty Act,2012** read

	with Rule 18A.of the **Bangladesh VAT and Supplementary Duty Rule,2016** as the payment of the consideration shall be in foreign currency (US Dollar) and through international tender. Accordingly, the subject service/ supply shall be "Zero Rated" VAT. The successful bidder shall ensure compliance in this regard with the local VAT authorities.
41.2.2	Bidders shall quote price exclusive of Bangladesh VAT and shall raise Tax Invoice (Challan Patra) as per Rule 16(1) (Musak-11) of the VAT and SD Act, 2012 and read with VAT and SD Rules, 2016 mentioning Name, Address and VAT Registration Number of BHEL site office. VAT is separately payable for which the bidder shall submit self-certified copy of the Treasury Challan and / or self-attested copy of the Current Account (Musak-18) along with the Tax Invoice as an evidence of payment of output tax claimed from BHEL.
41.2.3	The successful bidder shall ensure compliance in this regard with the local VAT authorities.
41.2.4	Bidder shall note that the Tax Invoice complying with Rule 16(1) of the Value Added Tax & supplementary Duty Rules, 2016 must contain the 'Bill to' and 'Ship to' details as below: BHEL Bangladesh VAT Regn. No. 00761853 GM/Construction Manager- BHEL Maitree Site Bharat Heavy Electricals Limited Power Sector Eastern Region, 2x660 MW Maitree Super Thermal Power Project, Moidara Village, Rampal Upazila, Bagerhat District, Bangladesh
41.2.5	**DELETED**
41.2.6	The bidder shall submit self-certified copy of the Treasury Challan and / or self-attested copy of the Current Account (Musak-18) along with the Tax Invoice as an evidence of payment of output tax claimed from BHEL.
41.2.7	Bidders shall quote price excluding Bangladesh VAT envisaging VAT exemption on the same. In this connection please note that VAT, if and as applicable, on Bidders Quoted Price and in case BHEL is unable to provide exemption documents shall be payable extra. In such case bidder shall submit self-certified copy of the Treasury Challan and / or self-attested copy of the Current Account (Musak-18) along with the Tax Invoice as an evidence of payment of output tax claimed from BHEL.
41.2.8	**Value Added Tax Deduction at Source: (VDS)**
41.2.8.1	BHEL shall make deduction of VAT at source (VDS), as / if applicable, from the Running Account Bills of the bidder depending upon the status of the bidder like "Manufacturer", "Trader" or "Procurement Provider" as per the extant provision of the Value Added Tax Act, 1991 read with the relevant Notification issued thereunder. BHEL shall issue VAT Deduction Certificate in "Musak-12kha" to enable the

	service provider to take credit of the same while paying his Output VAT. Since VDS is adjustable by bidder against his output tax, hence Bidder shall quote price excluding Bangladesh VAT.
41.2.8.2	The bidder must consider the duty drawback / export incentives available in Bangladesh while giving quotations.
41.3.0	**INCOME TAX DEDUCTION AT SOURCE:**
41.3.1	Bidder should have valid 12-digit TIN number in Bangladesh prior to start of work. Advance Income Tax (AIT) under the Income Tax Ordinance,1984(and rules made thereunder) shall be deducted at prevailing rates on Gross Invoice value from the bills unless Exemption Certificate from the appropriate authority/ authorities is/ are furnished under Income Tax Laws of Bangladesh
41.3.2	Payment shall be made in Bangladesh. Bangladesh Income Tax (AIT) shall be deducted, if applicable.
41.3.3	If Indian bidder becomes successful and opt for payment, for supply portion only, in Indian INR, Payment shall be made in Indian Rupees complying Clause No: 41.3.1 as above and Indian Income Tax shall be applicable as per Section 194 C of Indian Income Tax Act. As a result of above VAT become applicable, shall be loaded by 7.50% Truncated Rate during Tendering evaluation. Please note that payment of service portion shall be made in line with currency matrix.
41.4	**Paying Authority - Construction Manager/ General Manager – BHEL – Maitree Site Office** . Bidder shall note that the Tax Invoice complying with Rule 16(1) of the Value Added Tax Rules, 1991 must contain the 'Bill to' and 'Ship to' details as below: BHEL Bangladesh VAT Regn. No. 00761853 Bharat Heavy Electricals Limited Power Sector Eastern Region, 2x660 MW Maitree Super Thermal Power Project, Moidara Village, Rampal Upazila, Bagerhat District, Bangladesh Consignee – A/C – BIFPCL Ship to – A/C Matree Project Bill to – A/C – BHEL Site Office
42.0	**TERMS OF PAYMENT**
42.1	The contractor shall submit their running bill (RA bill) at site once in a month, at the end of the month, as per billing schedule of this tender. RA bill, complete in all respects accompanied by BHEL engineer's certified/ measurement sheet, jointly signed, will be paid after passing of the bill, subject to completeness & correctness. Measurement will be taken as per relevant clause of GCC or as specified elsewhere in tender and certified by the BHEL engineer of actual work. However, no extra payment shall be made in the event of delay in release of payment.
42.2	Subject to any deduction which BHEL may be authorized to make under the contract, the contractor shall on the certification of the BHEL engineer at site, be entitled to payment explained hereunder.
	For erection,testing & commissioning of various items as described in tender document ,progressive payments shall be made as per the billing break-up

	(mentioned elsewhere in this volume of tender), on the basis of contract price as per rate schedule (these percentages are only for the purpose of progressive payment & should not be considered as price of individual items and vendor should complete all the works without quoting reference to the billing break up).
42.3	Contractor's RA bill, complete & correct in all respect accompanied with requisite statutory certificates, certified by BHEL engineer, shall be paid within 45 - 60 days of submission of appropriate invoice with all supporting documents. The measurement will be taken by BHEL engineer as per relevant clause of GCC and certify regarding actual work executed in measurement book and bills for work. However, no extra payment shall be made in the event of delay in release of payment beyond the stated day.
42.4	Each RA bill shall accompany with latest agreed & jointly signed L-3/ construction schedule, as enumerated in this tender.
42.5	All admissible recovery/ adjustment, etc shall be made from interim payable amount.
42.6	BHEL site at its discretion may split up percentage break up given in Sl.no.43.0 and effect payment to suit the site condition, cash flow requirement, according to the progress of work.
43.0	**BILLING BREAKUP**
43.1	Ninty (90%) percent payment on pro-rata basis for the work completed as per billing schedule (detailed below) shall be released as progressive payment by the site authorities, on submission of protocols duly signed by BHEL site official (s) / Owner. BHEL at their descretion may further split up the above percentage and effect monthly payment in consideration of site conditions, flow requirement etc. during site execution.
43.1.1	Out of above 90%, 1.5 % of gross bill amount shall be paid in the following manner on certification by BHEL engineer after compliance of each of following activity in each month. In case of non-fulfilment of respective activity by contractor in each month, no payment shall be made by BHEL against corresponding activity and no claim of bidder, at a later date, whatsoever, in this regard will be entertained by BHEL.
43.1.2	0.7 % shall be paid on compliance of house keeping of contractor's working area and store/ office areas.
43.1.3	0.3 % shall be paid on compliance of general illumination of contractor's working area and stores, office area.
43.1.4	0.2 % shall be paid on compliance of applicable OHSAS requirement as per guidelines of BHEL/ PSER and as specified in the tender.
43.1.5	0.3 % shall be paid on compliance of applicable safety requirement as per guidelines of BHEL/ PSER and as specified in the tender.
43.2	Balance ten percent (10%) of the total value shall be released by the site authorities, as per following break up -
43.2.1	5% on successful completion of Trial Run of Unit#1
43.2.2	Balance five per cent (5%) of the contract price shall be released on i) successful commissioning and readiness of electrical system as per scope of the contract ii) submission of As built drawing, iii) material re-conciliation, iv) liquidation of pending points, v) handing over of the Package. In case, any of the above activities is delayed due to reasons not attributable to the contractor for a period of more than 6 months, this 5% may be released on submission of separate BG as per performance bank guarantee format of equivalent amount valid till completion of all the above noted activities. However, contractor shall comply with all formalities required for final billing / contract closing before drawing the last payment
Billing schedule for 90% above (Cl. 43.1), is as given below -	

Sl No.	Description of activity	IN % OF QUOTED UNIT RATE	Reference item no of Volume-III
A	**CABLE TRAY WITH ACCESSORIES/ TRAY FIXING MATL. & SUPPORTING STRUCTURES ,TRAY COVERS, IRREGULAR BENDS ETC**		Sch-3 - Sl No. A,B,C, D.1,D.2,AE.1,AE. 2,X.5
(i)	FABRICATION AND ERECTION COMPLETE AS APPLICABLE IN ALL RESPECT.	70%	
(ii)	FINAL PAINTING AND MARKING OF TRAY NOS.	20%	
B	**CABLE LAYING**		Sch-3 - Sl No.F
(i)	LAYING OF CABLES	75%	
(ii)	DRESSING & CLAMPING	15%	
C	**CABLE TERMINATION / STRAIGHT THROUGH JOINTING**		Sch-3 - Sl No.G
(i)	TERMINATION	70%	
(ii)	TESTING OF CONNECTED EQUIPMENTS / SYSTEM	20%	
D	**EARTHING / LIGHTNING PROTECTION**		Sch-3 - Sl No.H
(i)	INSTALLATION,WELDING,PAINTING	70%	
(ii)	CONNECTION TO EQUIPMENT & GRID	20%	
E	**CONDUITS / PIPES**		Sch-3 - Sl No.E
(i)	LAYING OF CONDUIT/PIPE COMPLETE IN ALL RESPECT	90%	
F	**HT MOTORS/LT MOTORS/ACTUATORS /MISC EQUIPMENT(COMMISSIONING ONLY)**		Sch-3 - Sl No.11.0,12.0,13. 0 of L, Sl No.13.0 to 24.0 of M, Sl No.14.0 of Z.1, Sl No.X.1 & X.2
(i)	TESTING, PRE COMMISSIONING OF INDIVIDUAL ITEMS	50%	
(ii)	COMMISSIOINING OF INDIVIDUAL ITEM	40%	
G	**INSERT PLATES, ANCHOR FASTENERS(SUPPLY INCLUDED) ,CHEQUERED PLATES, CANOPY, BASE FRAMES ETC**		Sch-3 - Sl No.X.6,X.7,X.8
(i)	FABRICATION AND ERECTION	70%	
(ii)	PAINTING AS APPLICABLE	20%	
H	**SWITCH GEAR, MCC, PCC, CONTROL PANELS/ DESK, OTHER PANELS, PUSH BUTTON STATIONS, BATTERY, BATTERY CHARGER, DISTRIBUTION BOARD, COMPUTER, PRINTER, JUNCTION BOX, MARSHALLING BOX , STARTER UNIT, MISC EQUIPMENTS ETC.**		Sch-3 - Sl No.J,K, Sl No.1.0 to 10.0 of L, Sl No.1.0 to 12.0 of M, Sl No. N, Sl No.O, Sl No.P, Sl No.X3 & X4,X.13
i)	PLACEMENT, ALIGNMENT & COUPLING AS APPLICABLE	50%	
(ii)	PRE-COMMISSIONING CHECKS, TESTING	20%	
(iii)	CHARGING	20%	
I	**SUPPLY OF RUBBER MAT / DISPLAY BOARD/moisture sealing compound/cable Lug/Cable gland/galvanized MS conduit/ Cable gland adaptor/cable gland hole plug/paint/Cable straight through jointing kit.**		Sch-4
i)	On completion of Supply	80%	

ii)	on laying/installation of material/item	10%	
J	**INSTALLATION OF RUBBER MAT / DISPLAY BOARD/moisture sealing compound/ Cable gland adaptor/ cable gland hole plug.**		Sch-3 - Sl No.X.9,X.10,X.11 ,X.12
(i)	On completion of installation	90%	
K	**CIVIL WORKS**		Sch-3 - Sl No.I
(i)	Prorata on completion of actual work	90%	
L	**OIL FILLED TRANSFORMERS**		
L.1	Erection, Testing and commissioning of Transformer and associated Equipments / accessories.)		Sch-3 - Sl no.1.0(b),2.0(b),3 .0,4.0(b),5.0(b),6. 0(b),7.0(b),8.0(b) ,9.0(b),10.0(b),11 .0(b),12.0(b),13.0 (b),of Sl No.Z.1 and Sl no.1.0 to 7.0 of Sl No.Z.2
i)	Placement on foundation and alignment.	35%	
ii)	Fixing, fitting, of piping,hydraulic test of radiator banks, erection of allied items / associated auxiliaries including filling of pre-treated, tested oil as applicable	20%	
iii)	Completion of dry out of transformer including Oil filteration complete.	10%	
iv)	Pre-commissioning checks & tests	15%	
v)	Charging	10%	
L.2	UNLOADING AND/OR SHIFTING(if required) as applicable, to TRANSFORMER FOUNDATION FOR ERECTION PURPOSE		Sch-3 - Sl no.1.0(a),2.0(a),4 .0(a),5.0(a),6.0(a),7.0(a),8.0(a),9.0 (a),10.0(a),11.0(a),12.0(a),13.0(a) of Sl No.Z.1
i)	Completion of above noted activities	90%	
M	**DRY TYPE TRANSFORMER, NGR, MISC EQUIPMENTS ETC.**		Sch-3 - Sl No.Z.3
i)	PLACEMENT, ALIGNMENT & COUPLING AS APPLICABLE	70%	
ii)	PRE-COMMISSIONING CHECKS, TESTING	10%	
iii)	CHARGING	10%	
N	**BUS DUCTS (ISOLATED PHASE B/D AND SEGREGATED PHASE B/D)**		Sch-3 - Sl No.ZA.1,ZA.2
(i)	Pre-assembly of Bus ducts and accessories, pre-alignment, erection with proper leveling and alignment, including welding etc.	65%	
(ii)	Pre-commissioning checks & tests & charging	15%	
iii)	Charging	10%	
O	**LT BUS DUCTS**		Sch-3 - Sl No.ZA.3
(i)	Pre-assembly of Bus Ducts and accessories, pre-alignment, erection with proper levelling and alignment, including welding etc.	70%	
(ii)	Pre - commissioning checks/testing & charging .	10%	
iii)	Charging	10%	
P	**DG SET**		Sch-3 - Sl no.ZB
(i)	Placement and alignment of DG set on Foundation	45%	
(ii)	Erection of associated accessories viz. package piping, cabling, insulation etc. as applicable.	25%	
(iii)	Pre-commissioning checks/testing	10%	
(iv)	Charging and putting DG set on trial operation	10%	

Q	**SUPPORT STRUCTURE (FOR BUS DUCT, DG SET ETC)**		Sch-3 - Sl No.ZC
(i)	Assembly of structure, as applicable	25%	
(ii)	Placement, alignment & welding of structures as applicable.	65%	
R	**GENERATOR CIRCUIT BREAKER (GCB)**		Sch-3 - Sl No.Y
(i)	Placement and alignment of GCB on Foundation alongwith installation/fittings of associated items including loose items, internal wiring etc.	60%	
(ii)	Pre-commissioning checks/testing	20%	
(iii)	Charging	10%	
44.0	**RETENTION AMOUNT**		
44.1	Shall be as per as per terms of payment/ billing schedule of this volume.		
45.0	**INTEREST BEARING RECOVERABLE ADVANCE/MOBILISATION ADVANCE**		
	Not applicable for this tender.		
46.0	**OVER RUN CHARGE (ORC)**		
	Not applicable for this tender.		
47.0	**REVISION ON ACCEPTED CONTRACT RATE**		
	Not applicable in this tender.		
48.0	**PRICE VARIATION CLAUSE/ ESCALATION (PVC)** Not applicable for this tender.		
49.0	**EXTRA/ ADDITIONAL ITEMS OF WORK**		
	Shall be as applicable as per GCC.		
50.0	**LIQUIDATED DAMAGE**		
50.1	If the successful bidder fails to complete entire scope within completion period, for reasons attributable to them, BHEL shall have the right to recover as liquidated damages (LD) a sum equivalent to 0.5 % of contract price, including taxes, duties, etc., for delay of each week or part thereof.		
50.2	**INTERMEDIATE LD**		
50.2.1	Intermediate LD milestones **(M1 & M2)** have been defined as per **clause no. 37.0**. In case of slippages of these milestones, delay analysis shall be carried out on achievement of each of these two intermediate milestone.		
50.2.2	In case delay in achieving M1 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 2% of executable contract value, will be withheld.		
50.2.3	In case delay in achieving M2 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 3% of executable contract value, will be withheld.		
50.2.4	Amount already withheld, if any against slippage of M1 milestone, shall be released only if there is no delay attributable to contractor in achievement of M2 Milestone.		
50.2.5	Amount required to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone payment (if any) and balance amount (if any) shall be withheld @10% of RA Bill amount from subsequent RA bills.		
50.2.6	Final deduction towards LD (if applicable), on account of delay attributable to contractor shall be based on final delay analysis on completion / closure of contract. Withheld amount, if any due to slippage of identified intermediate milestone(s) shall be adjusted against LD or released as the case may be.		
50.2.7	In case of termination of contract due to any reason attributable to contractor before completion of work, the amount already withheld against slippage of intermediate milestones shall not be released and be converted into recovery.		
50.2.8	* ***Executable Contract Value*** *- Value of work for which inputs/ fronts were made available to contractor and were scheduled for execution till the date of achievement of that milestone*		
50.3	The total liability for delay shall not in any case exceed 10 % (Ten percent) of the contract price, including taxes, duties, etc. Contract price for this purpose, shall be		

	the final executed value exclusive of ORC, extra work executed, supplementary/ additional items and PVC.
50.4	BHEL shall deduct aforesaid amounts from any money due or which may become due to the successful bidder and/ or recover from the bank guarantees/ security deposit of the successful bidder. To be entitled to impose such compensation/ penalty/ recovery, BHEL will not be required to prove that they have incurred such amount as actual damage.
50.5	BHEL reserve the right to complete the job through other resource on account of and at the risk & cost of successful bidder without notice to successful bidder of the work not so executed, without cancelling the order/ contract in respect of the work not yet due for completion.
50.6	BHEL reserve the right to cancel the order/ contract or a portion thereof for the work not so completed at the risk & cost of the successful bidder and the successful bidder shall be liable to BHEL for any excess costs thereof.
50.7	The successful bidder shall continue with performance of the order/ contract under all circumstances, to the extent not cancelled.
50.8	Where action is taken as per above, the successful bidder shall be liable for any loss, which BHEL may sustain on that account. The successful bidder shall not be entitled to any gain on such action and the manner & the method of such purchase shall be at the discretion of BHEL. It shall not be obligatory on the part of BHEL to serve a notice of such completion, through other resource, on successful bidder.
50.9	Other provision shall be as per the GCC.
51.0	**GUARANTEE**
51.1	Even though the work will be carried out under supervision of BHEL, successful bidder will be responsible for the quality of workmanship, quality of materials/ items and design for which successful bidder is responsible.
51.2	Successful bidder shall guarantee the work executed under the scope of the contract for a period of 24 (Twenty-four) months from the date of start of guarantee period as certified by the engineer and shall rectify free of cost all defects due to faulty supply or work done. In case successful bidder fails to repair/ replace the defective works within the time specified by the engineer, BHEL may proceed to undertake the repairs/ replace such defective works at successful bidder's risk and cost without prejudice to any other rights and recover the same from security deposit/ other dues.
51.3	The guarantee period will commence from the date of handing over of electrical system under scope of this contract to customer or six months after completion of full load operation of unit, whichever is earlier, provided all erection, testing and commissioning works are completed in all respect for the unit.
51.4	Other provision shall be as per the GCC.
52.0	**CUSTOM CLEARANCE**
52.1	The successful bidder shall be responsible for Bangladesh customs clearance of all materials, supplies, equipment, tools and other articles shipped into Bangladesh by him for the implementation of his works, including the food and the personal effects of the Successful bidder's personnel.
52.2	All payment for clearance charge, storage charge, etc. which are imposed by the relevant agencies of the Government of Bangladesh, relating to the clearance of equipment, materials and Plant that will be incorporated in the Permanent Works or relating to the Temporary Works shall be borne by the Successful bidder. Further, if the Successful bidder is delayed in submitting necessary shipping documents to the Employer, the demurrage charges by

	the Port Authority will be borne by the Successful bidder.
52.3	Tools and equipment and other equipment of the Successful bidder for use during construction but which are to remain the property of the Successful bidder and which are to be exported by the successful bidder from Bangladesh at the completion of the Work shall be carefully documented and specially listed to facilitate both import and export. The Successful bidder shall determine prior to shipment the customs regulations applicable to this special case as well as normal import rules and regulations applicable. The Successful bidder shall also be responsible for inland transport by barge/ truck/train to the Site.
53.0	**IDENTIFICATION OF CONTRACTOR'S EMPLOYEES, VEHICLES AND BUILDINGS**
53.1	The Contractor shall provide each of his employees and his Subcontractor's employees with a name tag bearing the picture, the name or initials of the employee, a serial number and the name of the Contractor. Each employee shall wear his badge visibly to the security personnel at any time.
53.2	All vehicles and large equipment furnished and used by the Contractor or his Subcontractors on the Work shall be clearly marked with the Contractor's or Subcontractor's business name. The Contractor's offices, stores, depots and other facilities shall also be clearly identified. The detailed requirements are defined in the Safety Health and Environmental (SHE) Plan to be provided by the Contractor.
53.3	The Contractor shall be liable for and shall provide all aspects of security and security measures for the Site, Employer’s site offices and Employer’s living accommodation, including guard services, transfer organizations and transport etc.
53.4	Around-the-clock security presence and operational routine shall be maintained throughout the year. Passes and temporary identification permits shall be issued and examined and access to any part of the Site, the site offices and living accommodation shall be controlled and limited to those who have an authorization.
54.0	**EXPATRIATE PERSONNEL**
54.1	The Contractor shall submit to BHEL / Employer data of all personnel he intends to bring into Bangladesh for the performance of the Work. This data shall include the name and present address of each person, his intended assignment and responsibility in connection with the Work and a concise resume of his experience in the type of work to which he will be assigned. This data shall be submitted to the BHEL / Employer at least thirty (30) days prior to their expected arrival in Bangladesh.
54.2	Any expense associated with illness of the Contractor's personnel, including replacement thereof, shall be to the Contractor's account.
54.3	Costs of passports, visas, travel documents, inoculations and other incidental expenses incurred by the Contractor's non-Bangladesh employees and their dependents occasioned by travel to and from Bangladesh shall be borne by the Contractor.
54.4	All accommodations and amenities for the Contractor’s personnel and families (including all staff and labour) must be provided by the Contractor, and BHEL / Employer shall not have any liability for the same.

55.0	**BANK DETAILS**
55.1	EMD, Tender cost, & Security Deposit amount, as applicable, can also be submitted directly by Foreign Bidders (other than Indian bidders) to the followings Bharat Heavy Electricals Limited bank account in Bangladesh- SBI (Branch Address): Dr. Motiar Rahman Tower, 64 KDA Avenue, Tetultola Mor, Shibbari Khulna City Corporation, Khulna-9100. Phone: 88-041-721338 (Direct), 88-041-2831345 Ext. 102 Cell: 8801716-138627, Fax: 88-041-733350. A/C No (USD): **05620257520202** A/C No (BDT): **:05620257520201** SWIFT: **SBINBDDH056** ROUTING NO: **220471543** BHEL's address in Bank A/c- Bharat Heavy Electricals Ltd., Rampal, Bagerhat, Bangladesh.
55.2	EMD, Tender cost, & Security Deposit amount, as applicable, can also be submitted directly by Indian Bidders to the followings Bharat Heavy Electricals Limited bank account in India- 1. SBI (Branch Address:-Commercial Branch, Salt Lake, Sector V, Kolkata, Branch Code SBIN0004289), A/C No. 11107800029, INR Account.
56.0	**LAWS AND REGULATIONS**
56.1	The Successful bidder agrees and acknowledges that:
56.1.1	He and their respective employees, servants, consultants and agents abide by all Applicable Law, (i) relating to the performance of the Work; (ii) by all rules and regulations of those Governmental Authorities who have control or jurisdiction over the Site or the countries where the Successful bidder may reside or perform work, directly or indirectly under this Contract (including the timely payment of any and all fees, assessments, or other governmental charges and registrations with relevant agencies or other Governmental Authorities required in connection therewith) and; (iii) with the terms and conditions of any Authorizations.
56.1.2	Successful bidder represents that it is fully aware of all of the Applicable Laws, terms and conditions of any Authorizations, business practices and plant rules and regulations which must be complied with when performing the Work.
56.1.3	Successful bidder shall furnish to Employer and Engineer, promptly upon request, such information concerning Successful bidder, their respective employees, consultants, servants and agents as the Employer or Engineer may be required to furnish to any applicable Governmental Authority.
56.2	Without prejudice to the generality of the foregoing:

56.2.1	The Successful bidder shall observe, comply with and respect Bangladesh laws, rules and regulations and shall not interfere with Bangladesh political or religious affairs either directly or indirectly.
56.2.2	The Successful bidder shall comply with such other rules and regulations as Employer and the Engineer may establish from time to time with respect to the construction work and personnel employed by the Successful bidders provided such rules and regulations shall not modify any of the Contract.
56.2.3	The Successful bidder shall, in all dealings with its labor, pay due regard to all recognized festivals, official holidays, religious or other customs and all local laws and regulations pertaining to the employment of labor.
56.2.4	The Successful bidder shall not give or barter or otherwise dispose of, to any person or persons, any arms or ammunition of any kind, or permit the same as aforesaid.
56.2.5	In the event of any outbreak of illness of an epidemic nature the Successful bidder shall comply with and carry out such regulations, orders and requirements as may be made by the Government of the People's Republic of Bangladesh or the local medical or sanitary authorities, for the purpose of dealing with and overcoming the same.
56.3	**Compliance**
56.3.1	Successful bidder shall ensure that its employees, servants, consultants and agents abide by all Applicable Law, relating to the performance of the Work and by all rules and regulations of those Governmental Authorities and persons who have control or jurisdiction over the Site (including the timely payment of any and all fees, assessments, or other governmental charges and registrations with relevant agencies or other Governmental Authorities required in connection therewith) and with the terms and conditions of any Authorizations.
56.3.2	Successful bidder represents that it is fully aware of all of the Applicable Laws, terms and conditions of the Authorizations, consents, business practices and plant rules and regulations which must be complied with when performing the Work.
56.3.3	Successful bidder shall furnish to the BHEL / Employer, promptly upon request, such information concerning its employees, consultants, servants and agents as BHEL / Employer may be required to furnish to any applicable Governmental Authorities.
56.4	**Related Compliance Obligations**
56.4.1	The Successful bidder shall Take all reasonable care that the Work is performed with the minimum possible impact on the environment and local community in respect of land and occupants affected by or adjacent to the Work.
56.4.2	The Successful bidder shall have responsibility prior to Provisional Acceptance Certificate for administration and co-ordination with the Governmental Authorities, as necessary, of any testing or the taking of any other action necessary to demonstrate the Work’s compliance with all Applicable Laws, as well as the Authorizations, Consents, as maybe required for or issued in connection with the development, construction, erection and operation of the Works.
56.4.3	The Successful bidder shall provide BHEL / Employer with a copy of all communications with any such authorities and at least five (5) days prior

	written notice to BHEL / Employer in respect of any meeting with any such authorities (with Successful bidder responsible for obtaining all necessary permissions for the attendance of a representative of BHEL / Employer at any such meeting).
56.4.4	The Successful bidder shall carry out its obligations under this Contract so as not to cause or contribute to any breach by, or violation of, Employer of any Applicable Law, consent or Authorization.
56.5	**Permits and Licenses**
56.5.1	Successful bidder shall obtain and maintain all consents, permits and licenses **("Consent")** which are required by Applicable Law for the performance of the Work and to allow Successful bidder to perform and complete the Work in accordance with the Contract Schedule (irrespective of whether the same are required to be procured in the name of Successful bidder or Employer), other than the Authorizations.
56.5.2	Specifically, where an Consent by its very nature can only be procured by the Employer (BIFPCL), the Employer shall at the Successful bidder's request, execute such documents and complete such formalities as are necessary for presentment of the application or other Consent related documents to the relevant Governmental Authority or other person. However, the foregoing shall in no circumstances be construed as (i) relieving the Successful bidder from his obligations under Clause 23.3.1 for which he shall remain primarily and fully responsible, or (ii) as imposing any responsibility on the Employer in respect of procurement of consents/ licenses/ approvals/ permits other than the Authorizations.
56.5.3	If requested by Successful bidder, BHEL / Employer shall provide reasonable assistance to Successful bidder in obtaining and maintaining such Consents. Successful bidder shall not be entitled to any adjustment to the Contract Schedule or the Contract Price or any other terms of this Contract relating to any delay or failure to obtain or maintain any such Consents. Employer /BHEL will provide reasonable assistance to the Successful bidder for obtaining any required authorization and export licenses for exporting tolls, equipment, test equipment, and other Successful bidder's Equipment, all of which are and remain the property of the Successful bidder, from Bangladesh at the conclusion of the Work.
56.6	**SUCCESSFUL BIDDER'S RESPONSIBILITY TO GET ACQUAINTED WITH BANGLADESH LAWS, IMPORT POLICY, ETC.**
	The Successful bidder shall get himself acquainted with the relevant Bangladesh Laws as well as the import policy of the Government of People's Republic of Bangladesh remaining in force regarding import of banned items, if any, during the execution of the Contract. In case of import of any banned items and/or contraband item, the consequential liability shall rest with the Successful bidder. Similarly the Successful bidder shall be responsible for any non-conformance of Bangladesh Laws either by its own employees during execution of the Contract.
57.0	**CONTRACT PRICE**
57.1	Bidder shall quote their price as per the format of Volume-III, price schedule (Latest revision) only. The total price quoted in price schedule ,Volume-III,shall be considered for evaluation & awarding.

57.2	Quantities of various items mentioned in the respective Price schedules, Volume-III are approximate, based on very preliminary information and may vary to any extent or to be deleted altogether. The quoted rates of each item will remain firm throughout the period of execution including extension, for reasons whatsoever, as long as variation in the total value of the work executed under any part of this contract including extra items, if any, remains within +/- 15 % (plus/ minus fifteen percent) of the awarded price (as per LOI/ WO).
57.3	Accepted unit rates for each SWGR/ panel shall remain firm regardless of any change in width, height, type, weight or other parameter (except length), as furnished in tender. For variation in length, adjustment to accepted rate of SWGR/ panel shall be based on following modality. Decision of BHEL shall be final & binding on bidder.
57.3.1	For variation in length within +/- 15% of SWGR/ panel, accepted unit rates shall remain firm.
57.3.2	For variation in length of SWGR/ panel beyond +/- 15% of specified length, wherever indicated in the tender, rate of unit length of variation shall be arrived by dividing the item rate by length as indicated in tender and rate/ price adjustment for payment during execution for length excess/ shortage over & above the +/- 15 % variation of indicated length shall be done accordingly on the following basis.
57.3.3	Based on above, if actual length exceeds variation limit, accepted unit rates will undergo change for the portion beyond 1.15/ 0.85 times of indicated length, additional payment/ recovery will be effected by BHEL in the following manner.
57.3.3.1	Length of SWGR/ panel as indicated in tender = A.
57.3.3.2	Accepted unit rate for SWGR/ panel = Rs B.
57.3.3.3	Rate per unit length (L) to be considered for the purpose of additional payment/ recovery for variation in length = Rs B/A = Rs C.
57.3.3.4	Actual length of the SWGR/ panel = D.
57.3.3.5	Additional payment/ recovery in unit rate for variation of lingth beyond length (1.15A/ 0.85A) = (D-1.15A)/ (0.85A-D) x C.
57.4	Applicability of new size of cable tray, cable, etc for a project of such magnitude may be inevitable. To derive rates of such new items of installation of cable tray, laying of cable, cable termination, etc, which are not covererd in BOQ of Volume-III, following guidelines shall be applicable for this tender. Decision of BHEL shall be final & binding on bidder.
57.4.1	For new size cable tray, width of cable tray will be taken into reference and rate of installation of cable tray of nearest width will be pro-rated to derive the rate for installation of new cable tray.
57.4.2	To derive the rate for laying of new size cable, OD of cable will be taken into reference and rate of laying of cable of nearest lower OD will be pro-rated to derive the rate for laying of for new cable.
57.4.3	Rate for termination of new size cable and other items will be derived based on mutually agreed modality and on approval of BHEL.
58.0	**OTHER TERMS**
58.1	The contractor shall provide signed *'Certificate of Declaration for Confirming the Knowledge of Site Conditions, Laws and Regulations'* as per attached format on its letter head along with the offer.
58.2	Applicable Law or Law with respect to any person, shall mean any law, legislation, statute, act, by-laws, rule, regulation, ordinance, order, decree, protocol, notification, policy, by-law, administrative guideline, ruling, instruction, directive, code, requirement, consent, license, approval, permit, judgment, court order, treaty or any interpretation thereof by any Governmental Authority or person acting under the authority of any Government Authority and / or of any statutory authority, whether in effect as on the Contract Date or thereafter, as applicable to such

	person.
58.3	Customer shall mean the Bangladesh –India Friendship Power Company (Pvt.) Limited (BIFPCL), having its office at Level 17, Barak Unique Height, 117, Kai Nazrul Isam Avenue, Eskaton Garden, Dhaka, Pin 1217, Bangladesh.
58.4	Engineer or Consultant shall mean M/s. FICHTNER GmbH & Co. KG, Stuttgart, Germany or such other engineer or consultant, as may be appointed from time to time by Customer and who is acting on behalf of Customer as Engineer for the purpose of the Contract with Customer and includes such other person (if any) to who the Engineer's authority may have been lawfully delegated pursuant to the Contract with Customer.
58.5	Governmental Authority shall mean, in respect of a country, the government (Central, State and local) or any ministry, directorate, department or political sub division thereof and any person exercising executive, legislative, judicial, regulatory or administrative functions of or pertaining to government or law or any other governmental entity, instrumentality, agency, authority, corporation, committee or commission under the direct or indirect control of any such government.
58.6	Site means the Project Site at Rampal, District Bagerhat, Bangladesh, all off-site and lay down areas, jetty, intake water system, ash dyke and other locations where all or any part of the work is to be executed under the scope of work of BHEL in accordance with the Contract with Customer.
58.7	The Contractor shall provide and employ in connection with the execution of the Works:
58.7.1	Only such technical assistants as are skilled and experienced in their respective trades and such sub-agents, foremen and leading hands as are competent to give proper supervision to the Work they are required to supervise.
58.7.2	Such skilled, semi-skilled and unskilled labour as is necessary for the proper and timely execution of the Works. To the extent possible, the Contractor shall deploy unskilled labour from the local populations.
58.7.3	Child Labour: The Contractor shall not employ any child to perform any work that is economically exploitative, or is likely to be hazardous to, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development in compliance with the applicable labor laws and other relevant treaties ratified by the government.
58.7.4	Working Time: No work shall be done on legal Bangladesh holidays or at times other than the regularly established working hours without the written approval of BHEL/ Owner (BIFPCL) and/ or Engineer (Fichtner), which shall not be unreasonably withheld. However, work necessary in case of emergencies or for the proper case, receipt, unloading, transporting, maintenance, and protection of equipment or finished work may be done without prior approval. This requirement shall not preclude the Contractor's use of scheduled overtime work and such work may be established by the Contractor, as a regular procedure, with the written permission of BHEL/ Owner (BIFPCL) and/ or Engineer (Fichtner); such permission, however, may be revoked at any time by BHEL/ Owner (BIFPCL) and/ or Engineer (Fichtner) if the Contractor fails to maintain adequate equipment and supervision for proper execution and control of the Work and all operations performed there under.
58.7.5	The Contractor shall comply with all applicable relevant labour Laws including the Bangladesh Labour Act 2006 and the Bangladesh Labour Rules 2015 to the Contractor's personnel relating to their employment, health, safety, welfare, immigration and shall allow them all their legal rights.
58.7.6	The Contractor shall be responsible for obtaining all necessary permits(s) and /or visa(s) from the relevant Governmental Authorities for the entry and deployment of employees, representatives, labour, consultants and other personnel to be

	employed on the Site into the country where the Site is located, and otherwise for ensuring all due compliance with Applicable Laws with respect thereto.
58.7.7	The contractor shall arrange passports for all his employees, representatives, labour, consultants and other personnel. BHEL will assist Contractor for issue of Visa including multi-entry visa and other permits as per requirement for the job/Work. However, the Contractor shall arrange for attestation of certificates and other documents required for travel arrangements, medical test as applicable and comply with other formalities. All expenses for all these activaties will be borne by the Contractor.
58.7.8	It shall be the responsibility of the Contractor to pay wages/ salaries and other benefits to its employees / personnel engaged by it as per the agreement with them, and in keeping in line with the Local laws in Bangladesh. The Contractor shall submit the Construction Manager, BHEL Maitree Project, Bangladesh regularly, the details / Statement of wages/ salaries and other benefits paid to its employees / personnel in India /Back home, besides wages / salaries and other benefits paid in Bangladesh.
58.7.9	The Contractor, in particular, shall provide proper accommodation to his labourers and arrange proper water supply, conservancy and sanitation arrangements at the site for all necessary hygienic requirements and for the prevention of epidemics in accordance with relevant regulations, rules and orders of the government.
58.7.10	The Contractor, further in particular, shall pay applicable wages to his labourers, and pay them in time. In the event of delay in payment BHEL may effect payments to the labourers and recover the cost from the Contractor.
58.7.11	The Contractor shall at all times during the progress of the Contract use its best endeavour to prevent any unlawful, riotous or disorderly conduct or behaviour by or amongst its employees, representatives, labour, consultants and other personnel.
58.7.12	The Customer and / or Engineer or BHEL after notifying and discussion with the Contractor, be entitled to object to and require the Contractor to remove forthwith from the Work any person employed by the Contractor in or about the execution of the Work who in the opinion of the Customer and / or Engineer or BHEL misconduct himself or is incompetent or negligent in the proper performance of his duties or whose employment is otherwise considered by the Employer and / or Engineer to be undesirable and such person shall not be again employed upon the Work without the written permission of the Customer and / or Engineer or BHEL. Any person so removed form the Work shall be replaced immediately by a competent substitute approved by Customer and / or Engineer or BHEL.
58.7.13	All employees or representatives engaged by the Contractor in connection with the performance of the Contract shall be under the complete control of the Contractor and shall not be deemed to be employees of the BHEL or Customer, and nothing contained in the Contract shall construed to create any contractual relationship between any such employees, representatives and BHEL or Customer.
58.8	Indemnification: Contractor shall protect, defend, indemnify and hold the Customer, the Engineer, BHEL (and their respective officers, directors, employees, servants or agents) (the “Indemnified Persons”) harmless from and against:
58.8.1	Any and all Losses arising directly or indirectly from or incurred by reason of the acts or omissions of any of Contractor or any of their respective officers, directors, employees, servants or agents in the performance of Contractor’s obligations under the Contract, without limitation, whether or not resulting from any defect in or condition of the premises on which the Work is or is to be performed or any equipment thereon, including any such Losses arising from injury to or death or damage to or loss of property.
58.8.2	Any and all Losses arising directly or indirectly from or incurred by reason of claims or sanctions or penalties imposed by any Governmental Authorities or others for any actual or asserted failure by any of Contractors or any of their respective

	officers, directors, employees, servants or agents to comply with any Applicable Law or Authorizations or Consents or with any rules and regulations applicable to it or them or to obtain or maintain any Consents.
58.8.3	Any and all Losses arising directly or indirectly from or incurred by reason of any failure of Contractor:
58.8.3.1	To pay any Taxes relating to income or any other Taxes required to be paid by such person;
58.8.3.2	To make any payments in respect of Taxes which are to be paid by such Person in connection with the performance of its obligations relating to this contract or, in the case of the Contractor, any Taxes which it is required to pay pursuant to the terms of this Contract.
58.8.3.3	To file tax returns as required by Applicable Laws or comply with reporting or filing requirement under Applicable Law relating to Taxes; or nothing in this clause shall restrict any person's right to contest the amount of any tax or other liability owned to a competent authority provided such contest is bona fide and made in good faith;
58.8.4	Any and all Losses arising directly or indirectly from or incurred by reason of hazardous materials introduced to the Site or any other location by any of other location by Contractor or any of their respective officers, directors, employees, servants or agents in t the performance of the Work;
58.8.5	Any and all Losses arising directly or indirectly from or incurred by reason of non-compliance with Applicable Laws by the Contractor or any of their respective officers, directors, employees, servants or agents including , without limitation , labour laws; and
58.8.6	Any and all Losses arising directly or indirectly from or incurred by reason of any accident or injury to any workman or other person in the employment of the Contractor.
58.8.7	Contractor Obligation to Ensure
58.8.7.1	The Contractor shall appropriately insure against such liability in compliance with all Applicable Law and shall continue such insurance during the whole of the time that any persons are employed by him/it on the Work and shall provide BHEL, Customer or Engineer with a copy of such policy of insurance and the receipt of payment of the current premium or evidence that it has complied with the Applicable Law in this regard.
58.8.7.2	All accidents shall be reported by the Contractor directly to the appropriate Governmental Authority as per Applicable Law remaining in force.
58.8.7.3	Automobile Liability Insurance: Covering use of all vehicle use by the Contractor or its Subcontractors (whether or not owned by them) in connection with the execution of the Contract.
58.8.7.4	Workers' Compensation: In accordance with the statutory requirements under Applicable Laws. The minimum insurance cover for personal injury or death insurance for the Contractor's employees is as per the law and common practice in Bangladesh.
58.9	Laws and Regulations: The contractor agrees and acknowledges that :
58.9.1	Contractor shall and shall ensure their respective employees, servants, consultants and agents abide by the all Applicable Law, (i) relating to the performance of the Work and (ii) by all rules and regulation of those Governmental Authorities who have control or jurisdiction over the Site or the countries where the Contractor may reside or perform work, directly or indirectly under this Contract (including the timely payment of any or all fees, assessments or other governmental charges and registrations with relevant agencies or other Governmental Authorities required in connection therewith) and (iii) with the terms and conditions of any Authorizations.
58.9.2	Contractor represents that it is fully aware of all the Applicable Laws, terms and conditions of any Authorizations, business practices, plant and project Site rules

	and regulations which must be complied with when performing the Work.
58.9.3	Contractor shall furnish to BHEL, Customer and Engineer, promptly upon request, such information concerning contract and their respective employees, consultants, servants and agents as BHEL or Customer or Engineer may be required to furnish to any applicable Governmental Authority.
58.10	SIGN BOARDS
	The Contractor shall provide one project/Work profile sign board for each site of the size not exceeding 1 m x 2 m, and maintain them in good condition. All information on the signboards will be written in English and Bengali. The signboards will be positioned on a steel frame as directed by the BHEL or Customer or Engineer. The Contractor shall submit proposals for the materials of the signboards, the text layout (in English and Bengali) on an approved yellow background and installation of the signboards on Site to BHEL for approval. Each sign board shall show: a) the name of the Work b) the name of the Contractor c) all other details as required by the BHEL or Customer or Engineer The Contractor shall maintain the sign boards and remove them on completion of the Works or when instructed by the Engineer
58.11	Without prejudice to the generality of the foregoing:
58.11.1	The Contractor shall observe, comply with the respect Bangladesh Laws, rules and regulation and shall not interfere with Bangladesh political or religious affairs either directly or indirectly.
58.11.2	The Contractor shall comply with such other rules and regulation as Customer and Construction Management may establish from time to time with respect to the Construction work and personnel employed by the Contractors provided such rules and regulation shall not modify any of the Contract.
58.11.3	The Contractor shall, in all dealings with its labour employed on or connected with the Contract, pay dues regard to all recognized festivals, official holidays, religious or other customs and all local laws and regulation pertaining to the employment of labour.
58.11.4	The Contractor shall not give or barter or otherwise dispose of, to any person or persons, any arms or ammunition of any kind, or permit the same as aforesaid.
58.11.5	In the event of any outbreak of illness of an epidemic nature the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the government of the People's Republic of Bangladesh or the local medical or sanitary authorities, for the purpose of dealing with and overcoming the same.
58.12	Change in Laws and Regulation: Any law, regulations ordinance, order or by laws having the force of law is enacted, promulgated, abrogated, or changed in Bangladesh, which shall be deemed to include any change in interspersion of application by the Competent Authority.
58.13	While bidder's scope include deployment of all resources, like T&P, materials, consumables, manpower including supervision etc for proper completion of the subject job and no sub-contracting for execution of the job is allowed by BHEL, depending on project's requirement and on prior acceptance of BHEL, bidder may associate agencies for deployment of skilled/ un-skilled manpower only for site execution. Bidder should arrange all resources, like T&P, materials, consumables, supervision etc directly for the subject job.
58.14	Drawings issued, if any, are for tender purpose only. No additional financial implication will be entertained by BHEL at a later date on account of any alteration to this.
58.15	Successful bidder shall provide temporary barricade all around the working area to avoid any untoward incident, as per guideline of customer.

58.16	Successful bidder shall strictly comply with the HSE guidelines of BHEL & customer and follow the Access Control System regarding security aspect of the project.
58.17	Any other non-conformity noticed w.r.t. customer's guidelines, but not listed in the tender, will also be fined. Decision of BHEL in this regard is final & binding on successful bidder. For this purpose, it is prudent that bidder visit site prior to offer submission and get acquainted with local environment, customer's guideline, etc. No claim successful bidder, whatsoever, at a later date will be entertained by BHEL. The amount will be deducted from bills of the successful bidder The amount collected on the above will be utilized for giving award to the employees of various agencies working at site who could avoid accidents by following safety rules and for improving the safety at site. Such award will be decided by the committee consisting of employees of agencies working within the project and be awarded in presence of BHEL representative.
58.18	Successful bidder shall submit indemnity bond after receipt of LOI towards indemnifying BHEL of non-fulfillment of any statutory payments to authorities as per prescribed format in line with customer's format.
58.19	The successful bidder shall make arrangement at their own cost for necessary access to the work site from common access road.
58.20	The security and safety laws/ guidelines as applicable from time to time shall have to be strictly followed by the successful bidder. For this purpose, it is prudent that bidder visit site prior to offer submission and get acquainted with local environment, customer's guideline, etc. No claim successful bidder, whatsoever, at a later date will be entertained by BHEL.
58.21	For materials supplied by the successful bidder for the project, entry gate pass duly signed & stamped, as per guidelines of the project, to be submitted positively for record purpose.
58.22	No announcements, press releases, handouts or photographs for publication etc. relating to this agreement/ purchase-order/ work-order or any part of the Supply/Work shall be issued or released without BHEL's prior written approval.
58.23	DELETED
58.24	EXIM Bank undertaking as per attached format to be furnished by the bidder along with their offer.
58.25	All other term & conditions of this specification shall be governed by the pertinent provisions of GCC and other volumes of this tender, as applicable.

ANNEXURE – I

LIST OF T&P TO BE PROVIDED BY BHEL FREE OF HIRE CHARGE ON SHARING BASIS

SL NO	DESCRIPTION & CAPACITY OF T&P	QUANTITY	REMARKS
1.0	75T/80T up to 250T capacity crawler crane.	1 no	For designated work as to be finalized with BHEL site after award of work.
2.0	EOT crane in TG hall.	1 no	For general purpose.

NOTE	
1.0	Successful bidder shall note that since above T&Ps will be used by various agencies at site, can be issued depending on availability & as per direction of BHEL. Terms of issue shall be as specified in the tender.

ANNEXURE-II
LIST OF T&Ps TO BE DEPLOYED BY SUCCESSFUL BIDDER

SL NO	ITEM
1.0	**Lifting material**
1.1	Truck/ trailor – 8T/ 10T/ 12T.
1.2	14MT New Generation Tyre mounted mobile crane (TRX / SX or Equivalent model). Note: Hydra or similar crane shall not be accepted
1.3	Steel wire rope.
1.4	Shackle.
1.5	Jack.
1.6	Hand pulley block/ hoist.
1.7	Sling.
1.8	Transit pulley.
2.0	**Oil treatment/Filteration Plant**
2.1	Transformer oil filteration machine of suitable capacities.
2.2	Oil hose.
2.3	Pre-treatment tank with all accessories & fittings (should accommodate transformer oil).
2.4	Vaccum pump.
2.5	Calibrated vacuum gauge of 1 tor – 1 no.
2.6	Oil gauge glass and three number steel containers – 2 nos.
2.7	Compound gauge (pressure side 1 & vaccum side 760 mm of hg).
2.8	Tarpaulin (both ordinary & fire resistant).
2.9	Trident hose adapter.
2.10	Vaccum cleaner.
2.11	Vaccum hose.
3.0	**External assembly**
3.1	Safety belt.
3.2	Safety helmet.
3.3	Protable collapsible ladder.
3.4	Scaffolding material.
3.5	Torque wrench M12.480. M20 2000 kg-cm.
3.6	Precision level.
3.7	Plumb bob.
3.8	Vaccum cleaner.
3.9	Electric blower.
3.10	Electric hot blower.
3.11	Grinder.
3.12	Hand lamp with transformer (240 / 24 V).
3.13	Drill machine.
3.14	Tool sets, spanner, etc.
3.15	Cable crimping tools (hydraulic and ordinary) of all sizes.
4.0	**Welding & gas cutting**
4.1	Arc welding set.
4.2	Mig welding set.
4.3	Gas welding set.
4.4	Gas cutting set.
4.5	Welding mask, apron, glove, glasses.
4.6	Welding machines (generator / transformer).
5.0	**Testing equipment**

5.1	Primary & secondary current injection test kit.
5.2	Primary/ secondary voltage injection test kit.
5.3	Motorized megger (5 KV).
5.4	Hand operated megger.
5.5	Omicron test kit.
5.6	Avometer/ motwane make.
5.7	Phase sequence indicator.
5.8	Precision voltage, frequency and temperature calibration.
5.9	Digital multimeter.
5.10	Tong tester with selector switch.
5.11	Ducter/ micro ohm meter (digital).
5.12	Relay test kit (eemake ‘zfb’ of equivalent).
5.13	Schering bridge for tan delta measurement.
5.14	Continuity tester, relay jack plug.
5.15	Three phase (15A) and single phase variac.
5.16	Wheatstone bridge.
5.17	Bdv testing kit for transformer oil.
5.18	HV test kit, 100 mA (both AC & DC suitable for testing the equipment).
5.19	Transformer turn ratio kit.
5.20	Winding resistance kit.
5.21	Micro ohm meter
5.22	Testing kit for moisture content/ resistivity/ acidity, etc or suitable arrangement made for testing at reputed/ approved laboratories.
5.23	Frequency Response Analysis Testing Kit
6.0	**General equipment**
6.1	Steel measuring tape.
6.2	Drill gauge.
6.3	Straight shank drills (1.00 mm to 13 mm).
6.4	Mores taper drills up to 40 mm.
6.5	Hand reamers up to 50 mm.
6.6	Hand taps m1 to M30.
6.7	Taps for taper pipe thread PT1/8-3/4, PT 1-2.
6.8	Carbide rotary cutters “A” type – “G” type.
6.9	Hack saw blades (high speed tool steel) upto 300 mm.
6.10	Machinist files 250 mm – 300 mm.
6.11	Set of needle files.
6.12	File handles.
6.13	Emery cloths/ papers.
6.14	Working lamps (with holder & sufficient extn chord).
6.15	Steel tool boxes (containing socket wrench set).
6.16	Torque wrenches.
6.17	Adjustable angle wrenches (upto 12’’).
6.18	De spanner sets.
6.19	Ring spanner sets.
6.20	Combination pliers.
6.21	Insulated cutting pliers.
6.22	Wire strippers.
6.23	Cable joint pliers.
6.24	Crimping tools (different sizes).
6.25	Screw driver sets.
6.26	Big screw drivers.
6.27	Jig saw tooth machine & blades.

6.28	Circular saw tooth machine & blades.
6.29	Hand drill m/c and bits of dia 5, 8, 10, 12, 18 and 22 mm.
6.30	Hand grinder (emmery grinder) AG5 & AG7 with grinding wheel.
6.31	Cutting wheel (no 36).
6.32	Wire spool.
7.0	**Dewatering equipment.**
7.1	Dewatering pump (5 HP), diesel & electric operated.
8.0	**SCAFFOLDING PIPES AND ACCESSORIES**
8.1	NECESSARY ARRANGEMENT SHALL BE MADE FOR WORKING AT HEIGHT FOR CABLING, CABLE TRAY AND OTHER JOBS ETC.
9.0	**T&P FOR HANDLING AND TRANSPORTATION OF POWER TRANSFORMERS.**
9.1	SUITABLE NO OF JACKS WITH COMPLETE ACCESORIES
9.2	MULTI AXLE LOW BED TRAILER
9.3	ADEQUATE QTY. OF WOODEN/CONCRETE SLEEPERS

NOTE	
1.0	Bidder shall note that this list is not exhaustive and they may be required to provide additional T&Ps not stated in the list for proper execution of job, at no extra cost to BHEL. Similarly, if any out of of list is not required for the job as per jointly agreed program, successful bidder need not to deploy the same.
2.0	MMD and T&P shall be mobilized and deployed by successful bidder, as required at site for successful execution of the job. Deployment plan of T&P, MMD shall be jointly finalised based on project requirement prior to start of work or during progress of work. The plan might undrgo revision depending on project requirement.
3.0	Bidder shall note, periodical testing & calibration of testing equipment are to be done at CMERI/ Durgapur, ERTL/ Kolkata, Regional Research Laboratories/ Gwahati/ Jorhat/ Bhubaneswar OR Any recognised/reputed laboratory of Bangladesh acceptable to BHEL/BIFPCL and copy of test certificates to be submitted to BHEL as per 'ISO' norms.

ANNEXURE-III
LIST OF CONSUMABLE TO BE SUPPLIED BY SUCCESSFUL BIDDER

SL NO	ITEM
1.0	Ms bolt, nut, plain washer and spring washer.
2.0	Copper washer.
3.0	Welding electrode, gas, filler wire, cleaning agents, etc.
4.0	Cable tag, Ferrule, Aluminium strip/fasterners etc.
5.0	Grouting compound, sand, chip, etc for minor civil works.
6.0	Emery sheet, grease, etc.
7.0	Oxygen & DA cylinder.
8.0	Primer & paint.
9.0	½" MS plug as required.
10.0	Jute waste and markin cloth.
11.0	Tarpauline.
12.0	Any other item as specified elsewhere in the tender.

NOTE	
1.0	Bidder shall note that this list is not exhaustive and they may be required to provide additional consumables not stated in list for proper execution of job, at no extra cost to BHEL. Similarly, if any of aforesaid items is not required for the job as per jointly agreed program, successful bidder need not to deploy the same.
2.0	Deployment plan of major consumables shall be jointly finalised based on project requirement prior to start of work or during progress of work. The plan might undrgo revision depending on project requirement.

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This volume shall be construed as part of tender document and shall be read along-with others volumes of tender. Unless otherwise specified, in case of any confusion of any clause/ provision of this volume or any conflict/ inconsistency of any clause/ provision of this volume with that of other volume, the same shall be brought out by the bidder in writing to BHEL for clarification or during pre-bid discussions, if applicable, failing which most stringent interpretation in favour of BHEL shall be adopted and the same shall be binding on the bidder. Unless otherwise specified, all terms & conditions shall be applicable for entire scope and for each part/ package of tender.

CLAUSE NO	DESCRIPTION
1.0	**NAME OF WORK**
1.1	PACKAGE- (Main Plant Area-U#1 and BOP Area-U#1&2)
	Providing labour, supervision, T&Ps, consumables, etc for receipt from store/ storage yard, watch & ward, transportation to site, pre-assembly (as required), erection, testing, commissioning, trial run, handing over, etc, as required and procurement/ manufacturing, supply to site, receipt, storage, etc (Except those materials which BHEL will provide as per tender) for total scope defined in tender and terms & conditions of tender, taking into account of all clarifications, confirmations, agreements till date for complete work of generator transformer, all other power transformers, Generator Circuit Breaker, HT/ LT bus duct, DG set, DC system, associated equipment/ items/ panel, cable tray & accessories; cabling; various panel; HT/ LT switch gear, HT/LT Motors , lighting and earthing protection;other miscellaneous equipment; etc for Main Plant Area-U#1, FGD U#1 and BOP Area-Common for U#1&2 at 2x660 MW MAITREE SUPER THERMAL POWER PROJECT located in Moithara Village, Rampal Upazila, Bagherhat District, Bangladesh.
2.0	**BROAD SCOPE OF WORK**
2.1	The scope under this tender shall cover receipt of materials from site stores/ open yards/ unloading bay of power house, dragging to position (place of erection)/ loading in truck/ trailer with the help of crane, handling at site/ dragging to place of erection (wherever applicable), watch & ward for safe custody of materials, inspection of materials, submission of inspection reports for any shortage/ damage or anything else called for, preservation/ conservation, fixing of supports (base channels), pre-assembly, supply of necessary consumables/ hardware, as specified in the tender, all erection of equipment & support structures, levelling, alignment, grouting, earthing of necessary equipment with nearest earthing point, testing, commissioning, calibration, trial operation, assistance to PG test, handing over to the entire satisfaction of BHEL/ customer, reconciliation of materials, returning of unused materials, scrap materials, packing cases/ wooden boxes/ cable drums/oil drums/acid jerrycans, etc to BHEL's/ customer's stores/ yards, etc of various equipment/ items/ materials covered under this tender.
2.2	It is not the intent to specify completely here in all details of handling, erection, testing, commissioning of the equipment. Omission of specific reference to any method, or test & equipment or material necessary for the proper and efficient services towards installation of the plant shall not relieve successful bidder of the responsibility of providing such facilities/ services to complete the project or portion of the project awarded to them. The quoted rates shall deem to be inclusive of all such contingencies. Only exclusions specifically mentioned in this tender shall be entertained in all matters.
2.3	If any damage or discrepancy is found, successful bidder should inform BHEL immediately and make a joint inspection of materials, submission of inspection reports for any shortage/ damage or anything else called for preservation/ conservation/ insurance claim. If any theft occurs when materials are in custody of successful bidder', successful bidder shall lodge FIR to nearest police station.
2.4	The work shall conform to dimensions & tolerances given in various drawing & documents that will be provided during erection. If any portion of work is found to be defective in workmanship, not conforming to drawings or other stipulations,

	successful bidder shall dismantle & redo the work duly replacing defective materials at their cost, failing which, job will be carried out by BHEL by engaging other agencies/ departmentally and will be recovered from successful bidder's bills towards expenditure incurred including BHEL's usual overhead charges.
2.5	Successful bidder shall deploy fire extinguishers of required number in their office, work areas. During oil filling as well as during filtration of transformer, round the clock observation with requisite fire extinguisher is mandatory.
2.6	Successful bidder shall take the full responsibility of testing, pre-commissioning and commissioning of the equipment being installed by them under the overall supervision of BHEL. It shall be the responsibility of successful bidder to arrange all the testing/ measuring instruments with the calibration certificates and complete all the testing, pre-commissioning, commissioning activities for the particular equipment as per relevant standards, code of practice, manufacturer's instructions, applicable quality plans for installation, testing & commissioning and BHEL norms. All these will be witnessed by BHEL/ customer or both and reports signed jointly. Successful bidder shall submit a check list to BHEL prior to taking up testing, commissioning activities which shall be approved by BHEL and the activities shall be carried out in accordance with the check list.
2.7	Successful bidder shall provide necessary supervision, skilled/ semi-skilled workmen, competent experienced erection, commissioning engineers to carry out the tests independently, electrical license holder supervisors & electricians, erection tools & tackles, consumable, testing, measuring & commissioning instruments/ equipment of required range, administrative personnel, transport vehicles, security guards for timely execution of the contract.
2.8	If situation so demands that in order to achieve project schedule/ milestone, various activities are to be carried out at a time, successful bidder shall provide necessary manpower, tools, tackles, equipment testing & measuring instruments for simultaneous working round the clock, at no extra cost to BHEL.
2.9	While testing/ commissioning, if the system involving equipment erected & commissioned by successful bidder is observed to be not functioning properly and successful bidder considers it to be arising due to defects in the purchaser's equipment/ system, it shall be the responsibility of successful bidder to check, establish and demonstrate that either the defect exists in the purchaser's equipment/ system terminals or there is no defect in the equipment/ system installed by successful bidder inclusive of interconnecting cabling up to the terminals of purchaser's equipment. If the defect is established to be in purchaser's equipment or in interconnecting cables not erected by successful bidder, the same shall be rectified by the purchaser.
2.10	Manufacturer's drawings must be studied before handling, erection, testing and commissioning of equipment. Dragging of the equipment should be avoided and use of a crane and trailer/ truck should be made for the handling purpose while transporting to various site of erection from the site stores. While lifting panels in packed condition, utmost care should be taken to avoid any damage to protective and metering equipment. The panels should preferably be kept inside the packing box till the foundations are made ready. However, once the material is issued to successful bidder for handling/ erection from BHEL custody, the preservation/ conservation will be completely in the scope of successful bidder.
2.11	During erection, commissioning of equipment, if any component is found defective and is required to repair/ replace, successful bidder has to give complete support for repairing/ replacement of component. Complete support includes arrangement for dismantling of defective components, transportation of the materials from the plant premises to the transporters' loading point, collection of repaired materials from the repairing shop or transporters' go down, assembly of the same in position, etc, without any extra cost.
2.12	It will be the responsibility of successful bidder to re-conserve/ preserve the materials equipment, provide watch & ward after issued from BHEL stores. Successful bidder will do the routine maintenance of the equipment or will attend minor repair/ trouble shooting jobs during handling, erection, commissioning till

	taken over by customer for commercial operation of the plant. Successful bidder has to follow the Field Quality Plan, from erection of the equipment to its commissioning. In each RA bill, successful bidder have to submit the reconciliation statement, measurement sheet, protocols, etc as supporting documents of the bill. Successful bidder shall submit test reports protocols, log-sheets as per Field Quality Plan at different stages of commissioning and trial operation in formats prescribed by BHEL.
2.13	All the requirements of the IE rules are to be strictly fulfilled and to be completed with providing required consumables without any extra cost. All the test records & joint protocols are to be furnished to BHEL in three sets. With each RA bill, the related protocols, FQP dully filled in is to be submitted by successful bidder along with reconciliation statement upto that period of billing.
2.14	Civil works including drilling, chipping, enlarging cut-outs, foundation pockets, cable cut-outs, grouting, etc, wherever required will be carried out by successful bidder at no extra cost. Successful bidder shall erect temporary scaffolding (scaffolding materials being arranged by successful bidder) for erection and provide suitable platform at places (as desired by BHEL) for the purpose of inspection/ testing.
2.15	During welding of supports with existing embedded insert plates are required, successful bidder have to chip on wall for insert plate. Also before grouting of equipment, successful bidder has to chip the concrete to get the iron materials for welding of the equipment support. However, in any case, the insert plates are not found in position, successful bidder may fix the insert plate by using anchor fastener (plate being supplied by BHEL and anchor fastener being in the scope of successful bidder). The size of fastener bolts may be communicated by BHEL at the time of requirement.
2.16	During testing, if any discrepancy is found, successful bidder has to report the same immediately to BHEL. BHEL will arrange for repair of the same at the manufacturers' workshop or other authorized repairing agency, but successful bidder has to give all sorts of support, eg loading of materials, taking out of the same through plant's materials gate with duly entry by security, transportation arrangement from erection site/ stores to the transporters' loading point/ go-down located at project site/ nearby area and hand over of the same safely.
2.17	At site, testing/ calibration of all meters/ relays/ thermal O/L relays, OTI, WTI including CT/ PT, etc are included in the scope. Disconnection of components as required shall be done without extra cost. For calibration of OTI and WTI, successful bidder has to arrange oil bath and calibrated standard thermometer.
2.18	Proper records for glands & lugs if supplied loose with equipment. However, if the same are assembled with equipment, successful bidder shall dismantle the same before erection & will be handed over for external & internal cabling or maintained by successful bidder for reconciliation.
2.19	If necessary, dismantling, mounting, testing, etc of field instruments/ devices, are under the scope of this tender.
2.20	Panels may be supplied in detachable units housed in wooden/ steel case which will be opened properly at the place of erection and will be placed on supports (base channels) levelled, aligned and subsequently fixed by welding/ bolting as per drawing. Complete assembly, erection and connection of inter-panel wiring, bus-bars between adjacent panels, mounting of loose supplied component as per drawing will be the responsibility of successful bidder. If any additional wiring or modification of wiring is required, successful bidder has to carry out without incurring any extra cost.
2.21	Supply of GI rigid conduit/ flexible conduit as per requirement is included in scope of this tender. For guidance, bidder shall refer to relevant document of tender (Lighting system for conduit).
2.22	The scope of tender includes cleaning, painting with 1 coat of red oxide primer, 1 coat of finish paint, including supply od primer & paint (Approved make as to be decided by BHEL) of all un-galvanised supporting structures. Accepted rates of fabrication, erection of supporting structure shall be inclusive of this.

2.23	Scope of tender includes coal galvanising painting for all welded/ cut galvanised surfaces. Accepted rates of corresponding items shall be based on this.
2.24	In each protocol, joint signature of BHEL, as well as customer, to be considered for further valuation of the work. The signature of BHEL only will not be sufficient for billing purpose.
3.0	**ELECTRICAL INSPECTOR'S APPROVAL AND POLLUTION CONTROL BOARD CLEARANCE**
	Successful bidder shall arrange to obtain clearance from Electrical Inspectorate (Statutory body of Bangladesh) and Pollution Control Board and arrange for the authorities' visit to site, as required. He will also arrange visit of electrical Inspector and obtain his approval for the installation work to be carried out under this scope of work and get the work done by the license holder electricians and supervisors as per local statutory requirement. The statutory fees only shall be reimbursed by BHEL. All other expenses in this regard shall be borne by the successful bidder.
4.0	**CABLE TRAY & SUPPORY STRUCTURES**
4.1	Cable tray work (ladder or perforated type) as per price schedule includes associated accessories, like horizontal bend, vertical bend, tee, cross, reducer (LHS), reducer (RHS). Total quantity of associated items erected for respective tray size shall be measured upon and paid as per relevant item rate of tray. Bidder's quoted rates against cable tray shall be in consideration to this.
4.2	Fabrication of irregular cable tray bends at site, if required, is included in the scope of the tender. Sketches of various types of such bends are available in the tender. Material required for this purpose will be taken from respective items of cable tray materials.
4.3	Fabrication of cable tray, type A, B, C and D, as per relevant sketch of the tender, or similar bends are considered part of the normal tray erection work and shall be done by the contractor within the tray erection rates. Rate for fabrication shall be deemed to be included in the rate for erection of cable tray of price schedule. No separate payment shall be made for such fabrication.
4.4	Fabrication of cable tray type, E, F and G, as per relevant sketch of the tender, are payable separately as per applicable item of price schedule.
5.0	**CABLE LAYING AND TERMINATION**
5.1	Cable laying job includes supply & installation of required clamps, Al strips, saddles, etc for cable dressing and clamping, etc and installation/ erection of trefoil clamps for single core cable of OD 30 mm to 50 mm, to be supplied by BHEL free of cost.
5.2	Brief details of major cable covers following.
5.2.1	1.1 KV, Al conductor, XLPE/ PVC insulated, galvanised steel round wire armoured for twin and multicore cables (non-magnetic hard drawn Al wire armoured conforming to H4 grade for single core cable), inner sheath extruded PVC compound conforming to type ST2 of IS:5831 for multicore cable. Single core cables shall have no inner sheath. Overall sheath - extruded overall FRLS PVC compound conforming to type ST2 of IS:5831, black in colour.
5.2.2	1.1 KV, Cu conductor, XLPE/ PVC insulated, galvanised steel round wire armoured for twin and multicore cables (non-magnetic hard drawn Al wire armoured conforming to H4 grade for single core cables), inner sheath extruded PVC compound conforming to type ST2 of IS:5831 for multicore cable. Single core cables shall have no inner sheath. Overall sheath - extruded FRLS PVC compound conforming to type ST2 of IS:5831, black in colour.
5.2.3	1.1 KV control cables with stranded, non-compacted plain annealed Cu conductor, PVC type-a insulation, core identification by colour coding (upto 5 cores)/ number marking (more than 5 cores), distinct extruded inner sheath of PVC type ST1 material, GS round wire armour as per IS:3975 (where applicable), and extruded PVC type ST1 outer sheath with FRISH properties, generally conforming to IS:1554 (Part-1) and BHEL's specification.
5.3	**`Cable Management System'** software is being introduced by BHEL and to be

	implemented for this tender for better contract execution. Brief description of the system is given in Annexure-I of this tender. Successful bidder shall comply with the same.
5.4	Cable termination shall include drilling/making of holes in gland plates, fixing of glands, ferrules and lugs, fixing of cable tags and connection to the equipment without implication of extra cost to BHEL. Material required for making ferrule and cable tag are to be arranged by the successful bidder without any extra cost to BHEL.
5.5	Proper reconciliation of gland, lug, if supplied loose & handed over for external & internal cabling shall have to be done by successful bidder.
6.0	**EQUIPMENT EARTHING**
6.1	Each & every Electrical equipment is to be grounded by copper flat/conductor as specified by drawing, docs provided by BHEL.
6.2	In case of earthling by conductor, end connection is to be done by using copper lug provided by BHEL. End connection/crimping of lug with grounding conductor is under bidder's scope at no extra cost.
6.3	Jointing of two conductor/copper flats is to be done by brazing which is under scope of successful bidder.
6.4	Measurement of earth resistance of Electrical earthing pit/ earthing mat is under bidder's scope.
6.5	In case where earthing flat/conductor is running on the equipment floor, clearance for floor finishing is to be given after completion of earthing of all equipments pertaining to the floor.
6.6	In case of dismantling of equipment after erection, removal & re-connection of earthing flat/conductor is under bidder's scope with no extra cost.
7.0	**LIGHTNING PROTECTION SYSTEM WORK**
7.1	In respect of scope of installation work for lightning protection system work, this volume is to be read in conjunction with other volumes of this tender for lightning protection system.
7.2	Horizontal / vertical air termination network will be installed on the top of all structures / buildings to be protected from lightning strokes. The installation work shall be duly coordinated by site with the other activities such as weather proofing application on roof etc.
7.3	The vertical air termination rod will be properly fixed as per details given in the drawing on the top of the building/structure to withstand very high wind pressure. The horizontal & vertical air terminations shall be properly fixed on the top of roof of the buildings such as not to make any penetration in the water proofing layer.
7.4	Each down conductor will have an independent ground termination. Conductors of the lightning protection system will not be connected with the conductors of the grounding system above ground level. The independent ground termination will comprise of a riser connection from a ground electrode, which in turn will be connected to the below grade grounding system.
7.5	Minimum number of joints in the lightning conductors shall be provided. All the joints will be done by arc welding/ brazing process. Overlapping of conductors at straight joints will not be less than 150mm. The contact surfaces will be properly cleaned before jointing.
8.0	**11 KV & 3.3 KV HT SWITCHGEAR**
8.1	Before erection of panels, proper alignment of embedded angle/channel is to be ensured from concerned Civil agency in presence of BHEL. If concrete cut-out is there, dimension of opening is to be crosschecked /ensured from concerned civil agency in presence of BHEL. Successful bidder will properly level and align foundation channels with panels. Foundation channels will be space welded with embedment and switchgear panels will be bolted/welded to the foundation channel. After completion of this work, clearance will be given for floor finishing. Wheel trolley is necessarily used for lifting/movement of vertical section of panels. Successful bidder shall co-ordinate with BHEL to achieve the desired

	technical requirement to ensure free movement of truck at all times and prevent damage to the finished floor during truck movement.
8.2	If necessary, dismantling of protective relay, switch, fuse, CT and making minor changes in wiring and remounting of such components or mounting of such items supplied loose and connections will be carried out by successful bidder at no extra cost.
8.3	Bus-bars are supplied loose for inter connecting two despatchable units. These are to be connected at site by successful bidder after erection of panels by bolted joints by applying anti-oxidation Densal compound and tightening of bolts to be checked by torque wrench subject to the approval and entire satisfaction of BHEL. Successful bidder shall not claim any extra cost separately as this would be deemed to have been included in the scope of installation of each circuit breaker/ panel.
8.4	HT SWITCHGEAR DETAILS
	HT switchgear mainly consists of, but not limited, to following.
8.4.1	Main breaker chamber.
8.4.2	Instrument and relay chamber.
8.4.3	Bus-bar chamber.
8.4.4	CT chamber.
8.4.5	Moving portion.
8.4.6	Secondary plug and socket arrangement.
8.5	Cable glands whenever supplied with equipment will be handed over to successful bidder for glanding of cable at the time of work and successful bidder to maintain proper record and hand over to BHEL for material reconciliation.
8.6	Removable undrilled gland plate with gaskets may be provided in each panel to facilitate for cable glanding and termination of external cables in the scope of successful bidder. If removal gland plates are not provided, making holes on the fixed plate by drilling & glanding, tapping is also under the scope of successful bidder for which successful bidder shall not claim any extra cost.
8.7	Double compression tinned brass cable glands and tinned copper lugs of 2.5 sqmm wherever supplied loose for each panel will be handed over to the successful bidder at the time of work and a proper record will be maintained by successful bidder for material reconciliation.
8.8	For making holes on removable gland plate or fixed gland plate successful bidder shall use suitable drilling machine. No gas cutting will be allowed.
8.9	Unused holes of the cable gland plate are to be sealed properly at no extra cost as per instruction by BHEL. Sealing plates are to be provided by BHEL but necessary consumables is under successful bidder's scope.
8.10	During interconnection of power/control bus bar, minor enlarging of bolting holes, making extra holes (if required) etc. are under scope of successful bidder at no extra cost.
8.11	The panels may be supplied in detachable units housed in wooden case which will be opened properly at the place of erection and will be placed on supports (base channels) levelled, aligned and subsequently fixed by welding/ bolting as per drawing. Complete assembly, erection and connection of inter-panel wiring, bus-bars between adjacent panels, mounting of loose supplied component as per drawing will be successful bidder's responsibility. If any additional wiring or modification of wiring is required, successful bidder has to carry out without incurring any extra cost.
9.0	**415 V LT SWITCHGEAR**
9.1	Before erection of panels, proper alignment of embedded angle/channel is to be ensured from concerned Civil agency in presence of BHEL. If concrete cut-out is there, dimension of opening is to be crosschecked /ensured from concerned civil agency in presence of BHEL. The base channels shall be normally supplied with the switchboards. These will have to be aligned, levelled and grouted in position as per approved drawings. Wherever the base channels are not supplied the same will be fabricated and

	painted at site. Structural steel will be issued by BHEL free of cost; payment against erection shall be released as per applicable item rate. Openings will be left on the floor during the time of casting, where the base channel will have to be grouted. All necessary concrete chipping and finishing works will be included in the scope of the job. Making base frame/ foundation frames/ support frame or structure as per drg/ procedures, painting of the supports, base channels, placement, levelling, alignment of the items/ panels, fixing its base of the items to foundation/ frames by fasteners, welding as per drg/ procedure mentioned in field quality plan and erection manuals. Red oxide primer and finishing paint as per BHEL approved shade and grade is to be applied on the structures/ foundation frames/ support frames in this contract.
9.2	Fixing of supports (base channels), alignment, levelling of supports & equipment, erection, testing, commissioning including earthing, checking of wiring, terminating protective relay, instrument, switch, etc of connecting internal wiring, testing of current transformer, potential transformer and other internal components, mounted in the equipment, is included in the scope of this tender.
9.3	LT SWITCHBOARD
	LT switchgear mainly consists of, but not limited, to following.
9.3.1	Incoming & bus-coupling module containing air circuit breakers, electrically operated drawout type duly protected by overload, short circuit and earth fault relays and having auto transfer facility of breakers. All relays involved in each incoming circuits to be checked for calibration. Indicating instruments like power factor meter, voltmeter, ammeter, watt/ kilowatt hour meter, wherever involved will also to be checked. CTs & PTs shall also to be checked.
9.3.2	Outgoing air circuit breakers, which will have similar kind of protection as above will have to be checked.
9.3.3	Direct on line/ reversible DOL starter circuits will involve switch with fuse, have power contactors, overload Relays and auxiliary contactors. Wherever higher KW rating modules are involved, air circuit breakers incorporating motor protection relays will be involved.
9.3.4	Auxiliary switch fuse feeders, containing air break switch & fuses.
9.3.5	Bus VT modules.
9.3.6	Control transformer feeders.
9.3.7	PLC controls wherever involved will have to be checked
9.4	Removable undrilled gland plates with gaskets may be provided in each panel to facilitate for cable glanding and termination of external cables in the scope of successful bidder. If removal gland plates are not provided, making holes on the fixed plate by drilling and glanding; tapping is also under the scope of successful bidder for which successful bidder shall not claim any extra cost.
9.5	Double compression tinned brass cable gland and tined copper lug of 2.5 sqmm, wherever supplied loose for each panels will be handed over to successful bidder at the time of work and a proper record will be maintained by successful bidder for material reconciliation.
9.6	For making holes on removable gland plate or fixed gland plate successful bidder shall use suitable drilling machine. No gas cutting will be allowed.
9.7	Unused holes of the cable gland plate are to be sealed properly at no extra cost as per instruction by BHEL. Sealing plates are to be provided by BHEL but necessary consumables is under successful bidder's scope.
9.8	During interconnection of power/control bus bar, minor enlarging of bolting holes, making extra holes (if required) etc. are under scope of successful bidder at no extra cost.
9.9	The panels may be supplied in detachable units housed in wooden case which will be opened properly at the place of erection and will be placed on supports (base channels) levelled, aligned and subsequently fixed by welding/ bolting as per drawing. Complete assembly, erection and connection of inter-panel wiring, bus-bars between adjacent panels, mounting of loose supplied component as per drawing will be successful bidder's responsibility. If any additional wiring or

	modification of wiring is required, successful bidder has to carry out without incurring any extra cost.
10.0	**MISCELLANEOUS ELECTRICAL PANEL/DESK**
10.1	Before erection of panels, proper alignment of embedded angle/channel is to be ensured from concerned Civil agency in presence of BHEL. If concrete cut-out is there, dimension of opening is to be crosschecked /ensured from concerned civil agency in presence of BHEL.
10.2	The base channels may be simplex or duplex type. The base channels shall be normally supplied with the switchboards. These will have to be aligned, levelled and grouted in position as per approved drawings. Wherever the base channels are not supplied, the same will be fabricated and painted at site as stated elsewhere in tender. Structural steel will be issued by BHEL free of cost; payment against erection shall be released as per applicable item rate. Opening will be left on floor during the time of casting where the base channels will have to be grouted. All necessary concrete chipping and finishing works will be included in the scope of the job. Making base frame/ foundation frames/ support frame or structure as per drg/ procedures, painting of the supports, base channels, placement, levelling, alignment of the items/ panels, fixing its base of the items to foundation/ frames by fasteners, welding as per drg/ procedure mentioned in field quality plan and erection manuals. Red oxide primer and finishing paint as per BHEL approved shade and grade is to be applied on the structures/ foundation frames/ support frames in this contract.
10.3	Fixing of supports (base channels), alignment, levelling of support & equipment, erection, testing and commissioning including earthing, checking of wiring, terminating protective relay, instrument, switch, etc of connecting internal wiring, testing of current transformer, potential transformer & other internal components mounted in the above equipment shall be under scope of successful bidder.
10.4	Removable undrilled gland plates with gaskets are provided in each panel to facilitate for cable glanding and termination of external cables in the scope of successful bidder. If removable gland plates are not provided, making holes on the fixed plate by drilling and glanding, tapping is also under the scope of successful bidder for which successful bidder shall not claim any extra cost.
10.5	Double compression tinned brass cable gland and tinned copper lug of 2.5 sqmm wherever supplied loose for each panel will be handed over to successful bidder at the time of work and a proper record will be maintained by successful bidder for material reconciliation.
10.6.1	For making holes on removable gland plate or fixed gland plate successful bidder shall use suitable drilling machine. No gas cutting will be allowed.
10.6.2	Unused holes of the cable gland plate are to be sealed properly at no extra cost as per instruction by BHEL. Sealing plates are to be provided by BHEL but necessary consumables is under successful bidder’s scope.
10.7	Salient particulars of equipment/ instruments/ components provided in panels are briefly but not necessarily limited to following.
10.7.1	PT.
10.7.2	Timer.
10.7.3	Aux. Plug relays of various types and application.
10.7.4	Check synchronising relay.
10.7.5	Facia window.
10.7.6	Counter.
10.7.7	Fuse.
10.7.8	Selector switch.
10.7.9	Space heater with switch.
10.7.10	Printed circuit board
10.7.11	Push button.
10.7.12	Lamp for interior illumination.
10.7.13	Door switch.

10.7.14	Socket with switch.
10.7.15	Bus wires terminal blocks, etc.
10.7.16	The swing type synchronizing panel
10.7.17	Voltmeter.
10.7.18	Ammeter.
10.7.19	Frequency meter.
10.7.20	Synchroscope.
10.7.21	Synchroning lamps.
10.7.22	Selector switch for synch meters.
10.7.23	Alarm facia.
10.7.24	Dynamo meter.
10.7.25	Samaphore indicator.
10.7.26	Thermostat for heater.
10.7.27	Alarm chasis, with relay.
10.7.28	Bell alarm.
10.7.29	Resistor.
10.7.30	KWH meter.
10.7.31	Test-link.
10.7.32	Space heater
10.7.33	Thermostat
10.8	Successful bidder shall co-ordinate in a proper manner during commissioning of system with other agencies and will ensure successful commissioning of the system in a sequential way without any hazard and interruption in work under the direction and subject to the approval of BHEL.
11.0	**PUSH BUTTON, STARTER, FUSE BOARD, ETC**
11.1	The items shall require to be mounted on wall/ column/ floor.
11.2	For mounting of above items the required structural steel, like Pate, ISMC, ISA and flat–shall be supplied by BHEL free of cost as per tender. However, necessary fixing hard-wares are to be supplied by successful bidder at their cost and will be deemed to be included in the rate of respective item.
11.3	Checking of components, removal & reinstallation of internal component and re-wining, testing and commissioning shall be under the scope of successful bidder.
11.4	CHECK
11.14.1	General arrangement of fixing.
11.14.2	Tightness of nuts & bolt.
11.14.3	Tightness of door closing.
11.14.4	Mechanical operation of push button switch.
12.0	**GENERAL CHECKS ON SWITCHBOARD & ASSOCIATED PANEL**
12.1	Check of control wiring.
12.2	General check for cleanliness inside the switch board.
12.3	Operation of mechanical parts of relays, switches, push buttons, etc.
12.4	IR check of power & control circuit. High voltage test is to be carried out wherever specified. Checking of CTs, PTs by primary current injection, polarity check, magnetising test etc. checking of numerical relays by secondary current injection. The secondary current injection kit should be compatible for checking of protections like over current, earth fault, single/three phase differential, distance protection etc.
12.5	Verification of switch development.
12.6	Alignment of contacts with vertical busbars and contact pressure (Contact resistance measurement). The measurement of contact resistance at the busbar joint is to be carried out by micro-ohm meter (the provision being in the scope of successful bidder, the specification of which is given below). Ductor, low resistance ohm meter (reputed make), range (adjustable), (1) Range 0-100 micro ohm, 10A; (2) Range 0-1 milliohm, 10A; (3) Range 0-10 milliohm, 1A; (4) Range 0-100 milliohm, 1A; (5) Range 0-1 ohm, 1A; (6) Range

	0-3 ohm, 0.1A, Accuracy: 1% of full scale in all ranges; Battery : 20AH re-chargeable, Input Supply : 240V, 50Hz.
12.7	Phase out, phase sequence check of bus/line voltages.
12.8	Necessary arrangement for carrying out stability test of differential relay is under successful bidder's scope.
12.7	Verification of components like fuse, links and their ratings, etc.
12.8	Connection to earthing point. Earthing of panels by GI/Copper flat, flexible wire from nearest earth pit/ point. External cabling, tray fixation is included in the scope of this tender.
13.0	**DC SYSTEM**
13.1	Batteries, battery chargers, fuse DBs and its health monitoring system shall be erected as per drawing, docs provided by BHEL. However, location will be finalised in consultation with BHEL as suit at site.
13.2	Fitting of Loose items, if any supplied with chargers, DBs is under the scope of successful bidder.
13.3	Necessary arrangement for load testing of battery chargers & batteries is to be done by successful bidder at no extra cost. If available, load resistance panel will be provided by BHEL. During charging of batteries, arrangement of temporary ventilation fans is under successful bidder's scope.
13.4	Items for batteries are generally supplied in loose. Vendor has to assemble the items as per the drawing & docs provided by BHEL. Commissioning/charging of batteries shall be done in presence of representative of BHEL/battery supplier.
13.5	Necessary safety protections are to be adopted during acid filling activities as well as during whole process of commissioning/charging of batteries.
13.6	During charging/discharging of batteries, detail commissioning chart has to be prepared & signed with supplier representative, BHEL & end customer.
13.7	Periodical checking of battery health till handing over to the end customer is under scope of successful bidder. If top-up of acid/water is required till handing over the set to end customer, vendor has to do the same at no extra cost.
13.8	After acid filling, empty jerry cans are to be returned back to BHEL alongwith detail statement of reconciliation.
13.9	Salient particulars of loose items/ components of batteries are briefly but not necessarily limited to following. 1. Inter cell Connector 2. Interbank Connector 3. Inter row connector 4. Vent plug 5. Fasteners 6. Shroud ICC & Pillar 7. End Cell take-off 8. Cell Insulator 9. PVC Number Sticker 10. PVC Spill Tray 11. Cell stand 12. Cable Clamp 13. Battery health monitoring system 14. Cable Termination plate & stand
14.0	**GENERAL SCOPE OF TRANSFORMER, BUS-DUCT, DG SET**
14.1	Civil works including drilling, chipping, enlarging cut-outs, foundation pockets, cable cut-outs, grouting, etc, wherever required will be carried out by successful bidder. Successful bidder will have to erect temporary scaffolding (scaffolding materials being arranged by successful bidder) for bus-duct erection and provide suitable platform at places (as required and desired by BHEL) for the purpose of inspection/ testing by BHEL personnel.
14.2	During welding of supports with existing embedded insert plates are required, successful bidder has to chip on the wall for the insert plate. Also before grouting of equipment, successful bidder has to chip the concrete to get the iron materials

	for welding of the equipment support. However, in any case, the insert plates are not found in position, successful bidder may fix the insert plate by using anchor fastener (the plate being supplied by BHEL and the anchor fastener being in the scope of successful bidder). Size of the fastener bolts may be communicated by BHEL at the time of requirement.
14.3	Before erection, bus ducts are to be properly cleaned and erection clearance will be given when insulation resistance between enclosure and conductor is found healthy.
14.4	If necessary, dismantling, mounting, testing etc. of field instruments/ devices is under the scope of work.
14.5	The successful bidder shall provide skilled Al welder with MIG Al welding sets and welding materials inclusive of consumable. The filler Al alloy wire should be as per IS: 739/1977 or/and as specified in the BHEL standard, need to be supplied. Chemical and other test certificates of each wire roll should be furnished for acceptance of BHEL before use. Quantity of Al. Welder and welding set will be decided by BHEL according to the volume of job, as per requirement.
14.6	All the bus-bar bolted joints are to be tightened by torque wrench as per specified value in the drawing /document of BHEL. The contact surfaces of bus-bars, bus-bar bolts and nuts shall be thoroughly cleaned with petrol, petroleum jelly shall then be applied. These chemicals to be supplied by successful bidder free of cost. Special care shall be taken during erection to avoid damage to Zinc plated members of the structures. Any damage of the Zinc plated surface shall be made good by touch-up painting with cold galvanizing paint (to be supplied by the successful bidder as per specification of BHEL). The contact resistance is to be measured by micro-ohm meter which should be 10 Watt loss or less. However, if any changes in the specified value regarding tightness of bus bar joints and contact resistance may be intimated at the time of execution.
14.7	The measurement of contact resistance at the bus-bar joint is to be carried out by micro-ohm meter (the provision being in the scope of successful bidder, the specification of which is given below. Ductor, low resistance ohm meter (reputed make), range (adjustable), (1) Range 0-100 micro ohm, 10A; (2) Range 0-1 milliohm, 10A; (3) Range 0-10 milliohm, 1A; (4) Range 0-100 milliohm, 1A; (5) Range 0-1 ohm, 1A; (6) Range 0-3 ohm, 0.1A, Accuracy: 1% of full scale in all ranges; Battery : 20AH re-chargeable, Input Supply : 240V, 50Hz.
14.8	Cable for wiring up to marshaling kiosk/ fan control panel from associated equipment of transformers will be supplied by BHEL and cabling & termination, etc will be carried out by successful bidder as per scope of this tender within the quoted/ accepted rates of the equipment.
14.9	Cabling from bus-duct CTs to CT junction boxes will be in the scope of successful bidder. Successful bidder shall also erect, test (eg ratio, polarity, IR, winding resistance, magnetizing current/ knee point voltage test) and commission all the CTs integral to bus-duct.
14.10	Before mounting of all CTs in position, the tests for healthiness of all CTs, eg primary & secondary injection tests for all cores, magnetizing current/ knee point voltage test, secondary winding resistance measurement, continuity test, polarity tests on each winding, insulation resistance test on each winding by megger to earth and between windings for all cores, are to carried out by successful bidder.
14.11	Moreover, after wiring of the CTs to local JB/ panels, the above testing is to be carried out again from JB/ panel end without incurring any extra cost to ensure the wire connection of current transformers.
14.12	The fixing arrangement of CTs may need the holes enlargement, filing, and additional drilling of the support for mismatch of the same with the main equipment. Successful bidder has to carry out on free of cost.
14.13	Successful bidder has to arrange all the consumables for cleaning/ servicing

	(dismantling and re-assembly of equipment(s) after proper cleaning) of transformer accessories during installation.
14.14	**Transformer oil filling and oil filtration**: Handling of transformer oil drums issued to successful bidder shall be done with utmost care to avoid any damage or loss of oil. Provision of oil filtration machine (recommended capacity 24KL/ 15KL/ 12KL per hour discharge along with simultaneous vacuum capacity of 1 Torr as per the requirement) and two numbers oil tank (recommended capacity one 30 KL and one 25KL) is in the scope of successful bidder. Also successful bidder has to provide one no. calibrated vacuum gauge of 1 Torr, two no oil gauge glass and three number steel containers for collection of oil samples at the time of oil filtration. The filter machine should have the capacity of simultaneous filling of oil along with vacuum action. Other than the filter machine, if successful bidder fails to bring the mandatory materials required for filtration, BHEL will arrange at the overhead cost of successful bidder. Before filling oil in the transformer, oil shall be filtered separately in a tank of adequate capacity and suitable for the purpose (to be supplied by successful bidder) by successful bidder to meet proper dielectric strength, resistivity, acidity, moisture content, etc to the entire satisfaction of BHEL engineers at site. Arrangement of instruments for checking above parameters is under successful bidder's scope. The transformer oil testing covers Electric Strength (Break down voltage) in rms KV, Moisture Content in ppm, Neutralisation Value (Total acidity) in mg KOH/ gm, Dissolved Gas Analysis, Interfacial Tension @ 27^{O} C mN/ m, Flush point ^{O}C, Dielectric Dissipation Factor (tan delta) @ 90 ^{O} C, pour point etc. Successful bidder's responsibility to make the oil testing at authorized testing laboratory, eg Power Grid Corporation/ Central Power Research Institute/ or any other national institute, approved by BHEL.
14.15	Successful bidder has to carry out the above tests in each steps, eg (i) Testing of oil before pouring of oil from auxiliary tank (approximate 30 KL arranged by successful bidder) to main transformer tank; (ii) Testing of oil before pouring of oil from auxiliary tank to OLTC; (iii) Testing of oil before pouring of oil from auxiliary tank to radiators; (iv) Testing of oil before pouring of oil from auxiliary tank to conservator tank via main transformer tank. However, the repeated testing of oil may be at the discretion of BHEL/ customer.
14.16	Successful bidder should make the record of BDV value of each oil drum before and in between after the start of oil filtration.
14.17	For the distribution transformers/ small power transformer, where the main tank is supplied with oil filled in, the filtration can be carried out after the topping of oil to radiators, pipes etc. from oil drums. However, the oil testing of the drums before pouring is mandatory.
14.18	During filtration of transformer oil 2 % of wastage is allowable and no charge will be recovered for loss of this quantity of oil. However, any wastage beyond this 2% will be chargeable and will be recovered on actual cost plus 30% overhead.
14.19	Erection of bushings and connections of internal terminals of transformer winding to bushing terminals must be carried out with utmost care by competent technicians and supervisors.
14.20	At site, testing/ calibration of all the meters/ relays/ thermal O/L relays, OTI, WTI including CT/ PT, etc are included in the scope, disconnection of components as required shall be done without extra cost. For calibration of OTI and WTI, successful bidder has to arrange oil bath and calibrated standard thermometer.
14.21	Nitrogen gas pressure in all such transformers shipped without oil will be maintained by successful bidder without any extra cost after receipt of equipment by successful bidder. Nitrogen gas cylinders suitable for the purpose filled with gas will be arranged by successful bidder. Records of gas pressure will be taken weekly or as per direction of BHEL and a log book will be maintained by successful bidder till the transformer are filled with oil till the execution of work.
14.22	Proper records for glands and lugs if supplied loose with the equipment. However, if the same are assembled with equipment, successful bidder is to dismantle the same before erection of the same and will be handed over for

	external & internal cabling or maintained by successful bidder for reconciliation.
14.23	Successful bidder may have to mobilise more than 1 no oil filtration (one 24KL/ 15KL and one 24KL/ 12KL/ 6KL) machine with accessories to meet parallel oil flitration requirement at various working fronts.
14.24	**Nitrogen Purging**: Before filling up filtered oil to the transformer, one or more (as required) cycle of N2 purging is to be carried out to ensure the transformer winding free of moisture. Arrangement of high purity N2 for this job is under scope of successful bidder within the quoted/accepted rate.
14.25	Before erection of conservator tank, rubber bellow inside the tank is to be checked separately by using air pressure as specified by BHEL.
15.0	**OIL FILLED POWER TRANSFORMER**
15.1	Successful bidder will have to erect fan and cooler control cabinet/ marshalling kiosk for GTs, UATs, UTs, STs and SATs along with other accessories that will be supplied loose and are the part of the transformers. Grounding resistors for transformer neutral are also to be erected. The transformers are equipped with on-line dissolved gas analysis & monitoring system and partial discharge monitoring system.
15.2	Transformer bushings are supplied loose. These are to be erected with utmost care under BHEL supervision. Bushing-CTs are to be tested for polarity, ratio, and insulation resistance. Bushings are to be tested for dielectric strength, dissipation factor (Tan-delta), IR before and after erection. For testing of these bushings, successful bidder has to supply or fabricate the bushing stand at free of cost. After erection and charging of the transformer, if any leakage is found in the transformer body/ bushings/ pipes, etc successful bidder has to repair the same without any extra cost and successful bidder has to deploy the manpower round the clock, if the work is to carry out during shutdown.
15.3	Oil piping is to be erected separately along with conservator tank, radiator bank.
15.4	Cabling (Cable trays laying, glanding, laying of cables termination and lugging) from Buchholz relay, oil level gauge, sudden pressure relay, WTI, OTI, RTDs, Bushing CTs, Neutral CTs, Cooling fan motors, oil pumps to the marshaling kiosk are to be done by successful bidder with in quoted rates. Cables, cable trays, lugs will be supplied by BHEL.
15.5	Successful bidder will carry out following (but not limited to) tests at site as per applicable standards, codes, manufacturer's instructions, drawings, documents and subject to the approval.
15.5.1	Construction inspection.
15.5.2	Hydraulic test/air seal test for radiator banks and air tightness test for air seal of conservator tank.
15.5.3	Drying out of transformer. Adequate quantity of Nitrogen gas cylinders are to be arranged by successful bidder free of cost for the purpose of Nitrogen purging. For this purpose, successful bidder has to arrange nitrogen cylinders of 99.99% purity and (-) 50^0 centigrade dew point along with supplier certificate of purity. Also successful bidder has to arrange for dew point checking of transformer during nitrogen purging cycles.
15.5.4	Oil test of transformer oil (As per IS: 335).
15.5.5	Insulation resistance test of winding.
15.5.6	Measurement of winding resistance at all taps.
15.5.7	Phase sequence check.
15.5.8	Voltage ratio test at all tap position.
15.5.9	Tap changing operation test.
15.5.10	Breather check for Silica Gel.
15.5.11	Zero-sequence test.
15.5.12	Neutral connection to earth effectively.
15.5.13	Polarity, magnetic balance test, magnetizing current at 415 V, 3 phase and vector group test.
15.5.14	LV to HV winding ten-delta test after complete erection of bushings.
15.5.15	Low oil level for main tank and OLTC tank.

15.5.16	Measurement of zero sequence reactance.
15.5.17	Polarity and turns ratio test of bushing CTs.
15.5.18	Tan-delta test of bushing insulator.
15.5.19	Alarm and trip test for Buchholz relay operation, oil surge relay, PRV, MOG, SP relay, oil level indicator.
15.5.20	Cooling fans and pumps operation test.
15.5.21	Calibration and testing of WTI & OTI, transducers, RTDs, etc and setting of mercury switch.
15.5.22	On load tap changer operation test for ST, stability for differential and restricted earth fault test for GT, UT, UAT and ST.
15.5.23	Scheme test, pre-commissioning and commissioning of cooler control cabinet, OLTC and marshalling box.
15.5.24	All remote operation from DCS and relay panel.
15.5.25	Acoustic noise level.
15.5.26	Earthing of transformer body, NGR, marshalling box, OLTC cabinet.
15.5.27	Earthing of HV neutral to a separate earth pit.
15.5.28	Frequency response analysis test.
15.6	NEUTRAL GROUNDING RESISTOR
	The transformer is equipped with a neutral grounding resistor whose secondary is connected across a resistor. Erection of NGR, HT cabling from transformer neutral terminal to NGR (XLPE cable and jointing kit is to be supplied by BHEL), control cabling of resistor and upto JB/ TB/ marshalling box associated for this item, HV test of the cables is included in this contract and the quote rates by successful bidder shall be inclusive of the required cabling and termination work. Successful bidder will carry out following (but not limited to) tests at site as per applicable standards, codes, manufacturer's instructions, drawings, documents and subject to the approval.
15.6.1	Resistance measurement of NGR (successful bidder is to achieve the specified resistance value as per factory test report).
15.6.2	Insulation resistance.
15.6.3	Space heater healthiness.
15.6.4	HV test of HT cable.
15.6.5	Tightness test.
15.6.6	Earhting of NGR.
15.7	Breathers and associated piping supplied loose are to be erected by successful bidder. Pipes may be supplied in running meters which are to be properly erected as per layout drawing. Necessary work like pipe fitting, threading/ welding, etc including supply of all required pipe fittings, elbow, socket, bend, union, reducer, etc are to be carried out by successful bidder within accepted rates. Necessary supporting arrangements are to be provided for installations of equipment and associated piping jobs by successful bidder. Structural steel, if required for this shall be supplied by BHEL free of cost. First filling of breathers with Silica Gel after conditioning of the Silica Gel if required, is to be carried out by successful bidder. Subsequent change, if required, is also to be done by successful bidder. Silica gel for the purpose will be supplied by BHEL. Grouting of oil pipes, fan supports, supports of radiators, conservator tank and finishing of each foundation pedestal in the scope of successful bidder.
15.8	Oil testing of transformer is to carry out in phase wise. The oil is shifted in the auxiliary oil tank from oil drums and after filtration, the oil is required to carry out the tests, eg BDV, ppm, acidity, DGA, etc before pouring the same to main oil tank. After completion of oil filling to the main tank, the similar process, ie transhift from aux oil tank to OLTC, radiator, conservator tank, piping, etc is to carry out and every time the tests is to be carried out and after getting the satisfactory results, the oil pushing is allowable. Above tests are to be carried out after successful charging of the transformer also; as per instruction of BHEL and/or as specified in the commissioning chart.

15.9	Brief description & specification for LT, HT transformers, etc as referred is subject to change in respect of specification & description and successful bidder shall carry out work as per approved drawing/ BHEL's instruction.
16.0	**11KV/415V DRY TYPE TRANSFORMER**
16.1	This is resin cast air cooled housed in enclosure, with all embedded temperature element and associated controllers, temperature indicator cum switch.
16.2	Leveling & alignment shall be under the scope of successful bidder.
16.3	Removal, calibration, installation, testing, commissioning of temperature controller and switch shall be under the scope of successful bidder for which successful bidder shall not claim any extra cost separately.
16.4	Any loose component/ bus bars, neutral CTs are to be assembled by successful bidder without any extra cost.
16.5	For fixing of wheels of the transformer, BHEL will provide the insert plate on the concrete or provide MS beam/channel on the floor/ ceiling. If the above arrangements are not provided by BHEL, successful bidder has to erect the support by fixing the insert plate on anchoring to ceiling/ floor or to provide additional angle/ channel. The MS angle and channel will be provided by BHEL, but the anchoring arrangement (eg anchor bolts, nut, etc) are to be made by successful bidder themselves. This type of arrangement is applicable to erection of support structure of LT busduct also and the quoted rates of successful bidders shall be inclusive of above work.
16.6	Following tests are to be carried out.
16.6.1	Visual inspection.
16.6.2	Insulation resistance.
16.6.3	Winding resistance with the help of micro-ohm meter.
16.6.4	Milli-volt drop test.
16.6.5	Water tightness test.
16.6.6	Phase sequence test.
16.6.7	No load voltage test.
16.6.8	Vector group and polarity.
16.6.9	Magnetising current check at 3 phase, 415 V, 50 Hz power supply.
16.6.10	Magnetic balance test.
16.6.11	Continuity test.
16.6.12	Indication and alarm circuit along with door interlock switch.
16.6.13	Physical line connection as per phasing diagram
16.6.14	Neutral to earth connection effectively
16.6.15	Tests on RTDs, CT
16.6.16	Calibration temperature indicators, associated relays, switches
16.6.17	Any other test as specified by BHEL.
17.0	**GENERATOR CIRCUIT BREAKER (GCB)**
17.1	GCB will be placed in between main run IPBD from generator to GT inside power house area. Successful bidder will have to do its erection, testing, commissioning along with fittings of loose items (if any) and tit-bit internal wiring if required. After erection and proper alignment, it will be welded/ bolted with main run IPBD enclosure. To connect the conductor, 26 nos. Flexibles are to be connected to each side of the unit. The tightening torque of fixation screw for connecting braids and mounting procedure for elastic washers have to comply with bus-bar supplier instructions.
17.2	Making base frame/ foundation frame/ support frame or structure as per drg/ procedures, painting of the supports, base channels, placement, levelling, alignment, fixing its base of the items to foundation/ frames by fasteners, welding as per drg/ procedure mentioned in field quality plan and erection manuals.
17.3	All internal or external wiring, cabling, fixing of loose items are to be installed are covered in the scope of work in successful bidder. Above work will be carried out under supervision of BHEL Engineer/ dealer's service engineer.
17.4	The pre-commissioning and commissioning of GCB is to be carried out under the guidance of authorised dealers' service engineer. The charge for service

	engineer is provided by BHEL, but for assisting the commissioning work, successful bidder has to supply T & Ps and consumables along with deployment of their engineer.
17.5	Earthing of the equipment by GI flat/ flexible from the earth pit/ point is under successful bidder scope.
18.0	**DG SET & ACCESSORIES**
18.1	The DG set is of two types of specification. One is 2000 KVA, 415V, 2780A and another is 750KVA, 415V,1043A. It has to be installed on base frame with anti-vibration mounting system. Installation of generator terminal adaptor/ box, power bus bars, current transformer, instruments, power junction box, control junction box, cleaning of radiator tubes (cleaning agent to be supplied by BHEL), replacement of engine oil and its filter, lub oil filter, radiator coolant (diesel for commissioning, engine oil & its filter, lub. oil filter, coolant being supplied by BHEL), cabling, earthing, etc, complete.
18.2	Successful bidder will have to do erection, testing, commissioning of DG set along with acoustic enclosure, fuel tank, fuel oil piping, exhaust piping, installation of generator terminal adaptor, current transformer, instrument, power jb, control jb, cleaning of radiator tube (cleaning agent to be supplied by BHEL free of cost), replacement of engine oil and its filter, lub oil filter, radiator coolant (diesel for commissioning, engine oil & its filter, lub oil filter, coolant being supplied by BHEL free of cost) cabling, above ground earthing including separate earth pit, if necessary, etc, complete. Details of items covered under DG set are specified in Volume-III and payment against these items will be governed as per accepted rates against the same.
18.3	The DG set and associated items shall be erected, including cleaning of radiator tubes (cleaning agent to be supplied by BHEL), cleaning of fuel pipes &, lub oil pipe, replacement of engine oil & its filter, lub oil filter, super lub oil filter, radiator coolant before commissioning (Engine oil & its filter, lub oil filter, coolant will be supplied by BHEL), Acid pouring to batteries, which are supplied with DG set package, 1st charging of the same by charger (Acid arrangement and charger to be provided by successful bidder). Plant charger cannot be utilized for battery charging, and battery specification will be intimated by BHEL. Mounting of current transformers & assembly of bus-bars inside terminal box adaptor, cabling, earthing, etc.
18.4	Pre-commissioning, commissioning of DG set is to carry out under the guidance of authorised dealers' service engineer. Charge for service engineer is provided by BHEL, but for assisting the commissioning work, successful bidder has to supply T&Ps and consumables along with deployment of their engineer. Also, arrangement for accommodation, transportation, etc of service engineer, is successful bidder's responsibility.
18.5	For testing, commissioning, trial run, handing over, procurement of diesel from BHEL's authorized petrol pump, handling, transportation and filling in various stages including arrangement of container is in the scope of successful bidder. BHEL will reimburse the cost of diesel on submission of the bill of petrol pump.
18.6	For fabrication, erection of supporting structure for the DG set, payment shall be made as per the applicable item rate of price schedule.
18.7	For cabling of DG set, the same is included in the scope of work and no separate payment shall be made for the same. Accepted rates shall be inclusive of same.
18.8	PANEL
	Making base frame/ foundation frame/ support frame or structure as per drg/ procedures, painting of supports, base channels, placement, levelling, alignment of the items/ panels, fixing its base of the items to foundation/ frames by fasteners, welding as per drg/ procedure mentioned in field quality plan and erection manuals. Red oxide primer and finishing paint as per BHEL approved shade and grade is to be applied on the structures/ foundation frames/ support frames in this contract.
18.9	All internal or external wiring, cabling, fixing of current transformers, voltage

	transformers, relays, meters, sensors (which are supplied with materials in loose condition), are to installed in the panels with appropriate fixing supports, etc, as per instruction of BHEL, are covered in the scope of work in successful bidder.
18.10	Earthing of the panels by GI flat/ flexible wire/cable from the nearest earth pit/ point, external cabling, tray fixation is in the scope of the contract.
18.11	For testing of generator and DG set as well as panel, the testing protection & metering relays, numerical relays (Omicron relay kit if required, is to be provided by successful bidder), functional & stability tests, OCC & SCC, auto synchronization, auto close on main power failure (for DG only), interlock with other incomer breaker/ bus-coupler, sequential operation, Auto start and auto trip of pre-lub. oil pump (DG only), auto start & auto trip of DG set, interlock protection check, stability tests, current transformer (only testing of CT before mounting & testing with wires from panels), voltage transformers, sensors, RTDs, etc, are in the scope of the successful bidder.
18.12	Fuel day tanks may be interconnected with fuel pipes for ease of use. Fabrication, erection of such interconnection pipes is under successful bidder's scope. Pipes & accessory items will be supplied by BHEL free of cost.
18.13	Fuel pipes, if any between fuel handling building to DG building is under the scope of successful bidder. Red oxide primer and finishing paint as per BHEL approved shade and grade is to be applied on the pipes, structures/ foundation frames/ support frames in this contract. For fabrication, erection of pipes, supporting structure for the DG set, payment shall be made as per the applicable item rate of price schedule. Supply of material is under scope of BHEL. Supply of Consumables is under scope of vendor.
18.14	Flue Gas CHIMNEY:
18.14.1	Items for Flue gas pipes, supporting structures, plates shall be supplied in loose condition. Successful bidder has to fabricate, assemble the same as per drawing and instruction of BHEL Engineer. Red oxide primer and finishing paint as per BHEL approved shade and grade is to be applied on the pipes, structures/ foundation frames/ support frames in this contract. For fabrication, erection of pipes, supporting structure for the DG set, payment shall be made as per the applicable item rate of price schedule. Supply of material is under scope of BHEL. Supply of Consumables is under scope of successful bidder.
18.14.2	Thermal insulation of flue gas pipes and associated items are under scope of successful bidder. Works shall be carried out as per drawing and instruction of BHEL Engineer. Payment shall be made as per the applicable item rate of price schedule. Supply of material is under scope of BHEL. Supply of Consumables is under scope of successful bidder.
19.0	**11KV/415V DRY TYPE TRANSFORMER**
19.1	Isolated phase bus-duct is metal enclosed bus-duct in which each phase conductor is enclosed by an individual metal housing and separated from adjacent conductor housing by an air space. Isolated phase bus-ducts are of two basic types in general, ie discontinuous and continuous. In conductor continuous Isolated phase bus-ducts system, the various sections of the bus-ducts are so inter connected that low resistance path for the induced circulating current is provided from one phase enclosure to other phase enclosure.
19.2	After final alignment followed by welding works, successful bidder has to grout the duct support (grouting materials being in the scope of successful bidder and to supply as per BHEL recommendation). Also before grouting by successful bidder as well as before floor finish work (being carried out by civil successful bidder), the laying of earth flat from nearest riser, its welding and painting (eg Aluminium painting followed by primer as supplied by successful bidder) are in the scope of successful bidder.
19.3	Main bus-duct (made of A-alloy) meant for 21 KV system is being supplied by BHEL. The bus-duct is having phase side and neutral side bus-bar chamber for generator phase and neutral side terminal bushings. It is having NGT (Neutral Grounding Transformer) for generator neutral earthing, one SPVT cubicle and

	one LAVT cubicle on generator phase side, bus-duct CTs, One no hot air blower, Air pressurising unit, Silica Gel breather, adopter box, seal off bushings, shunts, sun canopy over the bus enclosure outside the TG hall. The bus-bar is connected with the generator as well as generator transformer by copper flexible. The bus-duct enclosure is made of Al alloy sheet and supplied in parts. The bus-duct is having three different sizes 1700 mm dia for main, 780 mm dia for tap-off and 1200 mm dia for delta bus-duct. Bus-duct is supported on steel structure and shunts at different locations. Different sections of the enclosures are connected together by Aluminium make up pieces welded at site. Various sections of the bus-bars are joined together by bolting and/ or welding.	
19.4	Shorting busbar(s) will be supplied by BHEL for "SCC" test of generator. Connection and dismantling of the bus-bar(s) is in the scope of successful bidder. After testing the loose bar as mentioned is to be returned to BHEL/end customer.	
19.5	BUS-BAR JOINT OF IP BUSDUCT	
	The bus-bar joints may be bolted type or welded type as specified for installation. For making the busbar joints, successful bidder strictly follow the specified procedures which will be communicated by BHEL engineer and precautions are to follow. Wire, brush, emery cloth or jointing compound containing metallic particles or other abrasive should not be used on plated surfaces.	
19.5.1	To obtain the correct tightening pressure on contact surfaces the following torques are recommended for various bolt sizes to conductors' bolted joints.	
19.5.1.1	Bolt	Recommended torque
19.5.1.2	M10	2.80 ~ 14.15 KG-M
19.5.1.3	M12	14.15 ~ 15.53 KG-M
19.5.1.4	M16	15.53 ~ 16.91 KG-M
19.5.1.5	M20	16.91 ~ 8.29 KG-M
19.5.2	Alternatively tighten the nut till Belleville washer becomes flat. Then unscrew the nut by about 1-8th turn.	
19.5.3	For enclosure window over bolted joint with neoprene gasket - For M10 bolt size, recommended torque size is 1.4 – 1.8 KG-M.	
19.5.4	For tightening of insulator with conductor - For M20 bolt size, recommended torque size is 15.0 – 15.5 KGM	
19.5.5	For tightening of enclosure at terminations, etc, with Nitrile bonded cork gasket For M 12 bolt size, recommended torque is 2.0 – 2.5 KG-M. For M 16 bolt size, recommended torque is 3.0 – 3.5 Kg-M.	
19.5.6	Before putting the enclosure make up pieces (Welded to enclosure) & covers of inspection windows, all the insulators should be cleaned again. The busduct should also be cleaned and dried up for any moisture condensates to obtain the desired IR value of the bus duct. Thoroughly check the interior of every enclosure and ensure that these are free from any foreign material.	
19.5.7	WELDING OF IP BUSDUCT	
19.5.7.1	Box section circumferential weld.	
19.5.7.1.1	A fully penetrated, fully fused weld with a 10% T (4mm max) reinforcement is required.	
19.5.7.1.2	Welding conditions MIG process	
	Filler wire	1.6 mm dia (NG :21 with 5% silicon)
	Angle	10^{O} F to 15^{O} F
	Cleaning	Degrease and scratch brush
	Setting	250 A to 320 A, 28 to 30 Volts (Dependent on thickness)
	Process	4 off 25 mm long equispaced tack weld
	Gas supply	10 to 12 ltr/ min argon.
	Shield	5/8" dia.
19.5.7.2	Tubular/ conductors weld:	
19.5.7.2.1	Butt welding is done as per fig.16. Align and tack weld in four positions and complete the weld all around.	
19.5.7.2.2	Welding conditions MIG process	

	Filler wire	1.6 mm dia (NG: 21 with 5% silicon)
	Angle	10^{O} F to 15^{O} F
	Cleaning	Degrease and scratch brush
	Setting	215 A to 275 A, 22 to 23 Volts (Dependent on thickness)
	Process	4 off 25 mm long equispaced tack weld
	Gas supply	10 to 12 Lt/ min argon
	Shield	5/8” dia.
19.5.7.3	Enclosure: Circumferential welds	
19.5.7.3.1	Fillet weld for make up pieces/ shunts after tack weld at four places.	
19.5.7.3.2	Welding conditions MIG process	
	Filler wire	1.6 mm dia (NG :21 with 5% silicon)
	Angle	10^{O} F to 15^{O} F
	Cleaning	Degrease and scratch brush
	Setting	200 A to 300 A, 25 to 30 Volts (Dependent on thickness)
	Process	4 off 25 mm long equispaced tack weld
	Gas supply	10 to 12 Lt./min argon
	Shield	5/8” dia.
19.5.7.4	Welded conductor joint: Ensure that the `in position’ conductor has been cleaned and prepared for welding. If due to site variation, length of conductor is modified, re-prepare the ends for welding, in accordance with joining recommendations and drawings.	
19.5.7.5	With the conductors in correct relative position and the permanent backing plates having a good fit, it is suggested that the conductors are clamped in alignment at top and button, by means of clamps made locally from channel section and on the sides by means of channels and large C-clamps. The clamping is particularly important where site joint is adjacent to an expansion joint.	
19.5.7.6	Before welding check, once again that the joint faces and permanent backing bars are clean from paint, grease and oxide film. Using asbestos cloth protect any insulator assembly close to the welded joint.	
19.5.7.7	Due to cold start condition, the resultant bead contour or beginning of run may be poor with inadequate penetration and porosity. This can be improved by striking the arc approximately on inch ahead of the beginning of the run and then quickly bring the arc to the weld starting point, reverse the direction of travel and proceed with normal welding. While finishing, a similar practice may be followed by reversing the direction of welding and simultaneously increasing the speed of welding to taper the width of the molten pool prior to breaking the arc.	
19.5.7.8	The root run should be chipped back to sound metal and the start & finish chipped to a taper to allow smooth continuity of root run on the remaining faces.	
19.5.7.9	Root run requires a short arc to provide desired penetration. A longer arc and higher arc voltage may be used on subsequent filler passes. After welding, remove any temporary packing, clean out bus-duct and make good any damage paint work.	
19.5.7.10	Welded bus enclosure joint	
19.5.7.10.1	Bridge the gap between bus enclosure by means of make-up pieces and clean the area by paint remover (the cleaning agent being supplied by successful bidder), which is to be welded. Tack welds the make up pieces before final weld all around.	
19.5.7.10.2	Welded joints of shunts	
	Various locations of shunts to be welded to the enclosures are shown in the layout drawing. Welding of shunts to the enclosures.	
19.6	EARTHING OF ISOLATED BUSDUCT AND CUBICLES	
19.6.1	EARTHING OF ISOLATED PHASE BUSDUCT	
	One end of the electrical continuous enclosure should be earthed to station earth at the shunt location where all the three enclosures are shorted. Location of earth points are shown in the layout drawing. For this purpose, two drilling are to be done on the shunt to suit at site and two separate earth strips are to be	

	connected to the station earth thus ensuring double earthing. In some assemblies (such as transformer hood etc) due to short length enclosures shunts are not provided. In such cases, phase enclosure should be separately earthed.
19.6.2	CUBICAL EARTHING
	One end of electrical continuous enclosure should be earthed to station earth at the shunt location where all the three enclosures are shorted. Location of earth points are shown in layout drawing. For this purpose, two drilling are to be done on the shunt to suit at site and two separate earth strips are to be connected to the station earth thus ensuring double earthing. In some assemblies (such as transformer hood etc.) due to short length enclosures shunts are not provided. In such cases, phase enclosure should be separately earthed.
19.7	Site welding of Al is to be done as per BHEL standard practice. For Al welding work (IP duct joints being splice plate type welding joint and/ or peripheral back tube type welding joint) of IP bus-duct and enclosures of SP bus-duct (if required), successful bidder is to supply Al welding machine, filler, argon gas and welding electrodes. The rate of erection of IP duct is inclusive the provision of welding accessories including consumables also.
19.8	Each section of bus-assembly is to be cleaned thoroughly before erection. The insulators shall be properly cleaned with required chemical, Carbon Tetra Chloride and IP bus-duct conductor joints shall be properly cleaned with required chemical, Methyl Ethyl Ketone (the cleaning agent is to be supplied by successful bidder, free of cost). Physical checking of bus-duct conductor, insulator and insulator support assembly, initial meggering, etc before placement of duct and successful bidder should keep the proper record before placement.
19.9	Successful bidder should ensure special care during assembly, alignment of current transformers, epoxy insulators, seal of bushings inside the IP duct before final tightening of hardware. For hole matching of the above materials, it may be required to enlarge or minor shift of holes in the structure/ aluminium conductor of IP bus-duct. Successful bidder is to carry out the work without any extra cost.
19.10	TEST VOLTAGE
19.10.1	The test voltage shall be applied between each phase and in turn with remaining phases earthed. The test voltage shall be alternating current on any frequency between 25 Hz to 100 Hz and approximately in sine-wave form. The rms value is given below.
19.10.2	For AC voltage, duration of test shall be one minute.
	The test with DC at a voltage not in excess of the values given below, for the corresponding rated voltage may be substituted for the ac test prescribed. The duration of the test shall be 15 minutes. The corresponding test voltage as indicated below shall be applied in turn between each phase conductor and its enclosure which shall be kept at ground potential. Remaining two phase conductors and and their enclosure shall be properly grounded. The test voltage shall be increased by the measuring instrument. The full test voltage shall then be maintained for the specified duration. Each bus including tap-off must withstand the above voltage.
19.10.3	TABLE-1

Rated voltage/ highest system voltage (V)	Test voltage (AC) (Kv)	Test voltage (DC) (kv)
3.6	116.8	116.8
7.2	21.6	21.6
12	28	28
17.5	30	30
24	44	44
36	60	60

19.11	INSULATION RESTANCE CHECK
	Before the application of high voltage check the insulation value of each bus conductor by means of 2.5 KV megger. A value of exceeding 100 mega ohms is expected under normal conditions. However, during rain seasons, the value may

	fall down considerably and drying up by hot air may be required before the test Minimum acceptable value is around 20 mega ohms. After the application of high voltage, the insulation value is checked again.
19.12	Handling during erection: The busducts are in un-packed condition, therefore great care is necessary in handling. Moreover, Aluminium being softer material, great care must be taken in handling enclosures and entire aluminium items.
19.12.1	While lifting enclosure assemblies, manila ropes are passed round the busduct enclosure near the support channels.
19.12.2	All shipping steel clamps are tight and bus-bar do not slip out while handling, if the busbar is assembled in enclosure. While inserting & mounting bus-bar in the enclosure care is taken that the bus-bar does not hit and damage the insulators.
19.12.3	During erection of IP duct, it may be required to transport the materials from store in advance. During this period, the materials must not be laid directly on ground but stacked on wooden battens (if the wooden battens not available at site, successful bidder is to arrange from outside) to avoid contact with soil, water, etc.
19.12.4	Items such as rubber components gaskets, insulation boards, busbar jointing compound, insulating compound and Belleville spring washer, etc should be protected against dirt, dust, grease and moisture, etc. Flexible connections made of thin Al or Cu require additional care to prevent physical damage. These connections should also be protected against dirt, dust, grease, moisture, etc.
19.12.5	Doors of cubicles must always be closed during storage to avoid ingress of vermins dirt, dust, grease and moisture etc.
19.12.6	Successful bidder should not stack bus-duct assembly packing one above the other, also avoid stacking of heavier items on bus-duct packing.
19.12.7	The CTs, VTs, LA's Capacitances, NG Transformers, Grounding resistors, insulators, bushings, moulded and rubber items and flexibles are normally supplied in loose condition along with the main materials. Successful bidder should keep these materials in indoor and well-ventilated area.
19.12.8	The opening of the TG wall through bus-duct enters the TG hall from GT is to be sealed by wall frame assembly completely to avoid rain entry.
19.12.9	Supporting structural fabrication & erection for bus-duct and grouting of structures (after alignment and preferably after welding of duct) are also included in the scope of tender.. The structures shall be assembled, aligned, grouted and are to be earthed through earth flat from nearest earth riser. Payment against this shall be made as per applicable item rate of price schedule.
19.12.10	Successful bidder will be given details of welding procedure for executing the job. Before starting the welding, successful bidder's qualified welder will have to demonstrate his ability to BHEL engineers by making sample welds. Successful bidder will engage the welders only after written clearance from BHEL after assessing the quality of the sample weld subject to various tests as per procedure of BHEL. Test pieces for the testing welder performance will be supplied by successful bidder. Consumption of welding rod should be inclusive in the price and the rate remains same independent of splice plate joint or back tube joint between two IP ducts
19.12.11	All the steel members are hot-dip galvanized. Adequate care is to be taken during erection as mentioned elsewhere in the specification. Welding if required shall be touched up with red-oxide followed by cold galvanizing paint.
19.12.12	Shorting of bus-bars/ flexible, opening of the same for OCC and SCC of the generator, and dry out of the generator through IP bus-duct is in the this tender. Apart from this, any other checks/ test mandatory as per Indian/ International Standards/ IE rules is to be carried out, without any extra cost.
19.13	NEUTRAL GROUNDING TRANSFORMER
19.13.1	Neutral side bus-duct emerging from top chamber is terminated to neutral grounding transformer whose secondary is connected across a secondary load resistor, erection, alignment, grouting of base frame of NGT (grouting materials being in the scope of successful bidder), Assembly. of space heaters with

	thermostat, fluorescent tubes, marshalling box, cabling of resistor and upto JB/ TB/ marshalling box associated for this item, assembly of CT, VT if any, space heaters, conduit wiring for illumination if any, internal wiring from equipment to JB, continuity test of the cables is included in this contract.
19.13.2	Lightning arrestor, surge capacitor (checking of connection to ground and line, continuity test, operation check of discharge counter, IR measurement by 5 KV megger), insulator NGT tests as per standard codes & practice.
19.13.3	Following tests of NGT are to be carried out.
19.13.3.1	Visual inspection.
19.13.3.2	Insulation resistance by 1 KV megger.
19.13.3.3	PI value by 5 KV megger.
19.13.3.4	Ratio test.
19.13.3.5	Magnetising current.
19.13.3.6	Contact resistance.
19.13.3.7	NGT resistance.
19.13.3.8	HV tests of HT cables.
19.13.3.9	Milli-volt drop test.
19.13.3.10	Limit switch healthiness.
19.13.3.11	Illumination circuit check, space heater connection.
19.13.4	Bolt tightness of Cu/ Al flexible at generator end (Top chamber) and generator transformer should preferably be of 36 N-Metre. However, BHEL will confirm specified value at the time of work and contact resistance is preferably 10 watt loss. So successful bidder should arrange torque wrench well in advance.
19.13.5	SPVT/ LAVT CUBICLE
	Placement, levelling, alignment, grouting of cubicle (grouting materials is included in the scope of this tender), assembly of voltage transformer, lightning arrestor, surge capacitance, HT fuse, space heater with thermostat, fluorescent tube, bus-bar adjustment for earthing, assembly of marshalling box, internal wiring, fixing of luminaries, etc. Adjustment of draw out trolley of each VT cells with its locking system and secondary connections of each VT cells through terminals and fuses in the Marshalling box (fixed in one of the cubicle) to the external equipment.
19.13.6	Checking voltage ratios on all windings, primary & secondary injection tests for all cores, magnetizing current/ knee point voltage test, secondary winding resistance measurement, continuity test, polarity tests on each winding, insulation resistance test on each winding by megger to earth and between windings for all cores, tightness test of flexible with tap-off bus-duct, earthing contact during draw out of PT module, fuse healthiness check, illumination circuit check, space heater connection.
19.14	HOT AIR BLOWER UNIT
	Placement, levelling, alignment, grouting of hot air unit (grouting materials under the scope of successful bidder), piping of blower line to and from IP busduct assembly (Transformer end & generator end), from top chamber, from NGT, etc with support, fittings, etc, painting (primar is to be supplied by successful bidder and touch up paint being supplied by BHEL) of the pipes and pipe support, earthing of HAB unit, assembly of the instruments and its calibration, red oxide primar painting, final painting of the pipes, pipe support and accessories (only final paints being supplied by BHEL), heater box, commissioning of blower motor, compressor, commissioning of related panels (testing and setting of monitoring relays, wiring inside the panels being inclusive). Successful bidder is to ensure the air tightness of air line on using consumables teflon tapes, jutes, etc during pre-commissioning and commissioning checks.
19.15	Successful bidder should complete the hot air piping work at the entry and exit point at top chamber side as well as generator transformer side before HV test of the duct in order to avoid the constraint piping work with charging of duct.
19.16	SITE TEST
	Tests, not limited to following, shall be carried out by successful bidder at site as

	per applicable standards, codes, manufacturer's instructions, drawing and documents and subject to approval and to the satisfaction of BHEL.
19.16.1	Construction inspection.
15.16.2	Welding joint check (Dye-Penetration and Radiography of each joint).
15.16.3	Conductor resistance test.
15.16.4	Bolt torque check (Tentatively tightness being 20 N-Metre for 10 mm bolt and 30 N-Metre for 12 mm bolt for LT board and for SP/ IP bus-duct the tightness being 36 N-Metre).
19.16.5	Inter cubicle and equipment wiring check.
19.16.6	Cleaning of bus-ducts.
19.16.7	IR test.
19.16.8	HV test (all CT secondaries being shorted and grounded before HV test).
19.16.9	Milli-volt drop test for bus bar joints (recommended 10 Watt loss per joint).
19.16.10	CURRENT TRANSFORMER
	Primary & secondary injection tests for all cores, magnetizing current/ knee point voltage test, secondary winding resistance measurement, continuity test, polarity tests on each winding, Insulation resistance test on each winding by megger to earth and between windings for all cores.
19.16.11	POTENTIAL TRANSFORMERS
	Checking voltage ratios on all windings, primary & secondary injection tests for all cores, magnetizing current/ knee point voltage test, secondary winding resistance measurement, continuity test, polarity tests on each winding, Insulation resistance test on each winding by megger to earth and between windings for all cores.
19.16.12	Air tightness and water tightness test.
19.16.13	Hot air blowing operational tests.
19.16.14	Open circuit tests.
19.16.15	Dry-out of generator through generator bus-duct.
19.16.16	The list of above tests to be carried out by successful bidder is not exhaustive and they may have to carry out separate tests, which may be necessary for satisfactory completion of the job at no extra cost.
20.0	**11KV/ 3.3 KV SEGREGATED PHASE BUS–DUCT**
20.1	11/ 3.3 KV bus-ducts are phase segregated housed in rectangular enclosures Te bus-duct is supported from the roof ceiling by tie rods and also by structural supports from ground. The following are the scope under 11/ 3.3 KV bus-duct.
20.2	The bus-duct is having suitable opening for bus-joints, transformer terminals, switch gear terminals etc. The inspection covers are having sealing arrangement with neoprene gasket. Bus duct shall be joined by flange to flange bolting. The gasket may be supplied in loose sheet. So successful bidder has to make the gasket with proper hole match without incurring any additional cost.
20.3	Seal off bushings, silica gel breathers, filtered drains are provided at different locations.
20.4	Space heaters/ hot air blowers have been provided to prevent moisture condensation inside the bus-duct. Before placement of duct, successful bidder should ensure the healthiness of the insulators, conductors and space heaters. For that, initial megger of the duct, continuity test of space heater is to carry out as a part of check list of busduct erection. If any space heater(s) is/ are required to replace even after placement of busduct, successful bidder has to replace the same by new one (the new one being supplied by BHEL).
20.5	A separately run 50/ 6 mm GS (or of suitable dimensions) flat suitably clamped along the enclosures shall be used as ground bus. All parts of bus enclosures, supporting structures, equipment frames shall be connected to the ground bus.
20.6	All steel members are hot-dip galvanized. Adequate care is to be taken during erection as mentioned in the tender. Welding if required shall be touched up with red-oxide followed by cold galvanizing paint.
20.7	In case of space heaters, GI conduit laying, installation of JBs, cabling/ wiring from distribution board to JB of individual bus ducts is in the scope of contract.

	Cable tray/ conduit laying work is also included in the scope of work. No separate payment shall be made against this.
20.8	The supporting structural erection for the bus-duct and grouting of the structures are also included in the scope of successful bidder. The structures shall be assembled, aligned grouted and are to be earthed. Payment against the same shall be as per the applicable item rate of price schedule.
20.9	Following tests are to be carried out.
20.9.1	Visual inspection.
20.9.2	Insulation resistance.
20.9.3	HV tests.
20.9.4	Milli-volt drop test.
20.9.5	Water tightness test.
20.9.6	Any other test as specified by BHEL.
20.10	The list of above tests to be carried out by successful bidder is not exhaustive and they may have to carry out separate tests, which may be necessary for satisfactory completion of the job at no extra cost.
21.0	**415 V LT BUSDUCT**
21.1	Bus-duct shall be supplied in parts and all the parts shall be assembled and the bus-bar connections shall be made including assembly of bellows at site. The insulators in bus ducts shall be inspected for any possible damage during transit and the defective ones shall be replaced. The insulators and bus-bar joints shall be properly cleaned with required chemical (the cleaning agent is to be supplied by successful bidder, free of cost). The contact surface of bus-bars, bus bar bolts and nuts shall be thoroughly cleaned with petrol and wiped. Petroleum jelly shall then be applied & bolted connections made. The bus-duct enclosures shall be checked for earth continuity and then earthed at required points. The bus-duct shall be duly supported between switchgear and transformer end. The opening in the wall where the bus-duct enters the switchgear room shall be completely sealed to avoid rain water entry. Expansion joints, flexible connections, etc supplied by the manufacturer of the bus-duct shall be properly connected.
21.2	The vertical structures shall be assembled, aligned & grouted and horizontal structures shall be welded with inserts made available as per layout drawings.
21.3	The entire run of the bus-duct from the switchgear end upto the transformer shall be aligned and erected as per the approved layout drawings and as per direction of BHEL site engineers to avoid any stress either on switchgear terminals or transformer terminals and the entire work is to be carried out only by competent and experienced manpower. Also, wherever bus duct is crossing through wall, it has to be erected with Bracket being supplied along with the bus duct.
21.4	All bolts in joints will be tightened by torque wrench as per approved pressure and subject to approval of BHEL. Anti-oxidation compound will be used for bolted joints and will be supplied by successful bidder free of cost.
21.5	Erection of supporting structures supplied along with the bus-duct is to be done by successful bidder. The painting (eg primar and shaded paint) of the bus-duct support are in the scope of contract including supply of the paints and payment shall be made as per the applicable item rate of price schedule. For fixing of LT duct support, BHEL will provide the insert plate on the concrete or provide MS beam/ channel on the floor/ ceiling. If the above arrangements are not provided by BHEL, successful bidder has to erect the support by fixing the insert plate on anchoring to ceiling/ floor or to provide additional angle/ channel. The MS angle and channel will be provided by BHEL, but anchoring arrangement (eg anchor bolts, nut, etc) is to be made by successful bidder themselves. This type of arrangement is applicable to installation of dry type transformer also and the quoted rates of successful bidders shall be inclusive of above work.
21.6	Welding of Bus-duct Cross-Section.
22.0	**415 LT BUS DUCT FOR DG SET**
22.1	Main Bus bar chamber of DG is connected to SWGR panel (At Power House SWGR room) by 415V LT Bus duct.

22.2	The vertical structures shall be assembled, aligned & grouted and horizontal structures shall be welded with inserts made available as per layout drawings.
22.3	The entire run of the bus-duct from the DG to switchgear end shall be aligned and erected as per the approved layout drawings and as per direction of BHEL site engineers to avoid any stress either on switchgear terminals or DG terminals and the entire work is to be carried out only by competent and experienced manpower. Also, wherever bus duct is crossing through wall, it has to be erected with Bracket being supplied along with the bus duct.
22.4	All bolts in joints will be tightened by torque wrench as per approved pressure and subject to approval of BHEL. Anti-oxidation compound will be used for bolted joints and will be supplied by successful bidder free of cost.
23.0	**EXTRA WORK ON IP/SP BUS-DUCT DUE TO MISMATCH**
23.1	During erection of IP/ SP busduct, there may be discrepancies like mismatch of bus duct conductors joints in between two successive busduct enclosure, structure of IP duct wrt civil foundation and the foot plate of IP duct enclosure, erection mismatch of SPVT and NGT cubicle wrt civil foundation, intermediate flexible/ splice plate connection hole mismatch, termination of the duct/ rubber bellow/ hood at equipment end (like generator, seal of bushing, common chamber, generator transformer, unit aux transformer, SPVT, NGT cubicle), fixing of seal of bushing, hot air piping work, etc.
23.2	Successful bidder has to modify above mismatch work by cutting, grinding, and Aluminium/ arc welding as required, with required consumables.
23.3	For cutting and grinding work of IP duct enclosure and conductor, successful bidder have to arrange special type of cutting machine jig saw tooth machine & blades, circular saw tooth machine & blades, hack saw blades (high speed tool steel) upto 300 mm as mentioned in the list of T&P. The rate of extra work is applicable as per BHEL normal rates on extra man-hour basis as detailed elsewhere in the tender, except Aluminium welding wok.
23.4	No separate rate will be entertained for above modification work except specific Aluminium welding work which may be payable per inch/ metre basis for welding of Aluminium conductor/ enclosure arising out of site-mismatch/ modification Aluminium welding width and thickness should match with the actual requirement during modification.
24.0	**FINAL PAINTING, MARKING**
	Final painting is excluded from the scope of work of successful bidder. But, touch-up painting for main items, as required, is in the scope of tender. Supply of applicable touch up paint (both primer and final paint) is also included in scope of tender. Paint has to be as per BHEL's/ customer's specification. Nomenclature of erected item is to be done as per BHEL/ customer requirement. Successful bidder shall provide identification/ marking of all equipment erected/ commissioned by him, by engaging professional gang with paints, consumables, as required under IE rules/ customers practices, before handing over of systems. Successful bidder's quoted rate/ price shall be inclusive of above activities.
25.0	**SCHEDULE OF SITE TEST**
25.1	Site testing shall be required for all Electrical equipment installed by successful bidder to ensure proper installation, setting, connection and functioning in accordance with drawing, specification, manufacturer's recommendation and approved quality plan for installation, testing & commissioning.
25.2	The following section will give a general guideline of tests, but not limited, to be carried out by successful bidder at site as per applicable standards, codes, manufacturer's instructions, drawing and documents and subject to the approval and to the satisfaction of BHEL engineers.
25.3	Successful bidder shall take full responsibility for satisfactory testing, pre-commissioning, commissioning and trial run of the connected equipment under overall guidance of BHEL and shall locate any cause of malfunction and shall make necessary minor wiring changes or cable connections to obtain intended operation. Testing shall also include any additional tests which BHEL engineer

	feels necessary because of site condition to ensure functioning of that equipment, material & system meets requirement of specification. The following are some of the major site tests. Checking shall be done on all circuits & modules and not as a typical checking in sample basis.
25.4	For commissioning of relays of various panels, as required, services of expert commissioning engineer/ OEM (Original equipment manufacturer) to be arranged by successful bidder at their own cost.
25.5	For commissioning of any other system/ equipment being issued by BHEL, if required, services of OEM (Original equipment manufacturer) shall be arranged by BHEL free of cost.
25.6	GENERAL CHECKS AFTER ERECTION
25.6.1	SWITCHBOARD/ PANEL.
25.6.1.1	Arrangement of various shipping sections as per GA drawing.
25.6.1.2	Front, rear side and top clearance.
25.6.1.3	Proper positioning of ends of main bus-bars in adjoining section.
25.6.1.4	Tightness of bus-bars joints between adjoining sections and its shrouding.
25.6.1.5	Alignment of panel.
25.6.1.6	Welding of base channel to embedded plates/ bolting with foundation bolt.
25.6.1.7	Adequacy of supporting channels and its arrangement.
25.6.1.8	Free closing and opening of door, tight closing of door.
25.6.1.9	Free movement of draw out modules and proper alignment of fixed and moving contacts, including terminals.
25.6.2	Construction inspection.
25.6.3	Welding joint check (Dye-penetration and radiography of each joint).
25.6.4	Conductor resistance test.
25.6.5	Bolt torque check (Tentatively tightness being 20 N-Metre for 10 mm bolt and 30 N-Metre for 12 mm bolt for LT board and for SP/ IP bus-duct the tightness being 36 N-Metre).
25.6.6	Inter cubicle and equipment wiring check.
25.6.7	Cleaning of bus-ducts.
25.6.8	IR test.
25.6.9	HV test (all CT secondaries being shorted and grounded before HV test).
25.6.10	Milli-volt drop test for bus bar joints (recommended 10 Watt loss per joint).
25.6.11	CURRENT TRANSFORMER
	Primary & secondary injection tests for all cores, magnetizing current/ knee point voltage test, secondary winding resistance measurement, continuity test, polarity tests on each winding, Insulation resistance test on each winding to earth and between windings for all cores by insulation tester.
25.7.12	POTENTIAL TRANSFORMER
	Checking voltage ratios on all windings, primary & secondary injection tests for all cores, magnetizing current/ knee point voltage test, secondary winding resistance measurement, continuity test, polarity tests on each winding, Insulation resistance test on each winding by insulation tester to earth and between windings for all cores.
25.7.13	Air tightness and water tightness test.
25.7.14	Hot air blowing operational tests.
25.7.15	Open circuit tests.
25.7.16	Dry-out of generator through generator bus-duct.
25.7.17	The list of above tests to be carried out by successful bidder is not exhaustive and they may have to carry out separate tests, which may be necessary for satisfactory completion of the job at no extra cost.
25.8	CHECK FOR CIRCUIT BREAKER PANEL
25.8.1	Operation of shutters
25.8.2	Manual closing/ opening of CB, measurement of contract resistance.
25.8.3	Operation of spring charging motor & limit switches.
25.8.4	Proper closing of CB

25.8.5	Trip free & anti pumping operation
25.8.6	Verification of minimum pick up voltage of closing & tripping coil.
25.8.7	Wiring of relays.
25.8.8	Functional test of protection relays by secondary injection, verification of settings & characteristics.
25.8.9	IR & earth resistance check for CTs & VTs.
25.8.10	Polarity & ratio check for CTs & PTs.
25.8.11	Magnetising characteristics check for CTs
25.8.12	Operation of indication/ alarm operation of auxiliary successful bidders, timers etc.
25.8.13	Primary injection test to verify correctness of releases
25.8.14	Operation of panel space heaters & thermostats.
25.9	PRIMARY/ SECONDARY INJECTION TEST FOR BIMETAL/ OTHER RELAYS
25.9.1	Verification of operation of control circuit in selected starter modules of different categories.
25.9.2	Operation of panel space heater/ thermostat.
25.10	SPECIAL CHECK FOR BUSDUCT
25.10.1	Cleanliness of busbar, supports etc.
25.10.2	Earth & insulation resistance
25.10.3	Measurement of contact resistance
25.10.4	HV test.
25.11	COMMISSIONING CHECKS
25.11.1	Power cable connection for tightness & phase sequence test.
25.11.2	Energisation by closing incoming breaker.
25.11.3	Control circuit operation of each starter module.
25.11.4	Verification of timer setting.
25.11.5	Verification of bus transfer & auto re-closing.
25.11.5	Energisation of power circuit of each module & operating motors on no load.
25.11.6	Checking operation from local push button station, switchgear and remote (CR), with and without all interlocks.
25.12	The list of above tests to be carried out by successful bidder is not exhaustive and they may have to carry out separate tests which may be necessary for satisfactory completion of the job, at no extra cost.
25.1	Site testing shall be required for all electrical equipment installed by successful bidder to ensure proper installations, setting, connection and functioning in accordance with drawings, specification, manufacturer's recommendations and approved quality plan for installation, testing & commissioning.
25.2	Successful bidder shall take full responsibility for satisfactory testing, pre-commissioning, commissioning and trial run of the connected equipment under overall guidance of BHEL and shall locate any cause of malfunction and shall make the necessary minor wiring changes or cable connections to obtain the intended operation. Testing shall also include any additional tests which the engineer deems necessary because of site conditions to determine that equipment, material and system meets requirement of the specification. Following are some of the major site tests. Checking shall be done on all circuits & modules and not as a typical checking in sample basis.
25.3	Successful bidder shall deploy experienced specialised team of commissioning engineer for commissioning of equipment/ systems under the scope of this contract. Successful bidder will also be responsible for mobilizing all T&P, etc as required for successful commissioning of the equipment/ systems under the scope of this contract and shall carry out all necessary pre-commissioning and commissioning checks/ tests. No separate amount will be paid for such deployment. The accepted rate shall be deemed to be inclusive of this cost.
25.4	Checks after erection: checks shall be carried out not limited to following details.
25.4.1	BUSDUCT
25.4.1.1	General arrangement of various sections as per drawing.
25.4.1.2	Bus-bar joints between various sections use of bimetal/ flexible joints as per

	drawings. Tightness of bus-bar joints and end terminations, tentatively tightness being 36 N-Metre and recommended 10 W loss per joint).
25.4.1.3	Tightness of nut connecting intersection flanges and covers.
25.4.1.4	Bus-duct supports as per drawings.
25.4.2	TRANSFORMER
25.4.2.1	Construction inspection.
25.4.2.2	Hydraulic test for radiator banks & air tightness test for air seal of conservator tank.
25.4.2.3	Drying out of transformer.
25.4.2.4	Oil test of transformer oil (as per IS:335 code).
25.4.2.5	Insulation resistance test.
25.4.2.6	Polarity, turn ratio and vector group test. Magnetising current test, magnetic balance test, tan-delta test for individual HV bushings, tan-delta test of transformer HV and LV side after oil filtration.
25.4.2.7	Polarity and turn ratio test of bushing CTs. Primary injection of CT's, secondary injection and loop test for CT's. Injection kits (3-ph & 1-ph) to be arranged by successful bidder.
25.4.2.8	Alarm and trip test for Buchholz relay, SP relay, oil level indicator.
25.4.2.9	Cooling fans and pumps operation test.
25.4.2.10	Calibration and testing of WTI & OTI.
25.4.2.11	On load tap changer operation test for ST, stability of differential and restricted earth fault test for GT, UAT and ST.
25.4.3	Special check for bus-duct
25.4.3.1	Cleanliness of bus-bar, supports, etc.
25.4.3.2	Earth & insulation resistance.
25.4.3.3	Measurement of contact resistance.
25.4.3.4	HV test.
25.4.3.5	Primary injection of CT's, secondary injection and loop test for CT's. Injection kits (3-ph & 1-ph) to be arranged by successful bidder.
25.4.4	Commissioning checks.
25.4.14.1	Power cable connection for tightness & phase sequence test.
25.4.14.2	Energisation by closing I/C breaker.
25.4.14.3	Control circuit operation of each starter module.
25.4.14.4	Verification of timer settings.
25.4.14.5	Verification of bus zone protection, bus transfer & auto re-closing.
25.4.14.6	Energisation of power circuit of each module & operating motors on no load
25.4.14.7	Checking operation from local push button station, switchgear and remote (CR), with and without all interlocks.
25.4.5	All necessary site tests in respect to DG sets and other system as per scope of work shall be carried out by successful bidder within accepted rates.
25.4.6	List of above tests to be carried out by successful bidder is not exhaustive and they may have to carry out separate tests which may be necessary for satisfactory completion of the job, at no extra cost.
26.0	**COMMISSIONING**
26.1	Successful bidder shall deploy experienced & specialised commissioning engineers' team for commissioning of equipment/ systems under the scope of this tender. Successful bidder will also be responsible for mobilizing all T&P, etc as required for successful commissioning of the equipment/ systems under the scope of this contract and shall carry out all necessary pre-commissioning and commissioning checks/ tests. No separate amount will be paid for such deployment. Accepted rate shall be deemed to be inclusive of this cost.
26.2	Necessary coordination with C&I counterpart for commissioning checks of HT/ LT switchgear, actuators, HT/ LT motor, transformer feedbacks, any other electrical feedbacks to DCS system or any other controller is included in the scope of this tender. Commissioning engineers must be provided by successful bidder during commissioning of these equipments for loop-tests with multimeter at C&I panel end as well as electrical equipment end.

26.3	DRIVE
26.3.1	Electrical testing of HT motors, LT uni-directional & bi-directional motors and DC motors (to be erected by other successful bidders) is included in the scope (detail is given in price schedule). Payment shall be made as per applicable item of price schedule. Before starting the motor, IR values of insulation shall be recorded and if found necessary, dry out operation shall be carried out by successful bidder to improve the IR values as per rate schedule. Necessary cabling from suitable MCB/ DB with all necessary assistance for motor drying out will be in successful bidder's scope. Cables for this purpose will be issued by BHEL on returnable basis free of hire charges. Necessary lugs with crimping tools are to be arranged by successful bidder within their quoted rates.
26.3.2	Rotation of motor terminal boxes and minor modification to suit cable termination, if required, shall be carried out at no extra cost.
26.3.3	For valves & dampers operated through associated MCCs, entire commissioning including setting of limit/ torque switch and position feedback unit, electrical control gear of actuators of MOVs & damper, is included in the scope of this tender. Payment shall be made as per applicable item of price schedule.
26.3.4	Commissioning including setting of all limit switch, etc of soot blowers operated through associated soot blower MCC will be within the scope. Payment shall be made as per applicable item of price schedule.
26.4	Successful bidder have to arrange all safety appliances required during acid filling/ charging of battery and other items, like specific gravity meter, thermometer, jerrycans, funnels, etc. Resistance box with all interconnecting cables, PVC drums, salt, acid for water load, etc of suitable rating/ capacity to carry out capacity/ discharge test of batteries shall be arranged by successful bidder at no extra cost. During commissioning of battery sets successful bidder has to arrange for necessary skilled manpower round the clock for charging, discharging, etc. Also, maintenance of battery parameters on a regular basis, after commissioning till handing over shall be carried out at no extra cost.
26.5	Providing Omicron/ Dobble relay kit for testing of GRP, STRP, BTS, DAVR, T & AVT is in commissioning scope of successful bidder, test kits along with operator need to be arranged by successful bidder as per requirement & satisfaction of BHEL. Functional stability & loop tests from switch yard/ transformer yard, HT/ LT SWGR has to be carried out for respective equipment and to be recorded. OCC & SCC, auto synchronization, interlock with other incomer breaker/ bus-coupler, sequential operation are also included in the scope of commissioning of respective relay panels/ equipment. For DAVR pre-commissioning checks & tests has to be carried out as specified in manufacturer's manual and as required by BHEL. Arrangement of load (eg lamp, heaters with wires) for dummy load test has to be done by successful bidder at no extra cost.
27.0	**PROTOCOL (ERECTION, TESTING & COMMISSIONING)**
	In each erection, testing & commissioning protocol, joint signatures of successful bidder, BHEL as well as Customer, if required, are to be considered for further measurement of work. Signature of BHEL only will not be sufficient for billing purpose. Final set of customer signed protocols, if required as per instruction of BHEL, with spiral binding are to be submitted to BHEL in triplicate.
28.0	**AS BUILT DRAWING**
28.1	Successful bidder has to prepare and submit final approved as-built drawing for all applicable erected equipment.
29.0	**MEASUREMENT OF QUANTITIES, RETURN OF SURPLUS AND WASTAGE**
29.1	In addition to technical requirement stipulated above, unless otherwise specified elsewhere in the tender, following technical requirements shall also be complied with by successful bidder.
29.2	Successful bidder shall, upon receipt of execution drawings, plan, assess and ensure availability of materials for execution. A rolling stock shall be maintained throughout the tenure of contract for the material with up-to date reporting on

	stock position, as well as drawing-wise/ area-wise material consumption for supply package items (eg cable trays and accessories, tray support material, cable, cable termination & jointing kit, earthing material, lug, gland, etc) as well as items supplied by successful bidder as part of package. Any perceived shortages/ immediate requirements etc shall be brought to the notice of the BHEL so that such exigencies can be effected without affecting the work/project schedule. In no case shall work be allowed to suffer on account of shortages, while wastage/ surplus shall be minimised. While, allowable wastages are quantified in the tender, surpluses beyond specified limit of tender value shall be made good by successful bidder. Responsibility for estimation of cabling package material quantities based on execution of work and engineering inputs provided by BHEL rests with successful bidder. These estimates shall be provided by successful bidder periodically to BHEL for ensuring material availability at site to suit erection schedule.	
29.3	For all payment purposes, measurement shall be made on the basis of the execution drawing/ physical measurements. Physical measurements shall be made by the successful bidder in the presence of BHEL	
29.4	Measurements for cable laying shall be made on the basis of length actually laid from lug to lug including that of loops provided and paid accordingly	
29.5	All surplus, scrap & serviceable cables cut out of cables quantity, ie issued by BHEL/ customer to successful bidder shall be returned by successful bidder to BHEL/ customer's stores/ yard in good condition and as directed by BHEL	
29.6	All cables being returned to stores should carry an Al tag indicating size & type of cable. Cable of less than 5m length will be termed as scrap. Unless specified otherwise, cable of length 5m and above shall be termed as serviceable material and shall be returned, size & category wise to BHEL/ customer's stores/ yard, as per instruction of BHEL.	
29.7	Cable of serviceable lengths being returned to the stores in drums shall have their free ends sealed and the balance lengths on the drum(s) shall be noted and certified by BHEL. This shall be applicable only for the purpose of accounting the cables issued by BHEL/ customer for installation.	
29.8	While carrying out material appropriation with successful bidder, all above points will be taken into account. All serviceable material returned by the successful bidder shall be deducted from the quantities issued for the respective sizes and categories and the balance quantity(ies) will be taken as the net quantity(ies) issued to the successful bidder. Material appropriation shall then be done and allowable scrap quantity calculated as per wastage allowance percentage specified in tender	
29.9	Any scrap/ wastage generated by the successful bidder in excess of allowable percentage shall be charged at the rates decided by BHEL/ customer, whose decision shall be final & binding on the successful bidder	
29.10	For steel material supplied by the successful bidder, all scrap shall be returned to BHEL/ customer's store/ yard with due accounting.	
29.11	Successful bidder shall carefully plan the cutting schedule of each cable drum in consultation with BHEL such that wastages are minimised and any resultant short lengths can be used where appropriate route lengths are available.	
29.12	Wastage allowances as permissible for various items are indicated below.	
29.13	Cutting and wastage allowance shall be computed on the lengths of cables and weight of steel actually used, measured and accepted.	
29.14	All wastages shall be properly accounted for and stored as directed by engineer.	
29.15	Wastage allowance for different items shall be as per following.	
	Item	Wastage allowance
29.15.1	HT cable	1%
29.15.2	LT cable above 70 mm^2	1%
29.15.3	LT cable upto 70 mm^2	2%
29.15.4	Control & special cable	3%
29.15.5	Fire survival cable	1%

29.15.6	Steel material (For cable tray/tray support installation/ supplied by BHEL free of cost or the successful bidder	1% by weight
29.15.7	Cable tray work (ladder or perforated type) as per price schedule includes associated accessories, like horizontal bend, vertical bend, tee, cross, reducer (LHS), reducer (RHS). Total quantity of associated items erected for respective tray size shall be measured upon and paid as per relevant item rate. Accepted rates against cable tray as per price schedule shall be in consideration to this.	
30.0	**GENERAL POINTS**	
30.1	In respect of scope of installation/ erection, testing, commissioning, etc of cable tray, cabling, earthing, lightning protection, switch gear, panel, etc work, this volume is to be read in conjunction with other volumes, documents of this tender.	
30.2	Deleted	
30.3	Any minor modification and rectification required for complete installation, testing and commissioning, and satisfactory trial operation and PG testing will be carried by successful bidder at no extra cost.	
30.4	Pre-commissioning, checks for correctness of erection to the entire satisfaction of the BHEL is included in the scope of work.	
30.5	Independent testing and commissioning of equipment erected by competent commissioning engineers to the entire satisfaction of BHEL is included in the scope of work.	
30.6	Successful trial operation and PG testing till handing over of the equipment is included in the scope of work.	
30.7	If necessary, dismantling of protective relays, switches, fuses, CTs, meters, etc and making minor changes in wiring and remounting of such components or mounting of such items supplied loose and connections thereof will be carried out by successful bidder at no extra cost.	
30.8	Any work beyond the scope of work, viz major rectification due to manufacturing defect/ modification arising out of design changes or damages in transit and reworks on works already completed satisfactorily for reasons not attributable to successful bidder, etc will be treated as “Extra work”. Successful bidder will have to carry out such works at the extra man-hour rate as indicated in this tender.	
30.9	Successful bidder shall set each piece of equipment on its foundation or supporting structures. Successful bidder shall assemble equipment as required. All equipment to be installed with parallel, horizontal and vertical alignment by skilled craftsman.	
30.10	Equipment furnished with finished coat of paint shall be touched up by successful bidder, so as to attain required dry film thickness, if their surface is spoilt during handling.	
30.11	For commissioning of system covering mechanical, C&I and electrical, while BHEL engineer shall coordinate, necessary assistance required for labour, supervisor, engineer, etc shall be arranged by successful bidder for the scope of this tender at no extra cost.	
30.12	Post-commissioning activities will include trial run, PG test of all connected equipment/ system which will continue upto the handing over of the unit and performance guarantee test. Successful bidder shall arrange for sufficient numbers of manpower along with engineers and supervisors for carrying out the activities under their own responsibility in coordination with other agencies.	
30.13	In case, any rework is required because of faulty erection of successful bidder, which is noticed during commissioning, the same has to be rectified by successful bidder at their cost.	
30.14	The bill of material for the above equipment/ material under the scope is given in the relevant annexure.	
30.15	The activities in specific but not limited to following for HT & LT switchgear, electrical control panels, etc as detailed in the tender and shall also be under the scope of successful bidder.	

30.16	Boards will be delivered in sections. Necessary inter-connection of bus-bar, bolting of panels, inter-panel wring, etc have to be done by successful bidder.
30.17	Normally, panels shall be complete with instrument mounting & wiring. However, if necessary, dismantling of existing components, making modifications in wiring to suit operating conditions, mounting and rewiring of new components will be carried out by successful bidder at no extra cost. Mounting of any instruments, meters, relays, etc, if supplied loose for safety in transit, are included in scope of work and will have to be carried out by successful bidder at no extra cost.
30.18	Interposing relays will be generally supplied fitted in the switchboard before dispatch. However, if in some cases, the same is supplied loose which will be required to be installed in various switchboards at site as per instruction of BHEL site engineers, it will be done by successful bidder at no extra cost.
30.19	Commissioning of HT & LT switchgear and panels will include operation of all connected components like motors, valves, dampers and finally commissioning of TG sets upto PG test of the unit(s). Successful bidders will have to keep their people round the clock, if necessary, during milestone activities, viz boiler light up, EDTA cleaning, steam blowing, synchronisation, full loading, trial run, and promptly take action for any repair, check and rectification, etc as required in the equipment erected and/ or commissioned by them.
30.20	Where assemblies are supplied in more than one section, successful bidder will make all necessary mechanical & electrical connections including connection between the buses. Successful bidders shall also do necessary adjustments/ alignment necessary for proper operation of circuit breakers and their operating mechanisms. Insulators & bushings shall be protected against possible damage due to negligence or carelessness of successful bidder during installation. Insulator/ bushing chipped/ cracked due to negligence/ carelessness of successful bidder shall be replaced by successful bidder at their own cost.
30.21	Base channel shall be normally supplied with switchboard/ panel. These will have to be aligned, levelled and grouted in position as per approved drawings. Wherever the base channels are not supplied, structural materials will be supplied by BHEL free of cost and the same will be fabricated and painted at site. Payment shall be made as per applicable item rate. Opening will be left on the floor during the time of casting where the base channels will have to be grouted. All minor concrete chipping and finishing works will be included in the scope of job.
30.22	Fabrication, painting and erection of cross channel, may be required to be done at site. Materials will be supplied by BHEL free of cost as per tender and the same will be fabricated & painted at site. Payment shall be made as per applicable item rate.
30.23	Fixing of support (base channel), alignment, levelling of supports and equipment, erections, testing and commissioning including earthing, checking of wiring, terminating protective relays, instruments, switches, etc of connecting internal wiring, testing of current transformers, potential transformers and all other internal components mounted in these equipment shall be under the scope of successful bidder.
30.24	Panels may be supplied in detachable unit housed in wooden case which will be opened properly at the place of erection and will be placed on supports (base channels) levelled, aligned. Complete assembly, erection, connections of inter-panel wiring & bus-bars between two adjacent despatchable units to be done as per as per drawing.
30.25	Subject to requirement, successful bidder shall fabricate and erect canopy for various equipment erected outside. Necessary structural materials, GI sheets, etc will be provided by BHEL free of cost.
30.26	It's responsibility of successful bidder to collect all HT earthing trucks (approximately 21 nos) from store, shift & place them to the designated place as per direction of BHEL. The scope also includes use of these equipment during,

	testing, commissioning, etc, as required. Cost of these activities is deemed to have been included in the accepted rate/ price.
30.27	Successful bidder have to arrange for necessary cleaning and suitable disposal of cable waste and working debris arising out of job executed by them, at designated location, on a daily basis. Failure to upkeep cleanliness and housekeeping will attract penalty as per relevant clause of tender.
30.28	Unless specified otherwise in tender, for cable of size 2.5 sqmm & below, cable termination rate (including shortings, etc) shall be inclusive of supply of lugs.
31.0	**ANNEXURE-I**
32.0	**ANNEXURE-II**

ANNEXURE-I
BHEL CABLE MANAGEMENT SYSTEM

SL NO	DESCRIPTION
1.0	**OBJECTIVE**
	To control and reduce the losses due to wastage of cable and measure the consumption of cable etc.
2.0	**BRIEF INTRODUCTION**
2.1	BHEL Cable Management System is designed for total management of plant cabling and its accessories at BHEL project site. The process start from dispatch, receiving of material (cable) at site from different BHEL agencies, storing of cable drum, issue and installation of cable at different work area as per cable schedule from concerned BHEL agencies. Along with BHEL material management agency, electrical and C&I agencies are the user of this system. Capturing of plan verses actual usage (laying length) of the cable data along with its identity is the purpose of the system. From this data it is possible to summarise the agency-wise total consumption, wastage, scrap, etc. System is able to extract or forecast the material requirement planning.
2.2	System is able to verify the wastage limit and other criteria of plant cable related job.
3.0	**USER**
3.1	Designing agencies and Supply agencies of BHEL.
3.2	MM & Erection engineers of BHEL
3.3	MM successful bidder, erection (Electrical, C&I & other agencies engaged in cable laying, termination, testing job).
3.4	Others internal users like.
3.5	System administrator.
3.6	Project administrators.
3.7	Job providers.
3.8	Application providers.
3.9	Data providers.
3.10	Resource providers.
4.0	**SOFTWARE FEATURE**
4.1	It's a web based system and compatible to most of all popular window based browser. Backend is oracle database and front end is published on internet information Server. Required popup allowed for this websites. May not be fully compatible with android device. Available over intranet and internet of BHEL. No cookies, script running permission or certificate etc required to open the application.
4,2	All user of this system should have a unique 'User ID' and 'password' to enter into the system. Along with that user needs permission for project(s) and function(s) he is allowed to work. One user can works in a single project at a time. Works at multiple project and multiple function is allowed exclusively (i.e. concurrent working not allowed). BHEL will have Global and local Administrators (local to project) who are authorised to provide rights to user in respective area.
5.0	**INPUT**
5.1	Master data, data for system administration – by BHEL.
5.2	Drawing and cable schedule – by BHEL.
5.3	Material scope – by BHEL.
5.4	Material management (Stock entry)/ issue – MM material receipt – Erection agency.
5.5	Cabling work/ re-work – Erection agency.
5.6	Re-routing, reason for re-routing – Erection agency.
5.7	Review & approval for all function – by BHEL.
5.8	Work log (Measurement sheet) data entry – Erection agency.
5.9	Work log forwarding for billing – Erection agency.
6.0	**OUTPUT**
6.1	Stock register.
6.2	Stock availability.

6.3	Successful bidder stock & availability.
6.4	Successful bidder consumption.
6.5	Successful bidder work log.
6.6	MU-wise planned quantity.
6.7	MU-wise stock, consumption.
6.8	Wastage, scrap.
6.9	Material requirement planning = Material requirement as per schedule – balance at site store - (Consumed + WIP).
7.0	**WORK LOG (MEASUREMENT SHEET)**
7.1	Drum number and dispatched unit mandatory in stock entry.
7.2	Used cable length = Gland to gland length + Lead length at end 1 + Lead length at end 2.
7.3	Drum length = Used cable length + Wastage length + Scrap length + Returned length (RSV).
7.4	Scrap = Cable not further usable.
7.5	Wastage = Small pieces which are cut during termination.
7.6	Un accounted cable length of a Drum shall be treated as wastage and shall be added to accounted wastage.
7.7	Gland to gland length = Reading at start gland - reading at end gland.
7.8	Lead length at end 1 and end 2 = Up to a fixed length depending on rack/ equipment size (to be decided by BHEL and built in the system)
7.9	Billable length = Used Cable length (Lug to Lug)
7.10	Re-use of used range of cable is not allowed.
8.0	**FUNCTION**
8.1	System administration by BHEL.
8.2	Create project.
8.3	Create package.
8.4	Create user.
8.5	Allotment of user right.
8.6	Addition of routing user.
8.7	Create stock yard.
8.8	Maintenance of all master data.
8.9	MM agency - Create DB, gate pass.
8.10	Erection user: RIV, RSV, work log, bill, stock, consumption.
8.11	BHEL user: Review and approval of all activity.
8.12	BHEL user: Re-work approval and cable routing priority settings.
9.0	**USER GUIDE**
9.1	User manual will be available in the system, access will be given to successful E&C agency. Training for users will be provided by BHEL. Successful bidder has to identify/ nominate 2-3 persons for the purpose.
9.2	System enhancement may take place at any time – it's a continuous process.
9.3	Area: Cable tray, gland, lug, work log and billing.

ANNEXURE-II-R-00

TENTATIVE DIMENSION/ WEIGHT OF MAJOR EQUIPMENT (VARIATION IN DIMENSION AND WEIGHT UPTO PLUS/MINUS 15% SHALL BE CONSIDERED AS MATCHING WITH SPECIFIED DIMENSIONS/WEIGHT)

SL NO	ITEM DESCRIPTION	UNIT	TOTAL QTY	APPROXIMATE DIMENSION (EACH)			APPROXIMATE WEIGHT (EACH) (MT)
				L (M)	B (M)	H (M)	
1	**HT Switchgear**						
1.1	11KV, 4000A, UNIT-1 SWITCH BOARD - 1BA (01BBA)	NO OF BOARD	1				
1.1A	Section-A			17.4	2.927	2.846	37.8
1.1B	Section-B			18.2	2.927	2.846	39.6
1.2	11KV, 4000A, UNIT-1 SWITCH BOARD - 1BB (01BBB)	NO OF BOARD	1				
1.2A	Section-A			14.12	2.927	2.846	30.6
1.2B	Section-B			14.94	2.927	2.846	32.4
1.3	11KV, 4000A, STATION SWITCH BOARD - 0BA (00BBA)	NO OF BOARD	1	7.54	2.927	2.846	14.4
1.4	3.3KV, 3150A, UNIT-1 AUX. SWITCH BOARD (01BCA)	NO OF BOARD	1	23.34	2.927	2.846	52.2
1.5	3.3 KV, 1600A, STATION SWITCH BOARD (00BCA)	NO OF BOARD	1	21.1	2.927	2.846	46.8
1.6	3.3 KV, 1000A, RAW WATER SWITCH BOARD (00BCG)	NO OF BOARD	1	11.26	2.927	2.846	25.2
1.7	3.3 KV, 2500A, CHP-1 AUX. SWITCH BOARD (00BCB)	NO OF BOARD	1	18.42	2.927	2.846	41.4
1.8	3.3 KV, 2500A, CHP-2 AUX. SWITCH BOARD (00BCC)	NO OF BOARD	1	25.8	2.927	2.846	57.6
1.9	3.3 KV, 2000A, CHP-3 AUX. SWITCH BOARD (00BCD)	NO OF BOARD	1	24.16	2.927	2.846	54
1.10	3.3 KV, 1000A, JETTY AUX. SWITCH BOARD (00BCF)	NO OF BOARD	1	10.44	2.927	2.846	23.4
1.11	3.3 KV, 1000A, AHP AUX. SWITCH BOARD (00BCE)	NO OF BOARD	1	15.36	2.927	2.846	34.2
1.12	3.3 KV, 1250A, UNIT-1 FGD SWITCH BOARD (01BCB)	NO OF BOARD	1	13.72	2.927	2.846	30.6
1.13	11 KV EARTHING TRUCKS	SET	9	0.7	0.9	1.3	0.56
1.14	3.3 KV EARTHING TRUCKS	SET	20	0.7	0.9	1.3	0.56
1.15	11 KV BUS TRANSFER PANEL	NO.	2	0.8	0.8	2.3	0.25
2	**LT SWBD AND DC DB**						
2.1	415V, 3000A, UNIT-1 EMERGENCY MCC (01BMA)	NO OF BOARD	1	15.36	1.1	2.45	18.57
2.2	220V, 1000A, UNIT-1 MAIN DCDB (01BUA)	NO OF BOARD	1	8.56	1.1	2.4	9.63
2.3	415V, 3200A, UNIT-1 TURBINE SERVICE PMCC (01BFA)	NO OF BOARD	1	14.46	1.1	2.45	17.32
2.4	415V, 250A, UNIT-1 TURBINE VALVE DB (01BJA)	NO OF BOARD	1	11.16	1.1	2.4	12.62
2.5	415V, 630A UNIT-1 SERVICE ACDB (01BJB)	NO OF BOARD	1	8.46	1.1	2.4	9.87

0.325

2.6	415V, 4000A, UNIT-1 BOILER SERVICE PMCC (01BFB)	NO OF BOARD	1	17.36	1.1	2.45	20.43
2.7	415V, 250A, UNIT-1 BOILER VALVE & DAMPER ACDB(01BJC)	NO OF BOARD	1	11.06	1	2.4	11.07
2.8	415V, 400A, UNIT-1 BOILER ACDB (01BJD)	NO OF BOARD	1	6.36	1.1	2.4	7.07
2.9	415V, 400A, UNIT-1 ESP & ID FAN AREA MCC (01BJE)	NO OF BOARD	1	3.66	1.1	2.4	4.07
2.10	415V, 400A, UNIT-1 ESP AC & VENTILLATION MCC (01BJF)	NO OF BOARD	1	3.66	1.1	2.4	4.07
2.11	415V, 4000A, STATION SEVICES PMCC, UNIT-1 (00BFA)	NO OF BOARD	1	13.4	1.1	2.45	16.62
2.12	415V, 630A UNIT-1 AIR WASHER MCC (01BJG)	NO OF BOARD	1	7.56	1.1	2.4	8.87
2.13	415V, 1600A, CCR AIR CONDITIONING MCC (00BJS)	NO OF BOARD	1	5.76	1.1	2.4	6.87
2.14	415V, 1000A, UNIT-1 VENTILATION MCC (01BJH)	NO OF BOARD	1	7.56	1.1	2.4	8.87
2.15	415V, 630A, UNIT-1 MISC SERVICE MCC (00BJQ)	NO OF BOARD	1	15.66	1.1	2.4	17.87
2.16	415V, 3200A, ADMIN BUILDING PMCC (00BFF)	NO OF BOARD	1	7.56	1.1	2.4	8.87
2.17	415V, 400A, AUDITORIUM ACDB (00BJK)	NO OF BOARD	1	6.36	1.1	2.4	7.07
2.18	415V, 400A, CANTEEN ACDB (00BJL)	NO OF BOARD	1	6.36	1.1	2.4	7.07
2.19	415V, 1000A, SERVICE BUILDING MCC (00BJM)	NO OF BOARD	1	7.56	1.1	2.4	8.87
2.20	415V, 400A, GAS CHLORINATION MCC (00BJN)	NO OF BOARD	1	7.56	1.1	2.4	8.87
2.21	415V, 3200A, FUEL OIL PMCC (00BFC)	NO OF BOARD	1	14.76	1.1	2.45	17.22
2.22	415V, 400A, PERMANENT STORE ACDB (00BJA)	NO OF BOARD	1	5.46	1.1	2.4	6.07
2.23	415V, 630A, WORKSHOP MCC (00BJB)	NO OF BOARD	1	7.56	1.1	2.4	8.87
2.24	415V, 630A, H2 MCC (00BJC)	NO OF BOARD	1	7.56	1.1	2.4	8.87
2.25	415V, 4000A, RODM PMCC (00BFE)	NO OF BOARD	1	24.66	1.1	2.45	28.72
2.26	415V, 2500A, DESALINATION PMCC (00BFJ)	NO OF BOARD	1	15.36	1.1	2.45	18.57
2.27	415V, 1600A, PTP MCC (00BJH)	NO OF BOARD	1	5.46	1.1	2.4	6.07
2.28	415V, 630A, FIRE WATER MCC (00BJF)	NO OF BOARD	1	7.56	1.1	2.4	8.87
2.29	415V, 630A, CPU MCC (00BJD)	NO OF BOARD	1	10.26	1.1	2.4	11.87
2.30	415V, 630A, ETP MCC (00BJE)	NO OF BOARD	1	14.76	1.1	2.45	17.22
2.31	415V, 3200A, AUX.BOILER PMCC (00BFD)	NO OF BOARD	1	15.36	1.1	2.45	18.57
2.32	415V, 3200A, COOLING TOWER PMCC - 1 (01BFJ)	NO OF BOARD	1	15.36	1.1	2.45	18.57
2.33	415V, 800A, CWT & CHLORINATION MCC (00BJP)	NO OF BOARD	1	5.46	1.1	2.4	6.07

2.34	415V, 3200A, UNIT-1 FGD SERVICE SWITCH BOARD (01BFH)	NO OF BOARD	1	24.66	1.1	2.45	28.72
2.35	415V, 2500A, FGD COMMON SERVICE SWITCH BOARD (00BFH)	NO OF BOARD	1	24.66	1.1	2.45	28.72
2.36	415V, 630A, FGD AC & VENT. MCC (00BJT)	NO OF BOARD	1	6.36	1.1	2.4	7.07
2.37	415V, FGD EMERGENCY MCC (00BMA)	NO OF BOARD	1	11.76	1.1	2.4	13.92
2.38	415V, 2500A, UNIT-1 ESP LTMSB-A (01BFC)	NO OF BOARD	1	11.76	1.1	2.4	13.92
2.39	415V, 2500A, UNIT-1 ESP LTMSB-B (01BFD)	NO OF BOARD	1	11.76	1.1	2.4	13.92
2.40	415V, 2500A, UNIT-1 ESP LTMSB-C (01BFE)	NO OF BOARD	1	11.76	1.1	2.4	13.92
2.41	415V, 2500A, UNIT-1 ESP LTMSB-D (01BFF)	NO OF BOARD	1	11.76	1.1	2.4	13.92
2.42	415V, 63A, UNIT-1 SOOT BLOWER MCC (01BJI)	NO OF BOARD	1	20.06	1.1	2.45	20.07
2.43	220V, 50A, FGD/FOPH DCDB	NO OF BOARD	1	5.46	1.1	2.4	6.07
2.44	220V, 50A, RWPH DCDB	NO OF BOARD	1	5.46	1.1	2.4	6.07
3	TRANSFORMERS (INDICATED WEIGHTS ARE IN DRY OIL CONDITION OF TRANSFORMERS)						
3.1	OIL FILLED TRANSFORMERS						
3.1.1	Generator Transformer (3x1 phase 270MVA, {(420/√3)/21KV)} along with all accessories complete (01BAT01,01BAT02,01BAT03)	SET	1	6.2	4.95	4.95	3 X 218
3.1.2	Spare GT 1X1 Phase 270MVA, {(420/√3)/21KV}) along with all accessories complete	SET	1	6.2	4.9	4.95	218
3.1.3	Station Transformer (125/62.5/62.5 MVA, 230/11.5/11.5 KV) with NGR and all accessories complete (00BAT01)	SET	1	6.5	3	6.5	120
3.1.4	65 MVA, 21/11.5 KV Unit Transformer with NGR and accessories complete (01BBT01, 01BBT02)	SET	2	4.5	3.5	4.5	42
3.1.5	16 MVA, 11/3.45 KV Unit Aux. Transformer - 1A & 1B with NGR and accessories complete (01BBT03, 01BBT04)	SET	2	3.5	3	3.5	17.5
3.1.6	8 MVA, 11/3.45 KV Station Aux. Transformer with NGR and accessories complete (00BBT01)	SET	1	6.5	4.8	5.4	25
3.1.7	6.3 MVA, 11/3.45 KV FGD Aux. Transformer - 1A & 1B with NGR and accessories complete (01BBT05, 01BBT06)	SET	2	6.5	4.8	5.4	12.25
3.1.8	12.5 MVA, 11/3.45 KV CHP Aux. Transformer - 1A&1B with NGR and accessories complete (00BBT03, 00BBT04)	SET	2	4.5	2.5	2.7	13.5

3.1.9	12.5 MVA, 11/3.45 KV CHP Aux. Transformer - 2A&2B with NGR and accessories complete (00BBT05, 00BBT06)	SET	2	4.5	2.5	2.7	13.5
3.1.10	10 MVA, 11/3.45 KV CHP Aux. Transformer - 3A&3B with NGR and accessories complete (00BBT07, 00BBT08)	SET	2	7.2	5.5	4.3	20.85
3.1.11	3.5 MVA, 11/3.45 KV AHP Aux. Transformer - A&B with NGR and accessories complete (00BBT09, 00BBT10)	SET	2	6.4	5.5	5.2	11
3.1.12	3.5 MVA, 11/3.45 KV AHP Silo Jetty Transformer - A&B with NGR and accessories complete (00BBT11, 00BBT12)	SET	2	6.4	5.5	5.2	11
3.1.13	3.5 MVA, 11/3.45 KV Raw Water Transformer - A&B with NGR and accessories complete (00BBT13, 00BBT14)	SET	2	6.4	5.5	5.2	11
3.1.14	95 KV, 1000mA HVR TRANSFORMER (ERECTION IS EXCLUDED - OIL FILTRATION & COMMISSIOINING ONLY)	NO.	56	2	1.6	2	2
3.2	OIL FILLED SERVICE TRANSFORMERS						
3.2.1	2.5 MVA, 11 /0.433KV, RODM Plant Service Transformer with all accessories complete (00BFT09, 00BFT10)	SET	2	4	3.2	3	7
3.2.2	2 MVA, 11 /0.433KV, CT Service Transformer with all accessories complete (01BFT15, 01BFT16, 01BFT15)	SET	3	3.5	3	2	6.5
3.2.3	2 MVA, 11 /0.433KV, Fuel Oil Service Transformer with all accessories complete (00BFT05,00BFT05)	SET	2	3.5	3	2	6.5
3.2.4	2 MVA, 11 /0.433KV, Aux. Boiler Service Transformer with all accessories complete (00BFT07, 00BFT08)	SET	2	3.5	3	2	6.5
3.2.5	2 MVA, 11 /0.433KV, Admin Service Transformer with all accessories complete (00BFT11, 00BFT12)	SET	2	3.5	3	2	6.5
3.2.6	2 MVA, 11 /0.433KV, Desalination Service Transformer with all accessories complete (00BFT13, 00BFT14)	SET	2	3.5	3	2	6.25
3.2.7	1.6 MVA, 11 /0.433KV, ESP Service Transformer with all accessories complete (01BFT05, 01BFT06, 01BFT07, 01BFT08, 01BFT09, 01BFT10, 01BFT11, 01BFT12)	SET	8	3	3	3	5.5
4	DRY TYPE TRANSFORMERS						
4.1	2500 KVA, 11 KV/433V, WITH ALL ACCESSORIES COMPLETE	NO.	6	3.2	2.265	3	1.275
4.2	2000 KVA, 11 KV/433V, WITH ALL ACCESSORIES COMPLETE	NO.	4	3	2.165	2.9	1
4.3	1600 KVA, 11 KV/433V, WITH	NO.	2	3	2.165	2.75	3.5

	ALL ACCESSORIES COMPLETE						
4.4	8500 KVA, 21 KV/765V EXCITATION TRANSFORMER & RECTIFIER UNIT WITH ALL ACCESSORIES COMPLETE	NO.	1	5.18	2	3.7	9.3
5	**IP BUS DUCT (24KV)**						
5.1	NG cubicle with NGR, NGT including assembly of loose components along with internal wiring, mounting of neutral CT etc.(Unit-1)	SET	1	2.2	1.65	2.1	-----
5.2	LAVT Cubicle including assembly of loose components along with internal wiring, mounting of LAs & VTs etc. (Unit-1)	SET	1				
		BOXES	3	1.5	0.8	2.1	
5.3	SPVT Cubicle including assembly of loose components along with internal wiring, mounting of VT etc. (Unit-1)	SET	1				
		BOXES	3	2	0.8	2.1	
5.4	Air pressurisation equipment comprising of load unit, compressor, receiver, drier, pressurising panel & control panel etc. (Unit-1)	SET	1				
5.4A	23 KW load consist of compressor and receiver			3.3	2.5	1.5	
5.4B	Drier and pressuring panel			2.65	2.3	3.3	
5.4C	Control panel			0.6	0.76	0.35	

ANNEXURE-III

(SPECIAL TECHNICAL REQUIREMENT)

B7.3.8 Earthing and lightning protection installations

B7.3.8.1 Earthing system - general

The earthing system will mainly comprise an earthing grid directly buried at a depth of not less than 1.0 m in the ground and a set of raisers connecting all electrical equipment and all metallic frames to the earthing grid forming an equipotential bonding system

The earthing system shall fulfill the following requirements:

- maintain a low overall resistance of the earth mass to limit the plant potential rise and ensure protective relay operation in the event of an external fault
- provide ground connections to all electrical apparatus enclosures and structural steelwork adequate to carry prospective ground faults without excessive heating or fire risk
- limit potential differences within the power plant site in the event of earth current, originating from within or outside the station. To ensure the safety of personnel and eliminate interference or damage to sensitive electronic circuits
- The contractor shall provide a potential gradient control system for all locations where dangerous surface voltage grandients can occur, the step and touch voltage shall be less than the permissible values according VDE 0101- 2 Figure 4 or IEEE 80.

The Bidder shall be entirely responsible for the earthing system and connections to cover the whole area and for ensuring that all apparatus is securely and safely connected to this system. The overall resistance of the earthing system shall be 0.5 Ohm or less.

The earthing system shall be interconnected with the earthing system provided for the 400/230 kV kV substation.

The requirements Part B0 shall apply.

B7.3.8.2 Common earthing system

The earthing system is common for:

- protective earthing for equipment at all voltages
- transformer neutral points earthing
- equipment equipotential earthing and bonding
- lightning protection system, etc.

The main parts of common earthing system are:

- indoor earthing system (above-ground earthing system)
- outdoor/external earthing system (under-ground earthing system)
- foundation earthing (see Part B0)
- lightning protection system.
- Screening.

B7.3.8.3 Indoor earthing system

The indoor earthing system shall form one ring inside the building on the walls of each building floor. Encircling bare copper bars shall be used inside

the building. From the inner ring the connections to the bus, panels and other electrical apparatus, cable trays, conduits, doors, steelwork, etc., shall be made using tinned stranded copper conductor or copper bars. All the electrical equipment, frames and mechanical apparatus shall be provided with designated earthing points with at least two connections to the earthing inner ring.

Large plants situated in buildings shall each be enclosed by an earth ring connected to the main earth grid at two or more points, at least every 20 m. The copper conductors may be laid and fixed at the cable trays. Where this is not possible earthing conductor supports shall be provided fixed in concrete or masonry. The copper bars shall be also fixed with earthing support on walls.

B7.3.8.4 Foundation earthing

The requirements of Part-B0 shall apply.

B7.3.8.5 Outdoor/external earthing system

The requirements of **Part B0** shall apply.

The outdoor earthing system consists of:

- earthing grid
- vertically buried rods, etc.

The earthing grid made of stranded tinned copper conductors with a minimum cross section of 240 mm2 shall be installed in the form of a common network. This is required to prevent the occurrence of excessive contact and step potentials on conducting parts of the installations which are not part of the electrical circuit.

The earth electrodes buried directly in the ground shall be arranged so as to utilize fully the available site area. An earthing grid shall be formed by interconnection of various points of the earth electrodes permitter. The spacing between conductors forming the mesh system shall limit the maximum mesh potential to a value not greater than the maximum tolerable contact potential.

The facilities most likely to supply or carry high current, such as the transformer, shall always be connected to the grid with more than one down-lead. The location of the grounding grid shall enable all items of equipment to be connected to the earthing system via the shortest possible route.

The lightning installations for all the buildings, structures, etc., shall also be connected to the earthing system.

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B7.3.8.6 Screening

The effects of lightning strokes on control and monitoring systems can lead to the destruction of electronic sub-assemblies and cables and shall therefore be prevented by adequate "screening" (see **Part B0**).

B7.3.8.7 Fences

All internal fences shall be bound to the main earth grid by a buried earth conductor (0.3 m deep) outside the fence to reduce touch voltages to a safe value.

The perimeter fence shall be provided with a separate earth not connected to the main earthing grid provided the two systems have a minimum separation of not less than two and a half meters. Where the systems approach closer than two and a half meters, they shall be bonded together.

B7.3.8.8 Cable trenches, tunnels, raceways and risers

A main copper earthing conductor shall be provided for each cable route to which all steelwork shall be bonded.

B7.3.8.9 Pipelines

Pipelines entering the site shall be fitted with a length of electrical insulation over the pipe on each side of the fence, and an insulating flange at the boundary. This prevents dangerous potentials occurring between the pipe and earth, both within and outside the site.

B7.3.8.10 Communication circuits

If it is not possible to limit the rise of station earth potential to the maximum of 650 V rms typically required by communication authorities isolating devices shall then be applied to the incoming lines as part of the communications installation.

B7.3.8.11 Material

Earth Electrodes
Earth electrodes shall consist of a network of horizontally buried conductors with vertically buried rods connected to the horizontal conductors.

Tinned stranded soft copper conductor shall be used for earth electrodes (grid conductors).

The cross-section of earth electrodes shall be chosen by the Bidder in accordance with the technical data but not less than 240 mm^2.

The size of tinned stranded soft copper conductors shall be uniform throughout the plant.

Earthing Conductors

Bare copper bars shall be used for the ring inside the buildings on the walls at each operational level

Tinned stranded soft copper conductor or copper tape shall be used for connection of the equipment to the ring inside buildings.

Tinned stranded soft copper conductors or PVC insulated copper conductor shall be used for all connections to earthing grid.

Single connections between the equipment and the earthing system shall carry the total fault current but the cross-section area of branch connections may be reduced to 60 percent of corresponding single conductor to provide for the current distribution in two or more conductors.

The earthing conductors shall be sized to carry for 1 sec the max. earth fault current.

The minimum cross sectional area of any earthing conductor shall be 16 mm^2.

Earthing Connections

All equipment within the station area shall be connected to the main grid including but not limited to the following: steel structures, hoist and motors, cranes and motors, control boards, generator frames, generators neutral point, generator cubicles, excitation cubicles, MV switchgear, transformers neutral point, transformer tanks, 400/230 kV GIS, fences, cables armour, cable trays and conduits, bus ducts, overhead shield wires, AC switchboards, DC switchboards, control panels, control desks, relay racks, motor frames, lighting fixtures, lighting poles, housing of small equipment, ladders, steel reinforcing bars where it is applicable or where it is used in ground slabs for equipotential grading, etc.

All joints and connections welding shall be of cad weld technique.

The location of all buried joints shall be identified on a drawing.

Whenever dissimilar materials are to be joined the necessary transition plates shall be inserted as required to ensure that electrolytic action is avoided.

All electrical equipment shall be equipped with earthing hooks of sufficient size and shall be earthed at the earth system by means of heavy-duty tinned copper compression lugs.

Earth Pits and Earth Rods

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Earth pits shall be provided for connecting copper bond earth rod with earth grid.

Earth rods shall be minimum 16 mm diameter and of a length sufficient to penetrate 3 m below the water table. Tinned copper shall be used for earth rods.

Earth rod shall be completed with a rod to cable clamp.
Earth link pits shall be provided at all interconnection points with the earthing system provided for the 400/230 kV Substation.

B7.3.8.12 Lightning protection

The requirements of Part-B0 shall apply.

The main components of a lightning protection system are as follows:

- air terminations
- down conductors
- earth terminations
- joints, bonds, test joints, etc.

All buildings and other high structures shall be fitted with rod-type air terminals and shall be connected to earth rods. Down conductors shall be bonded to adjacent metalwork and other earth conductors. All conducting bodies having a plan area exceeding 1 m2 or a volume of 0.1 m^3 shall be connected to a local ground rod, unless located entirely within a zone of lightning protection from an adjacent structure. All surge diverters shall be directly connected to earth rods. All earth rods shall be connected to the main earth grid. The steelwork of ground slabs shall be used to form an equipotential system bonded to the main earth grid, but the alternative of using a separate earth mat bonded to the grid may be considered in some areas.

The down conductor shall be designed to minimize the possibility of flashover to adjacent metal objects. Particular care shall be taken to ensure that the overall design is free from undue chemical and electrolytic effects.

Lightning earth rods shall be placed as near as practicable to the building line of the protected structure.

Disconnection links shall be installed at strategic points in the lightning protection system to all checking of the integrity of both the down conductor and earth termination.

The Bidder is bound to provide complete works even if the equipment or services to be provided are not mentioned specifically.

All necessary excavation and backfilling are included in this part of Contract.

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Bonding and Earthing

General

The conductors and sheaths of single-core 230 kV XLPE power cable connections shall be successively transposed at each joint pit location.

The cross-bonding system of the single-core 230 kV cable sheath circuit as well as design of the relative individual accessories shall also be provided. Insulation flanges at each joint are required to simplify fault locations at the cable sheath.

The maximum allowed induced voltage at normal operation shall not be higher than 110 V. The cable metallic sheaths shall be directly earthed through link boxes at every third joint bay. At the intermediate joints the sheaths shall be earthed through voltage limiters to limit steep-fronted transient over voltages to a value which can be safely withstood by the sheath insulation (i.e. in addition to the cable over- sheath this includes external joint insulation, terminal base insulation, sheath sectionalizing insulation - if any - as well as the insulation of the bonding leads and link boxes themselves).

If single-point bonded cable sheath, which is bonded at one position only shall be required, the applied ground continuity conductor shall meet IEEE Std 575 recommendations.

The bond connections and ground continuity conductors shall be able to carry the normal sheath current as well as the maximum fault current without undue heating. The completed bonding system shall be subject to a related test in the presence of Employer/Engineer. The cables used for cross-bonding leads shall be coaxial bonding cable.

Earthing at each joint location shall comprise of a tinned copper wire mesh and copper welded earth rods and insulated copper earth connections, all supplied and installed by the Bidder/Contractor completely with cast iron or hot-dip galvanized steel link boxes at each joint and cross-bonding links, housed in reinforced underground concrete pits necessary for easy access and disconnection to facilitate periodical serving tests.

Lids of concrete pits shall be made of light weight material with two strong handles. These shall move freely and shall not project after being placed in position. They shall be designed for heavy traffic loading.

The size of copper earth connections shall be adequate to carry the full expected fault current for the cable system.

The individual ground resistance at each earthing point shall not exceed 1.0 Ohm. Where necessary additional earth rods shall be provided to obtain this value under all considerable circumstances.

The metal sheath of the cables shall be connected to the earthing system at the sealing ends. Insulated links placed in proper boxes shall be included for easy disconnection to carry out periodical cable outer sheaths tests.

Bonding Leads

Bonding leads shall be very flexible. They shall consist of stranded copper conductors and shall be capable of withstanding the test voltage of 25 kV DC with 1 min duration according to IEC 60229 respectively after laying the test with 10 kV DC with 1 min duration.

Sheath bonding leads and coaxial cable leads to be installed between joints and various types of link boxes with or without voltage limiters as well as ground continuity conductors according to IEEE Std 575 recommendation, shall consist of XLPE insulated stranded copper wires conductor cables and shall be PVC sheathed. The size of those conductors must be adequate to carry the full expected (specified) fault current of the concerned cable circuit. Sheath bonding leads shall be permanently marked with phase identification at both ends of the cables and shall have a cross section of not less than 500 mm². Bonding system equipment, with the exception of surge voltage limiters (SVL), shall be capable of withstanding test after installation of 10 kV DC to earth for 1 minute and the subsequent

maintenance tests of 5 kV DC to earth for 1 minute when disconnected from earth.

Link Boxes

The link box to be made of stainless steel plate of sufficient mechanical strength for indoor, outdoor and burial applications, which is preferred to be vertical type with door and master key, is depending from the site conditions.

All bonding connection equipment with the exception of surge voltage limiters (SVL) shall be capable of withstanding a commissioning test after installation of 10 kV dc to earth for 1 minute and the subsequent maintenance tests of 5 kV dc to earth for 1 minute when disconnected from earth, and the short circuit levels given in this Specification.

The busbar or the links shall be capable of withstanding the fault current without temperature rise above acceptable value.

The link bar inside the link box shall be made of tin-coated copper. The removable copper links in the link boxes shall be so designed that there is no possibility of putting back the removable links in the wrong positions. The contact resistance shall be below 10 μΩ. The removal of the link bar for operation and testing on the cable sheath shall be done on a per-phase basis and will not impose unnecessary work in the connections or disconnection of the other phases connection and components inside link box.

Above ground link boxes shall be of weatherproof design suitable for mounting indoor or outdoor on structure or on wall. The link box shall be made of high quality stainless steel plate and shall be robust with adequate mechanical strength and be earthed by connection to the outgoing earth conductor. The selection of stainless steel covering shall consider the installation environment and longer-term use without rusting and corrosion on its surfaces.

Buried type link box shall be of a waterproof design by means of sealing arrangement suitable for installation in shallow pits with a depth of one to two meters below the ground surface. The link box shall be made of high quality stainless steel plate and shall be robust with adequate mechanical strength and be earthed by connection to the outgoing earth conductor. It shall be designed to withstand at least two meters depth of water and it will remain watertight throughout operation. The opening of front cover shall be designed with ease operation and will not involve more than one person for operation.

The link box will be installed in an underground manhole adjacent to the joint bay.

The lead sheath of two ends of the cable will be connected via copper conductor concentric bonding cable to the link box, whilst at switchgear and transformer side, the lead sheath of the cable end will be connected via

copper conductor to the ground through the link box. Suitable provisions such as cable lug or other shall be made for the connection of bonding cable. For those link boxes equipped with surge voltage limiter, they must be designed to be strong enough to withstand the impact due to the bursting apart of any surge limiter under fault conditions.

An identification of phase sequence, a permanent red "DANGER" signage and wiring diagram of the link box shall be provided and fixed on the front covering of the link box. The label shall be durable for longer-term use without deformation and decoloration.

Link boxes protection classes shall meet requirements as specified in the Technical Data Sheets.

Induced Voltage

General
All information and calculations on induced sheath voltages; cross-bonding arrangements and influences on the parallel protection/telephone cables shall be submitted, giving sufficient information to Employer/Engineer. The protection/telephone cables laid in power cable trenches or in the vicinity of such power cables have to be protected against damage by induced high voltages occurring in case of asymmetrical power cable operation, e.g. during short circuits.

Thus the Bidder/Contractor must prove by calculation on the induced voltages whether the sheaths and insulation of the offered cables are sufficient for the given network configuration.

The following assumptions shall be taken into consideration for such design (and evaluation) purpose only:

- cable arrangement as per enclosed tender drawings
- maximum zero-sequence current
- actual specific soil resistivity
- ohm at 80% of the length, and
- 1000 Ohm at 20% of the length.

All further protection measures for the protection/telephone cables (e.g. isolating transformers to be installed at certain pits within the cable run, or increase of insulation) shall be elaborated and proposed, and the Bidder/Contractor shall offer all equipment at work involved, by indicating all such modifications in his List of Deviations.

Surge Voltage Limiters (SVLs)
The surge limiter shall be designed with the purpose of limiting surge voltages under switching or fault conditions so as not to cause any sheath serving insulation breakdown.

For the surge voltage limiters, they shall be made of zinc oxide non-linear resistor disc which are similar to those used in surge arresters. The DC characteristics of the SVLs supplied shall have a characteristic impedance to suit the installation and maintenance requirement. Threshold voltage shall not be less than 5 kV dc. The DC voltage/leakage current characteristics shall be submitted for approval before manufacture.

Each single phase SVL or each phase of a three-phase SVL shall consist of a single element or a series arrangement of elements. There shall be no series spark gap to be designed. When a single phase unit or an arm consisting of two or more elements connected in parallel, at least one of the elements shall be directly connected, i.e., without a series spark gap. Unless otherwise agreed, SVLs shall be housed within the link boxes. Where installed at metal-clad terminations SVLs must be so installed that they may be readily disconnected.

Characteristics of each type of SVLs shall be designed to suit the operation parameters as stated in this Specification. The surge limiter with approved energy capacity shall be able to withstand the most severe fault conditions at all times. They shall be submitted for approval together with other system design data before manufacturing.

Joints

General
Joints shall have at least the same electrical, mechanical and thermal properties as for the cable. Longitudinal and radial watersealing are required for the joint.

Joint shall be supported by copper sleeve and coffin box and filled with water blocking compound.

Conductor ferrule type of plug in, welding or slip off is not acceptable

Test requirements for the joint shall be the same as for the cable unless otherwise proposed by the Bidder and agreed by Employer/Engineer.

The location of joints along the cable route shall be submitted during the engineering stage for Employer/Engineer approval.

Compression Dies for Joints
Details of all compression dies and equipment to be used for jointing works shall be submitted to Employer/Engineer for approval before using. When using, they shall be in full compliance with local regulations and shall not cause any dangerous situation to the members of jointing team.

The supply and transportation of the tools and equipment to site for jointing shall be the responsibility of the Bidder/Contractor and at no cost to Employer/Engineer.

Sealing Ends

General
The cable terminations shall be suitable for application to single-core XLPE underground cables as specified. They shall be designed to withstand the short circuit current as specified.

Plug-in type terminations are not allowed.
The Bidder/Contractor shall supply all necessary material (whether specifically mentioned or not), including cable clamps, labels, cable markers, compounds, tools, etc. for the proper termination of the cables.

Bidder/Contractors shall attach drawings to their Proposals showing in detail the method of termination of the cable and of earthing the sheaths.

The cable-sealing end on the generator transformers shall be of the SF6 immersed type.

The arrangement to meet these requirements shall be subject to the approval of Employer/Engineer.

All terminations shall be made by using stress control cones. They shall consist of prefabricated epoxy/silicone rubber and joined to the cable afterwards.

The stress control cone material shall have the same thermal expansion coefficient as the cable.
Supply and installation of the necessary hot-dip galvanized steel structures and non-magnetic clamps to support and fasten the cables at the GIS and at the transformers shall be included in the Contract Price.

The arrangement of the terminations, the supporting structures, including the cable fastening, shall be subject to the approval of Employer/Engineer.

For proposal of alternative methods, which shall be equivalent in performance to the method specified, the Bidder/Contractor shall submit information necessary to demonstrate the performance and experience of the method.

Pre-fabricated Type
Termination of cable shall be carried out by application of pre-fabricated silicon rubber-moulded stress relieve cone. which is housed in an epoxy bushing as specified in the Technical Data Sheets.

Glands
Cable glands for the cables shall preferably be of the compression type, and shall be insulated from the cable box by means of island layers, capable of withstanding 2 kV AC for one minute on each side. The connectors for bonding across the gland insulation shall be removable.

Glands and gland plates for the cables shall be made from non- magnetic material.

Installation Requirements for Underground Cables

Incidental Charges and Erection

The Bidder/Contractor shall lay and assemble all specified cables completely and shall, pursuant to a final site test, hand them over in working order. The incidental charges and erection work shall, in particular, besides all other necessary works and charges as covered by the Tender Documents, include:

a) Survey of the cable routes and measuring of the soil thermal resistivity to be expected along the cable routes, selection of delivery cable lengths and all necessary fittings.
b) Application for approval of the design calculations from Employer/Engineer
c) Application for approval of the cable routes from Employer/Engineer
d) Supervision of excavation and execution of concrete cable trenches, if necessary, shuttering and Employer/Engineering of the cable trenches, as well as the preparation of the cable ducts and supporting structures for installation of the cables.
e) Cable laying, including bedding into the sand, filling of the concrete cable trenches with sand, or laying in ducts and rooms, fastening on racks, cable brackets or supporting structures, cable ducts including cable racks, as well as cable-supporting structures and sealing ends and joint supports.
f) Supervision of procurement and filling-in of cable bedding and backfilling material which shall have a maximum thermal resistivity of 120 cm°C/W under operation conditions and shall be chemically neutral. In case the thermal resistivity exceeds 120 cm°C/W, even under completely dried out conditions, the Bidder/Contractor shall submit an alternative proposal to cope with the thermal design of the bedding and backfilling material.
g) Measurement of the thermal resistivity and temperature of the backfilling material along the cable route.
h) Supervision of procurement and laying of cable cover tiles, supervision of procurement and laying of cable ducts at road crossings.
i) Provision of auxiliary erection structures such as tarpaulins, free-standing structures, etc.
j) Supply of all material necessary for jointing, terminating and fixing the cables to the switchgear (and transformers), as well as cable trays, clamps, grounding material and all tools/ accessories required for proper installation.
k) Assembly ready for use, including assembly for the connection of joints and sealing ends, including cast resin cones, as well as making the electrical connections.
l) Exact design, erection and installation of the various required concrete pits with covers along the cable routes, and all necessary cable joints, oil tanks, and contact gauges, link boxes and thermo-element boxes.

m) Provision of assembly material, such as soldering and wiring material, benzene, propane, acetylene, oxygen, liquid air, petrol, etc., as well as compounds, tapes, papers and other consumable materials.

Installation Procedures

The cables and their accessories shall generally be installed, tested and commissioned under the supervision of the cable manufacturer's own staff. Local skilled and unskilled laborers shall only be employed for excavation, cable bedding, cable laying, backfilling and for civil works, but shall also be adequately supervised by the Tenderer/Contractor's personnel.

The Bidder/Contractor shall employ fully qualified and experienced personnel, who have had previous experience on comparable installations. This shall cover, as a minimum, survey, supervisory, civil, testing and commissioning engineers.

Excavation, cable bedding, cable laying, backfilling operations or civil work shall not be sublet to a Sub-Contractor without the written approval of Employer/Engineer.

The Bidder/Contractor shall take all necessary precautions to prevent damage to existing services and electric cables, and he shall be liable for any costs for repairing damage caused in the execution of the contractual work and shall pay the damage penalties according to the local laws and regulations.

Installation radii shall be as large as possible and the minimum shall be 25 D along the route, and 15 D adjacent to joints and terminations (D being the overall diameter of the cable).

Cable Laying and Routing

In general, the arrangement of cables and the methods of laying shall be subject to the approval of Employer/Engineer.

Cables shall be laid in covered concrete trenches filled with sand taking into consideration the space available.

The chosen manner of laying, e.g. in soil, in ducts or in trenches, shall be described exactly or shall be presented with the aid of sketches in the Bidder/Contractor's Proposal.

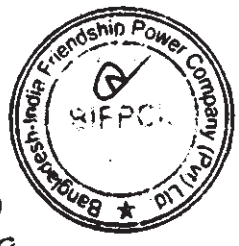
Cable in Concrete Trenches, Troughs, etc.

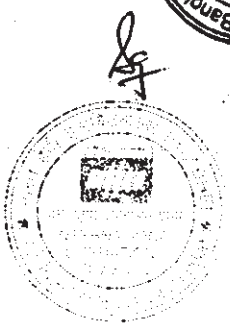
All concrete trenches/troughs and covers shall be provided and shall be subject to the approval of Employer/Engineer.

All cables installed in reinforced concrete trenches/troughs shall be supported by means of suitable spacers. After installation the trenches shall be filled with sand having an appropriate thermal resistance. For cable movements the snaked laying of cables is required. The cables shall be laid in a regular snaked form in the horizontal or vertical planes and they shall

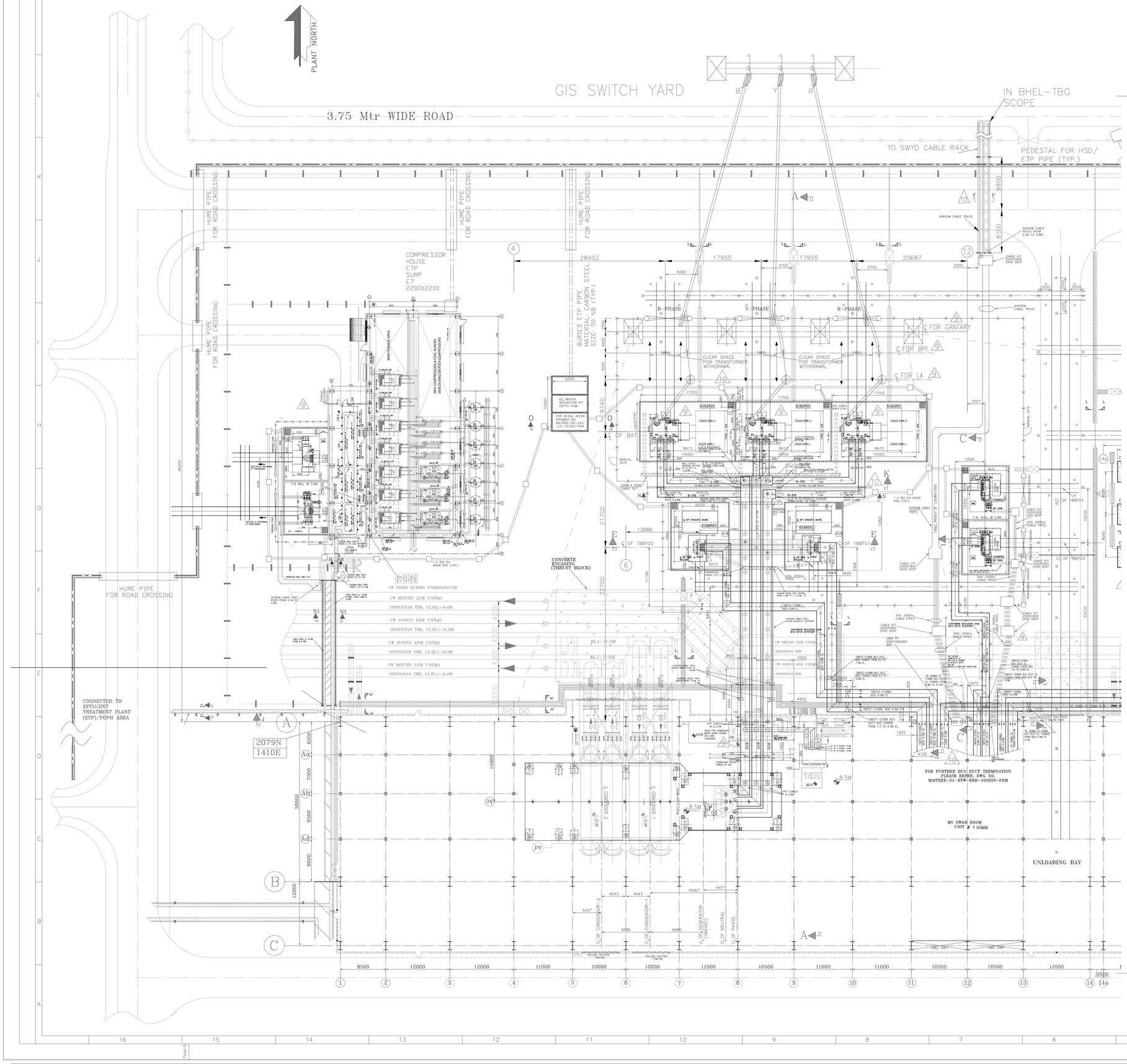
be secured at regular intervals by clamps or straps. The distance between the fixing points and the straps must take into account electrodynamic stresses under short circuit conditions.

They shall run in a neat and orderly manner and the crossing of cables within the trench/trough shall be avoided as far as possible. Cables of different voltages shall be kept separate. On completion of the cable laying all concrete trenches supplied under this Contract shall be inspected, and the Bidder/Contractor shall be responsible for the replacement of any broken parts at no additional cost.

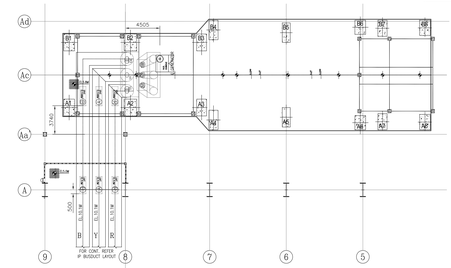




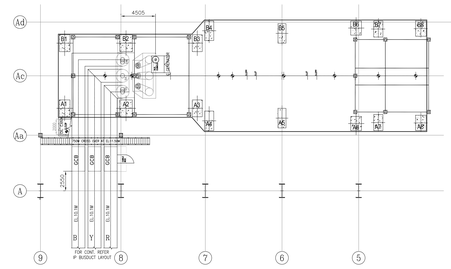
Approved
Checked and Approved
Date: 25-Oct-2019
"Approval does not relieve the LC, Contractor of his responsibility to comply with the Contract."



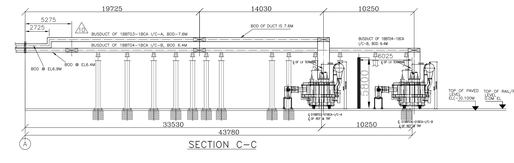
FOR DETAILS FROM COL. NO. 14A TO 27, PLEASE REFER SHEET 2 OF 3.



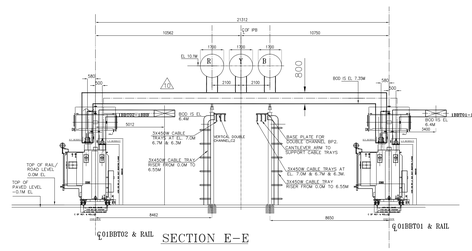
LOCATION OF LAVT CUBICLE AT EL 5.0M/ SPVT CUBICLE AT EL5.8M RESPECTIVELY



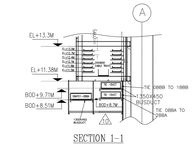
LOCATION OF GCB/NG CUBICLE AT 8.5M.



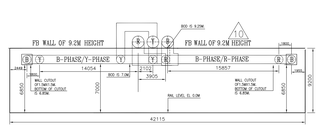
SECTION C-C



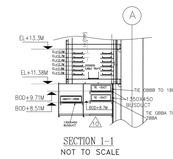
SECTION E-E



SECTION 1-1
NOT TO SCALE



SECTION N-N



SECTION 1-1
NOT TO SCALE

REV	DATE	ALTERED	CHECKED	APPROVED	NOTE
11	14.09.19	SKS	VY/SL	DR	THERE IS NO CHANGE IN THE DRAWING.
10	29.07.19	RK/SKS	VY/SL	DR	DRAWING REVISED INLINE WITH CUSTOMER COMMENTS. CHANGES ARE MARKED AS (10).
9	10.10.18	RK/SKS	VY/SL	DR	DRAWING REVISED INLINE WITH FICHTNER COMMENTS DTD 21.09.2018. VIDE TRANSMITTAL NO. Trans # FICH/MSTPP/TRM/054358. CHANGES ARE MARKED AS (9).
8	23.08.18	RK/SKS	VY/SL	DR	DRAWING IS REVISED INLINE WITH LATEST GA OF GT, SUT, GCB AND EXCITATION TRANSFORMER. LOCATION OF LA, BPI & SWITCHYARD GANTRY AS PER INPUT RECEIVED FORM BHEL-TBG. COMPRESSION HOUSE IS UPDATED AS PER LATEST DRAWING.
7	25.04.18	RK/SKS	VY/SL	RG	DRAWING REVISED INLINE WITH FICHTNER COMMENTS DTD 13.04.18 AND DISCUSSION HELD IN DRM AT BHEL-PEM-NOIDA DTD. 24.04.18
6	05.04.18	RK/SKS	VY/SL	RG	DRAWING REVISED AS PER FICHTNER COMMENTS DTD 08.03.18.
5	26.02.18	RK/SKS	VY/SL	RG	GENERATOR TRANSFORMER UPDATED INLINE WITH GGA.
4	09.02.18	RK/SKS	VY/SL	RG	DRAWING ARE REVISED AS PER FICHTNER COMMENTS DTD 19.02.2018. VIDE TRANSMITTAL NO. Trans # FICH/MSTPP/TRM/049863.
3	16.01.18	RK/SKS	VY/SL	RG	DRAWING ARE REVISED AS PER FICHTNER COMMENTS DTD 05.02.2018. VIDE TRANSMITTAL NO. TRANSMFICH/MSTPP/TRM/049501.
2	08.09.17	RK/SKS	VY/SL	RG	DRAWING ARE REVISED AS PER FICHTNER COMMENTS DTD 20.07.2017. VIDE TRANSMITTAL NO. FS10808-095744.
1		RK	VY/SL	MK	DRAWING REVISED IN LINE WITH MINUTES OF MEETING # 019 DATED - 24.08.2017

PROJECT
2x660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH (EPC MAIN PLANT PACKAGE)

OWNER CONSULTANT:
FICHTNER
M/s FICHTNER GmbH & Co KG, Stuttgart,GERMANY

OWNER:
BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

SCALE: 1:250
SHEET 1 OF 3

	DATE	NAME
DRAWN BY	14.06.17	RK
DESIGN BY	14.06.17	RK/VY
CHECKED BY	14.06.17	SL/SBH
APPROVED BY	14.06.17	MK
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM:		

TITLE
LAYOUT OF TRANSFORMER YARD (UNIT#1)

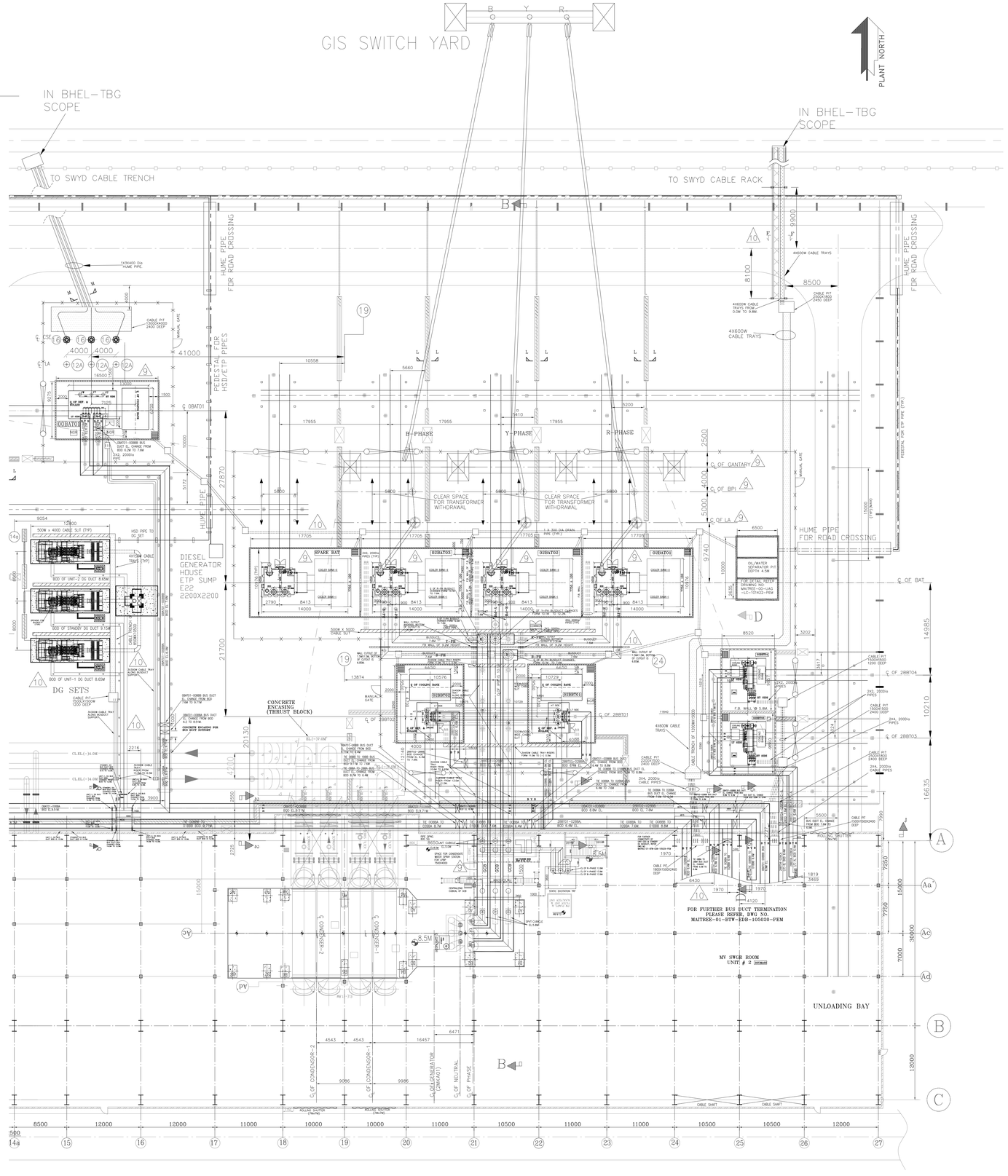
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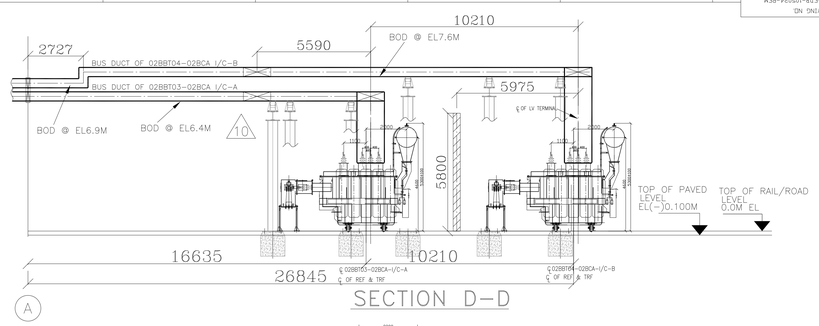
FORMAT SIZE A0

Approved and Approved
Date: 25-Oct-2019
Approval drawing! ENSURE the 'LATEST' revision of all documents is issued or the contrary.

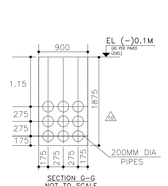
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MAITREE-00-BTW-EDB-10502-PEM

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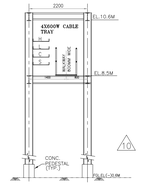




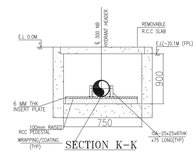
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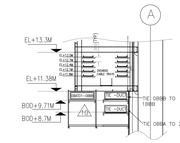
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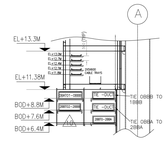
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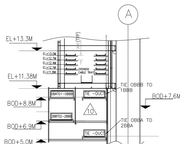
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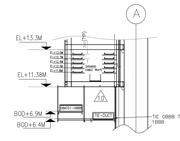
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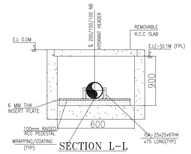
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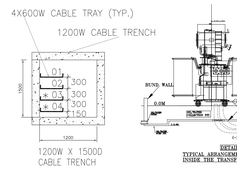
SECTION 4–4
NOT TO SCALE

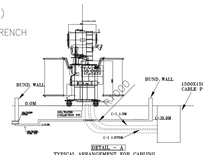


SECTION 5–5
NOT TO SCALE

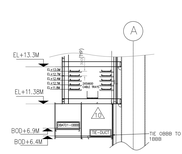


SECTION L–L

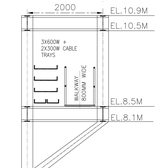




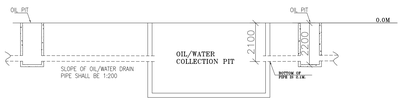
DETAIL – A
TYPICAL ARRANGEMENT FOR CABLING INSIDE THE TRANSFORMER PIT



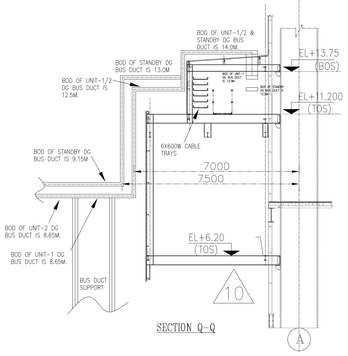
SECTION 5–5
NOT TO SCALE



SECTION P–P



SECTION O–O



SECTION Q–Q

REV	DATE	ALTERED	CHECKED	APPROVED	NOTE
11	14.09.19	SKS	VY/SL	DR	THERE IS NO CHANGE IN THE DRAWING.
10	29.07.19	RK/SKS	VY/SL	DR	DRAWING REVISED INLINE WITH CUSTOMER COMMENTS. CHANGES ARE MARKED AS △10
9	10.10.18	RK/SKS	VY/SL	DR	DRAWING REVISED INLINE WITH FICHTNER COMMENTS DTD 21.09.2018. VIDE TRANSMITTAL NO Trans # FICH/MSTPP/TRM/054338. CHANGES ARE MARKED AS △9
8	23.08.18	RK/SKS	VY/SL	DR	DRAWING IS REVISED INLINE WITH LATEST GGA OF GT, SUT, GCB AND EXCITATION TRANSFORMER. LOCATION OF LA, BPI & SWITCHYARD GANTRY AS PER INPUT RECEIVED FORM BHEL-TBG. COMPRESSOR HOUSE IS UPDATED AS PER LATEST DRAWING.
7	25.04.18	RK/SKS	VY/SL	RG	DRAWING REVISED INLINE WITH FICHTNER COMMENTS DTD 13.04.18 AND DISCUSSION HELD IN DRM AT BHEL-PEM-NOIDA DTD. 24.04.18
6	05.04.18	RK/SKS	VY/SL	RG	DRAWING REVISED AS PER FICHTNER COMMENTS DTD 08.03.18. GENERATOR TRANSFORMER UPDATED INLINE WITH GGA.
5	26.02.18	RK/SKS	VY/SL	RG	DRAWING ARE REVISED AS PER FICHTNER COMMENTS DTD 19.02.2018. VIDE TRANSMITTAL NO. Trans # FICH/MSTPP/TRM/049063.
4	09.02.18	RK/SKS	VY/SL	RG	DRAWING ARE REVISED AS PER FICHTNER COMMENTS DTD. 06.02.2018. VIDE TRANSMITTAL NO. TRANS#FICH/MSTPP/TRM/049001.
3	16.01.18	RK/SKS	VY/SL	RG	DRAWING ARE REVISED AS PER FICHTNER COMMENTS DTD 20.12.2017. VIDE TRANSMITTAL NO. FS12808-095744.
2	08.09.17	RK/SKS	VY/SL	RG	DRAWING REVISED IN LINE WITH MINUTES OF MEETING # 018 DATED - 24.08.2017
1		RK	VY/SL	MK	DRAWING ARE REVISED AS PER FICHTNER COMMENTS DTD 20.07.2017. VIDE TRANSMITTAL NO. 00182.

PROJECT
2x660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH
(EPC MAIN PLANT PACKAGE)

OWNER CONSULTANT:
FICHTNER
M/s FICHTNER GmbH & Co KG,
Stuttgart,GERMANY

OWNER:
BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NOIDA

SCALE: 1:250
SHEET 2 OF 3

	DATE	NAME
DRAWN BY	14.06.17	RK
DESIGN BY	14.06.17	RK/VY
CHECKED BY	14.06.17	SL/SBH
APPROVED BY	14.06.17	MK
SUPERSEDES:		
SUPERSEDED BY:		
SYSTEM:		

TITLE
LAYOUT OF TRANSFORMER YARD (UNIT#2)

SIZE: A0 | PROJECT NO: 421 | FILE:
ANNEX: – | DRAWING NO.: MAITREE–00–BTW–EDB–105024–PEM | REV 11

FORMAT SIZE A0

REV	DATE	ALTERED	CHECKED	APPROVED	NOTE
10	29.07.19	RK/SKS	VY/SL	DR	DRAWING ALTERED DUE WITH CUSTOMER COMMENTS. CHANGES ARE MARKED AS 10.
9	10.10.18	RK/SKS	VY/SL	DR	DRAWING ALTERED DUE WITH CUSTOMER COMMENTS DTD 21092018 VIDE TRANSMITTAL NO. Trans 9 CHANGES ARE MARKED AS 9/RK/SKS/18/VY/SL
8	23.08.18	RK/SKS	VY/SL	DR	LOCATION OF EL BPI & SWITCHYARD GANTRY AS PER INPUT RECEIVED FROM BHEL-TBG. CEMPRESSOR HOUSE IS UPDATED AS PER LATEST DRAWING
7	25.04.18	RK/SKS	VY/SL	RG	DRAWING ALTERED DUE WITH FIRMING COMMENTS DTD 13618 AND DISCUSSION ON DRW NO BHEL-HPEM-001BA DTD 24.4.18
6	05.04.18	RK/SKS	VY/SL	RG	DRAWING ALTERED AS PER FIRMING COMMENTS DTD 08.03.18 CLEARANCE UPDATED AS PER LATEST INPUT
5	26.02.18	RK/SKS	VY/SL	RG	DRAWING ALTERED AS PER FIRMING COMMENTS DTD 21022018 VIDE TRANSMITTAL NO. Trans 8 FIX/M/STP/18/04563
4	09.02.18	RK/SKS	VY/SL	RG	DRAWING ALTERED AS PER FIRMING COMMENTS DTD 08022018 VIDE TRANSMITTAL NO. TRANSM/ICH/MISTRY/BHEL 04501
3	16.01.18	RK/SKS	VY/SL	RG	DRAWING ALTERED AS PER FIRMING COMMENTS DTD 21012017 DRAWING ALTERED AS PER FIRMING COMMENTS DTD 5/01808-09Z/44.
2	08.09.17	RK/SKS	VY/SL	RG	DRAWING ALTERED IN LINE WITH NOZZLES OF MEETING @ 018 HELD ON 28.8.2017
1		RK	VY/SL	MK	DRAWING ALTERED AS PER FIRMING COMMENTS DTD 20.07.2017 VIDE TRANSMITTAL NO. 00102

OWNER:
BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

CONSULTANT:
M/s FICHTNER GmbH & Co. KG, Stuttgart,GERMANY

DRAWN BY	16.08.17	RK	1 OF 3
DESIGN BY	16.08.17	RK/VY	SCALE: 1:250
CHECKED BY	16.08.17	SL/SBH	SHEET
APPROVED BY	16.08.17	MK	

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT NOIDA

TITLE:
LAYOUT OF TRANSFORMER YARD (UNIT#1)

SUPERSEDES:
SIZE: A0 REQUEST NO.: 421 FILE:

SUPERSEDED BY:
ANNEX: – DRAWING NO.: MAITREE-00-BTW-EDB-105024-REV 10

| SYSTEM | | |

APPROVED
Checked and Approved.

Date: 19-Jul-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

SLD FOR GENERATOR CIRCUIT METERING AND PROTECTION [STG]

5

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CUSTOMER'S DRAWING NO.

REV.	DATE	ALTD	CHD	APPD	REMARKS
05	22.06.18	SrM	ABA	SL	REVISED INLINE WITH MOM DATED 27.04.18 & CUSTOMER COMMENTS DATED 11.06.18.
04	27.04.18	MEG	ABA	SL	REVISED INLINE WITH CUSTOMER COMMENTS. DTD 29.03.2018
03	15.03.18	MEG	ABA	SL	REVISED INLINE WITH CUSTOMER COMMENTS. DTD 31.01.2018
02	01.01.18	MEG	ABA	SL	REVISED INLINE WITH CUSTOMER COMMENTS. DTD 14.12.2017
01	18.9.17	MEG	AbA	SL	REVISED INLINE WITH CUSTOMER COMMENTS. DTD 30.11.2016

JOB NO. 421

STATUS CONTRACT

DISTRIBUTION

TO				
NO.				

OWNER : BANGLADESH–INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH

OWNER CONSULTANT : FICHTNER Consulting Engineers Limited — M/s FICHTNER GmbH & Co KG, Stuttgart,GERMANY

PROJECT : 2x660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH (EPC MAIN PLANT PACKAGE)

BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, INDIA

DEPT CODE		NAME	SIGN	DATE
E	DRWN	AbA		
	DSGN	AbA	–SD–	26.10.16
	CHD	AbA	–SD–	26.10.16
	APPD	SL	–SD–	26.10.16

TITLE 5: SLD FOR GENERATOR CIRCUIT METERING & PROTECTION [STG]

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

SHEET 1 OF 10 REV. 5

APPROVED
Checked and Approved.

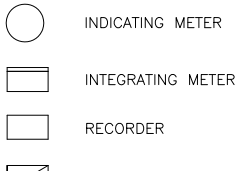
Date: 19-Jul-2018

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DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

LEGEND

A	AMMETER
ALF/ISF	ACCURACY LIMIT FACTOR/ INSTRUMENT SECURITY FACTOR
AS	AMMETER SELECTOR SWITCH
AT	CURRENT TRANSDUCER
AVR	AUTOMATIC VOLTAGE REGULATOR
AVT	AUTOMATIC VOLTAGE TRANSFORMER
CT	CURRENT TRANSFORMER
DDCMIS	DISTRIBUTED DIGITAL CONTROL, MONITORING & INFORMATION SYSTEM
DR	DISTURBANCE RECORDER
EQVT.	EQUIVALENT
F	FILTER
FBC	FIELD BREAKER CUBICLE
FFC	FIELD FLASHING CUBICLE
FS	FUSE
GEN	GENERATOR (1MKA01)
ECP	ELECTRICAL CONTROL PANEL
GR	GROUP
GREC	GENERATOR RECORDER
GRP	GENERATOR RELAY PANEL (01CHA)
GT	GENERATOR TRANSFORMER (1BAT01)
HZ	FREQUENCY METER
HZT	FREQUENCY TRANSDUCER
IVT	INTERPOSING VOLTAGE TRANSFORMER
LA	LIGHTNING ARRESTER
LAVT	LIGHTNING ARRESTER & VOLTAGE TRANSFORMER
MCB	MINIATURE CIRCUIT BREAKER
NGR	NEUTRAL GROUNDING RESISTOR
PF	POWER FACTOR METER
PFT	POWER FACTOR TRANSDUCER
R	RESISTOR
RA	CURRENT RECORDER
RHZ	FREQUENCY RECORDER
RVAR	VAR RECORDER
RW	WATT RECORDER
SC	SURGE CAPACITOR
SP	SURGE PROTECTION
STC	STEAM TURBINE CABINET
T&AVTP	TRANSDUCER & AVT PANEL
UT	UNIT TRANSFORMER (1BBT01/1BBT02)
V	VOLTMETER
VAR	VAR METER
Vk	KNEE POINT VOLTAGE
VT	VOLTAGE TRANSDUCER
MVARH	VAR HOUR METER
VART	VAR TRANSDUCER
VS	VOLTMETER SELECTOR SWITCH
W	WATT METER
MWH	WATT HOUR METER
WT	WATT TRANSDUCER



REFERENCE DRAWINGS

1 ELECTRICAL SINGLE LINE DIAGRAM FOR AUXILIARY POWER DISTRIBUTION DRAWING NO. MAITREE-00-BAY-EDB-105013-PEM

2 KEY METERING & PROTECTION SINGLE LINE DIAGRAM OF 400/230kV SWITCHYARD DRG. NO. MAITREE-00-BAY-EDB-325002-TBG

3 SLD FOR 11kV UNIT SWITCHBOARDS DRAWING NO. MAITREE-00-BTW-EDB-105038-PEM

4 GENERATOR DATA SHEET DOC NO. MAITREE-00-MKA-DA-140004-HWR

NOTES

1 NUMERICAL RELAYS SHALL BE WITH IEC 61850 COMMUNICATION PROTOCOL.

2 NUMERICAL RELAYS TO BE CONNECTED TO ETHERNET SWITCH UNIT AS PER IEC 61850 STANDARD AND INTERFACED TO DDCMIS.

3 TIME SYNCHRONISATION OF NUMERICAL RELAYS SHALL BE DONE ON NTP PROTOCOL AND TIME SIGNAL CONNECTED TO RELAY ETHERNET SWITCH.

4 LAPTOP PC COMMON FOR ALL GENERATOR PROTECTION PANELS TO BE PROVIDED FOR COMMUNICATING WITH FRONT RS-232/EQVT. PORT FOR THE FOLLOWING PURPOSE :

A) RETRIEVING DATA FROM NUMERICAL RELAYS
B) UPLOADING SETTINGS & I/O CONFIGURATION

THE LAPTOP PC SHALL BE LOADED WITH RELAY SPECIFIC SOFTWARE FOR ABOVE PURPOSE.

5 EXACT MAKE, TYPE & COMBINATION OF PROTECTION FUNCTIONS IN NUMERICAL RELAYS SHALL BE AS FINALLY DECIDED BY BHEL-BHOPAL.

6 100% STATOR EARTH FAULT PROTECTION IS BASED ON LOW FREQUENCY INJECTION PRINCIPLE.

7 ACCESSORIES FOR 100% STATOR EARTH FAULT AND ROTOR EARTH FAULT ARE INDICATED BASED ON SIEMENS PROTECTION RELAYS. THE ARRANGEMENT AND DETAILS OF THE SAME SHALL BE AS SHOWN IN BHEL-BHOPAL SCHEMATIC DRAWINGS BASED ON THE MAKE OF NUMERICAL RELAY PROCURED BY THEM. FOR ABB MAKE RELAYS, THE ACCESSORIES SHALL BE MOUNTED IN A SEPARATE STAND-ALONE PANEL.

8 TWO NOS. 220V DC INCOMING SUPPLY SHALL BE PROVIDED FOR GRP. NECESSARY CHANGEOVER SCHEME USING CONTACTOR SHALL BE PROVIDED AT GRP.

9 TRANSFORMER RELATED PROTECTIONS SUCH AS OIL TEMPERATURE HIGH TRIP & ALARM, WINDING TEMPERATURE HIGH TRIP & ALARM, BUCHHOLZ RELAY TRIP & ALARM, PRESSURE RELEIF VALVE OPERATED, SUDDEN PRESSURE RELAY OPERATED SHALL BE SHOWN IN A SEPARATE DOCUMENT FOR LOGIC DIAGRAM FOR GENERATOR CIRCUIT PROTECTION AND ANNUNCIATION DOC NO. Maitree-00-BAY-EDB-421510E003-PEM.

10 GENERATOR INTEGRAL PROTECTIONS LIKE WINDING TEMPERATURE , BEARING TEMPERATURE ETC. SHALL BE SHOWN SEPARATELY BY BHEL-HWR

11 DESIGN OF METERING AND PROTECTION SHALL BE IN ACCORDANCE TO THE TECHNICAL SPECIFICATION.

12 LOCATION OF CTs IS INDICATED IN 'CT DETAILS' TABLE.

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REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

TITLE
5
SLD FOR GENERATOR CIRCUIT METERING & PROTECTION [STG]

2X660 MW BIFPCL, BANGLADESH

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

SHEET 2 OF 10 REV. 5

APPROVED
Checked and Approved.

Date: 19-Jul-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

RELAY DETAILS

DEVICE NO.	DESCRIPTION	RELAY TYPE	RATED CURRENT	RATED VOLTAGE	AUX VOLTAGE	TYPE	MAKE	QTY.	LOCATION
GR1	GENERATOR PROTECTION RELAY GEN BACKUP IMPEDANCE PROTECTION [21G1] GEN REVERSE POWER PROTECTION [32G1] GEN LOW FORWARD POWER PROTECTION [37G1] GEN FIELD FAILURE PROTECTION [40G1] GEN UNDER VOLTAGE PROTECTION [27G1] GEN NEGATIVE PHASE SEQUENCE PROTECTION [46G1] * GEN DEAD MACHINE PROTECTION [50GDM1] GEN OVERCURRENT PROTECTION [51G1] GEN STATOR EARTH FAULT PROTECTION (95%) [64G1] GEN OVER VOLTAGE PROTECTION [59G1] GEN VT1 VOLTAGE SUPERVISION/ FUSE FAILURE PROTECTION [60G(VT1)] GEN POLE SLIPPING PROTECTION [78G1] GEN ROTOR EARTH FAULT PROTECTION [64F1] GEN STATOR EARTH FAULT PROTECTION (100%) [64G4] GEN UNDER FREQUENCY PROTECTION [81GUF1] GEN OVER FREQUENCY PROTECTION [81GOF1] GEN VOLTAGE RESTRAINED OVERCURRENT PROTECTION [51V1] GEN DIFFERENTIAL PROTECTION [87G1] GEN OVERFLUXING PROTECTION [99G1] GEN CIRCUIT BREAKER LBB PROTECTION / BREAKER FAILURE PROTECTION [50LBB1]	NUMERICAL	5A	110V	220V DC	REFER NOTE 5	BHOPAL TO DECIDE AS PER APPROVED VENDOR LIST	1	GRP (01CHA)
GR2	GENERATOR PROTECTION RELAY GEN BACKUP IMPEDANCE PROTECTION [21G2] GEN REVERSE POWER PROTECTION [32G2] GEN LOW FORWARD POWER PROTECTION [37G2] GEN FIELD FAILURE PROTECTION [40G2] GEN UNDER VOLTAGE PROTECTION [27G2] GEN NEGATIVE PHASE SEQUENCE PROTECTION [46G2] * GEN DEAD MACHINE PROTECTION [50GDM2] GEN OVERCURRENT PROTECTION [51G2] GEN STATOR EARTH FAULT PROTECTION (95%) [64G2] GEN OVER VOLTAGE PROTECTION [59G2] GEN VT2 VOLTAGE SUPERVISION/ FUSE FAILURE PROTECTION [60G(VT2)] GEN ROTOR EARTH FAULT PROTECTION [64F2] GEN STATOR EARTH FAULT PROTECTION (100%) [64G3] GEN UNDER FREQUENCY PROTECTION [81GUF2] GEN OVER FREQUENCY PROTECTION [81GOF2] GEN POLE SLIPPING PROTECTION [78G2] GEN VOLTAGE RESTRAINED OVERCURRENT PROTECTION [51V2] GEN DIFFERENTIAL PROTECTION [87G2] GEN OVERFLUXING PROTECTION [99G2] GEN CIRCUIT BREAKER LBB PROTECTION/ BREAKER FAILURE PROTECTION [50LBB2]	NUMERICAL	5A	110V	220V DC	REFER NOTE 5	BHOPAL TO DECIDE AS PER APPROVED VENDOR LIST	1	GRP (01CHA)
64GIT1 64GIT2	GEN INTERTURN PROTECTION	NUMERICAL	–	110V	220V DC	REFER NOTE 5	BHOPAL TO DECIDE AS PER APPROVED VENDOR LIST	2	GRP (01CHA)
60PT11 60PT12	GEN PT1 VOLTAGE SUPPLY SUPERVISION RELAY	STATIC/ ELECTROMAGNETIC	–	110V	220V DC	MVAPM32/EQVT	ALSTOM/ EQVT. DECIDED BY BHOPAL AS PER APPROVED VENDOR LIST	2	GRP (01CHA)
60PT21 60PT22	GEN PT2 VOLTAGE SUPPLY SUPERVISION RELAY	STATIC/ ELECTROMAGNETIC	–	110V	220V DC	MVAPM32/EQVT		2	GRP (01CHA)
60PT31 60PT32	GEN PT3 VOLTAGE SUPPLY SUPERVISION RELAY	STATIC/ ELECTROMAGNETIC	–	110V	220V DC	MVAPM32/EQVT		2	GRP (01CHA)

* WITH SIGNAL FOR REMOTE METERING AT DDCMIS FOR GEN. NEGATIVE PHASE SEQUENCE CURRENT

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REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

TITLE: SLD FOR GENERATOR CIRCUIT METERING & PROTECTION [STG] (5)

2X660 MW BIFPCL, BANGLADESH

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

SHEET 3 OF 10 REV. 5

APPROVED
Checked and Approved.

Date: 19-Jul-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

RELAY DETAILS

DEVICE NO.	DESCRIPTION	RELAY TYPE	RATED CURRENT	RATED VOLTAGE	AUX VOLTAGE	TYPE	MAKE	QTY.	LOCATION
87OA/ 51GT/ 99GT	OVERALL DIFFERENTIAL PROTECTION (87OA) GT HV O/C PROTECTION (51GT) GT OVERFLUXING PROTECTION (99GT)	NUMERICAL	5A/1A	110V	220V DC	REFER NOTE 5	BHOPAL TO DECIDE AS PER APPROVED VENDOR LIST	1	GRP (01CHA)
87GT/ 51NGT	GT DIFFERENTIAL PROTECTION (87GT) GT BACKUP EARTH FAULT PROTECTION (51NGT)	NUMERICAL	5A	110V	220V DC	REFER NOTE 5	BHOPAL TO DECIDE AS PER APPROVED VENDOR LIST	1	GRP (01CHA)
64GT	GT RESTRICTED EARTH FAULT PROTECTION (64GT)	NUMERICAL	1A	110V	220V DC	REFER NOTE 5	BHOPAL TO DECIDE AS PER APPROVED VENDOR LIST	1	GRP (01CHA)
87HV/ 59NGT	GT HV WINDING & OVERHEAD LINE CONNECTION DIFFERENTIAL PROTECTION PRE-SYNCHRONIZING EARTH FAULT PROTECTION [59NGT]	NUMERICAL	1A	110V	220V DC	REFER NOTE 5	BHOPAL TO DECIDE AS PER APPROVED VENDOR LIST	1	GRP (01CHA)
87UTA/ 51NUTA	UT-A DIFFERENTIAL PROTECTION (87UTA) (LOW IMPEDANCE) UT-A LV BACKUP EARTH FAULT PROTECTION (51NUTA)	NUMERICAL	1A	–	220V DC	REFER NOTE 5	BHOPAL TO DECIDE AS PER APPROVED VENDOR LIST	1	GRP (01CHA)
50UTA/ 51UTA/ 64RUTA	UT-A HV INST. OVER CURRENT PROTECTION (50UTA) UT-A HV DMT OVER CURRENT PROTECTION (51UTA) UT-A RESTRICTED EARTH FAULT PROTECTION (64RUTA) (HIGH IMPEDANCE)	NUMERICAL	1A	–	220V DC	REFER NOTE 5	BHOPAL TO DECIDE AS PER APPROVED VENDOR LIST	1	GRP (01CHA)
87UTB/ 51NUTB	UT-B DIFFERENTIAL PROTECTION (87UTB)(LOW IMPEDANCE) UT-B LV BACKUP EARTH FAULT PROTECTION (51NUTB)	NUMERICAL	1A	–	220V DC	REFER NOTE 5	BHOPAL TO DECIDE AS PER APPROVED VENDOR LIST	1	GRP (01CHA)
50UTB/ 51UTB/ 64RUTB	UT-B HV INST. OVER CURRENT PROTECTION (50UTB) UT-B HV DMT OVER CURRENT PROTECTION (51UTB) UT-B RESTRICTED EARTH FAULT PROTECTION (64RUTB) (HIGH IMPEDANCE)	NUMERICAL	1A	–	220V DC	REFER NOTE 5	BHOPAL TO DECIDE AS PER APPROVED VENDOR LIST	1	GRP (01CHA)

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CUSTOMER'S DRAWING NO.

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

TITLE
5
SLD FOR GENERATOR CIRCUIT METERING & PROTECTION [STG]

2X660 MW BIFPCL, BANGLADESH

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

SHEET 4 OF 10 REV. 5

APPROVED
Checked and Approved.

Date: 19-Jul-2018

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DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

CT DETAILS

C.T. NO.	CORE NO.	RATIO	BURDEN	ACCURACY CLASS	ALF/ ISF	VK ≥	Ie ≤	RCT AT 75°C ≤	LOCATION	PURPOSE
CT 1	–	24000/5A	100VA	0.5S	≤ 5.0	–	–	–	GEN BUSDUCT (NEUTRAL SIDE)	SPARE
CT 2	–	24000/5A	–	PX	–	150Rct+200 V	150mA AT VK/2	**	GEN BUSDUCT (NEUTRAL SIDE)	GEN PROTECTION RELAY GR1
CT 3	–	24000/5A	–	PX	–	150Rct+200 V	150mA AT VK/2	**	GEN BUSDUCT (NEUTRAL SIDE)	GEN PROTECTION RELAY GR2
CT 4	–	24000/5A	100VA	0.5S	≤ 5.0	–	–	–	GEN BUSDUCT (NEUTRAL SIDE)	FOR LOAD TRANSDUCER AND PERFORMANCE TESTING
CT 5	–	24000/5A	–	PX	–	150Rct+200 V	150mA AT VK/2	**	GEN BUSDUCT (PHASE SIDE)	GEN PROTECTION RELAY GR1
CT 6	–	24000/5A	–	PX	–	150Rct+200 V	150mA AT VK/2	**	GEN BUSDUCT (PHASE SIDE)	GEN PROTECTION RELAY GR2
CT 7	–	24000/5A	–	PX	–	250Rct+300 V	150mA AT VK/2	**	GEN BUSDUCT (PHASE SIDE) (BETWEEN GCB & GENERATOR)	87OA PROTECTION
CT 8	–	24000/5A	100VA	0.5S	≤ 5.0		–	–	GEN BUSDUCT (PHASE SIDE)	LOAD TRANSDUCER, LOAD SHEDDING & AVR
CT 9	–	24000/5A	100VA	0.5S	≤ 5.0	–	–	–	GEN BUSDUCT (PHASE SIDE)	METERING, LOAD TRANSDUCER,AVR
CT 10A	–	1000–500/5A OR 700–350/5A*	100VA	0.2	≤ 5.0	–	–	–	GEN NG CUBICLE	100% STATOR E/F PROTECTION
CT 10B	–	1000–500/5A OR 700–350/5A*	100VA	0.2	≤ 5.0	–	–	–	GEN NG CUBICLE	100% STATOR E/F PROTECTION
CT 11	–	13500/5A	–	PX	–	250Rct+350 V	150mA AT VK/2	**	GT (1BAT01) LV PHASE BUSHING	87GT PROTECTION
CT 12	–	13500/5A	–	PX	–	250Rct+350 V	150mA AT VK/2	**		
CT 13	1	1250/1A	15VA	5P	20	–		**	GT (1BAT01) HV NEUTRAL BUSHING	51NGT PROTECTION
	2	1250/1A	–	PX	–	20Rct+100 V	30mA AT VK/2	**		64GT PROTECTION
CT 14	1	1250/1A	–	PX	–	50Rct+100 V	30mA AT VK/2	**	GT (1BAT01) HV PHASE BUSHING	87GT PROTECTION
	2	1250/1A	–	PX	–	20Rct+100 V	30mA AT VK/2	**		64GT PROTECTION
CT 15	1	1250/1A	–	PX	–	50Rct+100 V	30mA AT VK/2	**	GT (1BAT01) HV PHASE BUSHING	87OA PROTECTION
	2	2000/1A	–	PX	–	2000 V	60mA AT VK	10		87HV PROTECTION
CT 16A	–	2000/1A	–	PX	–	40Rct+100 V	30mA AT VK/2	**	GEN BUSDUCT TAP–OFF TO UT–1A	UT–A DIFFERENTIAL PROTECTION
CT 16B	–	2000/1A	–	PX	–	40Rct+100 V	30mA AT VK/2	**	GEN BUSDUCT TAP–OFF TO UT–1B	UT–B DIFFERENTIAL PROTECTION
CT 17A	– –	2000/1A	15VA	5P	20	–	–	**	GEN BUSDUCT TAP–OFF TO UT–1A	UT–A HV OVERCURRENT PROTECTION
CT 17B	–	2000/1A	15VA	5P	20	–	–	**	GEN BUSDUCT TAP–OFF TO UT–1B	UT–B HV OVERCURRENT PROTECTION
CT 18A	–	24000/5A	–	PX	–	250Rct+300 V	150mA AT VK/2	**	GEN BUSDUCT TAP–OFF TO UT–1A	87OA PROTECTION
CT 18B		24000/5A		PX		250Rct+300 V	150mA AT VK/2	**	GEN BUSDUCT TAP–OFF TO UT–1B	87OA PROTECTION
CT 19A	1	400/1A	15VA	5P	20	–	–	**	UT–1A (1BBT01) LV NEUTRAL BUSHING	51NUT PROTECTION
	2	400/1A	–	PX	–	200Rct V	30mA AT VK/2	**		64RUT PROTECTION
CT 19B	1	400/1A	15VA	5P	20	–	–	**	UT–1B (1BBT02) LV NEUTRAL BUSHING	51NUT PROTECTION
	2	400/1A	–	PX	–	200Rct V	30mA AT VK/2	**		64RUT PROTECTION
CT 20A	–	400/1A THERMAL RATING Ith=4000A	–	PX	–	200Rct V	30mA AT VK/2	**	UT–1A (1BBT01) LV PHASE BUSHING	64RUT PROTECTION
CT 20B	–	400/1A THERMAL RATING Ith=4000A	–	PX	–	200Rct V	30mA AT VK/2	**	UT–1B (1BBT02) LV PHASE BUSHING	
CT 21A		4000/1A		PX		40Rct+100 V	30mA AT VK/2	**	11 KV 1BA BOARD (1BBA) INCOMER	UT DIFFERENTIAL PROTECTION
CT 21B		4000/1A	5	PX		40Rct+100 V	30mA AT VK/2	**	11 KV 1BB BOARD (1BBB) INCOMER	

* : RATIO OF CT–10A/CT–10B SHALL BE AS PER FINAL NGR VALUE TO BE SELECTED BASED ON MAKE OF GCB

** : SHALL BE AS PER ACTUAL MAKE OF THE CT AS PROCURED BY BHEL–BHOPAL

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REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

TITLE 5: SLD FOR GENERATOR CIRCUIT METERING & PROTECTION [STG]

2X660 MW BIFPCL, BANGLADESH

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

SHEET 5 OF 10 REV. 5

APPROVED
Checked and Approved.

Date: 19-Jul-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

IVT DETAILS

IVT NO.	RATIO	BURDEN	ACCURACY CLASS	LOCATION	PURPOSE
IPT 1	$\frac{110}{\sqrt{3}} / \frac{166.67}{\sqrt{3}}$ V	15VA	3P	GRP (01CHA)	FOR GENERATOR INTER-TURN FAULT PROTECTION (64 GIT)
IPT 2	$\frac{110}{\sqrt{3}} / \frac{110}{3}$ V	15VA	3P	GRP (01CHA)	FOR PRE-SYNCHRONIZATION EARTH FAULT PROTECTION (59NGT)

VT DETAILS

VT NO.	RATIO	BURDEN	ACCURACY CLASS	LOCATION	PURPOSE
PT 1	$\frac{21000}{\sqrt{3}} / \frac{110}{\sqrt{3}} / \frac{110}{\sqrt{3}}$ V	50VA	3P	SP & PT CUBICLE	GEN. SYNCHRONISING, FREQUENCY TRANSDUCER, LOAD TRANSDUCER & PROTECTION
		50VA	0.2		
PT 2	$\frac{21000}{\sqrt{3}} / \frac{110}{\sqrt{3}} / \frac{110}{\sqrt{3}}$ V	50VA	3P	SP & PT CUBICLE	GEN PROTECTION(GR1), GEN. SYNCHRONISING, AVR, GEN SYNCHRONISING, LOAD TRANSDUCER
		50VA	0.2		
PT 3	$\frac{21000}{\sqrt{3}} / \frac{110}{\sqrt{3}} / \frac{110}{\sqrt{3}}$ V	50VA	3P	SP & PT CUBICLE	GEN PROTECTION(GR2), METERING, AVR, LOAD TRANSDUCER, PERFORMANCE TESTING
		100VA	0.2		

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BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

TITLE
5
SLD FOR GENERATOR CIRCUIT METERING & PROTECTION [STG]

2X660 MW BIFPCL, BANGLADESH

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

SHEET 6 OF 10 REV. 5

APPROVED
Checked and Approved.

Date: 19-Jul-2018

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DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

TRANSDUCER DETAILS

DEVICE NO.	RANGE	OUTPUT	NO. OF OUTPUT	ACCURACY	AUXILIARY VOLTAGE	LOCATION
AT1/2/3/4	0–24000A	4–20mA	2	0.5	240V AC	INSIDE T&AVTP
HZT1/2/3/4	45–55Hz	4–20mA	2	0.2	240V AC	INSIDE T&AVTP
PFT1	0.5 LAG–1.0–0.5 LEAD	4–20mA	2	0.5	240V AC	INSIDE T&AVTP
VT1/2/3/4	0–25kV	4–20mA	2	0.5	240V AC	INSIDE T&AVTP
VT5/6/7/8/9/10	0–500kV	4–20mA	2	0.5	240V AC	INSIDE T&AVTP
VART1/2	–350–0–600MVAR	4–20mA	2	0.5	240V AC	INSIDE T&AVTP
WT1/2	0–825MW	4–20mA	2	0.5	240V AC	INSIDE T&AVTP
VAT1	0–800MVA	4–20mA	2	0.5	240V AC	INSIDE T&AVTP

INTEGRATING METER DETAILS

DEVICE NO.	TYPE	ACCURACY CLASS	LOCATION	PURPOSE
TVM–G	DIGITAL (WITH RS485 PORT)	0.2S	GRP	GENERATOR ENERGY ACCOUNTING & AUDIT METER

INDICATING METER DETAILS

DEVICE NO.	RANGE	INPUT	SIZE (MM)	TYPE	LOCATION	DESCRIPTION
A1	0–24000 A	4–20mA	48 x 24	DIGITAL	ECP	GENERATOR CURRENT
A2	0–10 kA DC	4–20mA	48 x 24	DIGITAL	ECP	GENERATOR FIELD CURRENT
HZ1	45–55 Hz	4–20mA	48 x 24	DIGITAL	ECP	GENERATOR FREQUENCY
VAR1	–350–0–600 MVAR	4–20mA	48 x 24	DIGITAL	ECP	GENERATOR REACTIVE POWER
W1	0–825 MW	4–20mA	48 x 24	DIGITAL	ECP	GENERATOR ACTIVE POWER
PF1	0.5LAG–1–0.5LEAD	4–20mA	48 x 24	ANALOG	ECP	GENERATOR POWER FACTOR
V1	0–25 kV	4–20mA	48 x 24	DIGITAL	ECP	GENERATOR VOLTAGE
V2	–15–0–15 V	4–20mA	48 x 24	DIGITAL	ECP	GENERATOR BALANCE VOLTAGE
V3	0–300 V DC	4–20mA	48 x 24	DIGITAL	ECP	GENERATOR EXCITER FIELD VOLTAGE
V4/5	0–500 kV	4–20mA	48 x 24	DIGITAL	ECP	400KV BUS VOLTAGE

GENERATOR RECORDER DETAILS

DEVICE NO.	PURPOSE	RANGE	INPUT	LOCATION
GREC	RA	0 – 24000A	4–20mA	GRP (01CHA)
	RW	0 – 800MW	4–20mA	
	RVAR	–800 –0– 800MVAR	4–20mA	
	RV	0 – 25kV	4–20mA	
	RHZ	45–55Hz	4–20mA	
	RVA	0–800MVA	4–20mA	

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BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

TITLE
SLD FOR GENERATOR CIRCUIT METERING & PROTECTION [STG]

5

2X660 MW BIFPCL, BANGLADESH

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

SHEET 7 OF 10 REV. 5

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CUSTOMER'S DRAWING NO.

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

SHEET NO. 9

UT # 1A 1BBT01 (SHEET NO. 10)

UT # 1B 1BBT02 (SHEET NO. 10)

PT 1, FS, MCB 1, MCB 2, PT11, PT12, LA 24kV, 10kA — LA&PT CUBICLE

60PT11 → IPT 2 → 59NGT (SHEET NO. 9), 99GT (SHEET NO. 9)

60PT12 → SYNCHRONISING, FREQUENCY TRANSDUCER STC, LOAD TRANSDUCER AND LOAD SHEDDING RELAY STC

PT 2, PT21, PT22, SC 28kV, 0.125µF — SP&PT CUBICLE

60PT21 → SYNCHRONISING

60PT22 → AVR (AUTO CHANNEL) AVR, LOAD TRANSDUCER STC

PT 3, PT31, PT32

60PT31 → PERFORMANCE TESTING

60PT32 → AVR (AUTO CHANNEL) AVR, LOAD TRANSDUCER STC

1BAC01 GCB

P2, CT 9, TVM–G, GRP

T&AVTP PANEL: AT1/2/3, WT1, VART1, PFT1, AT4, WT2, VART2

STC: LOAD TRANSDUCER MKA02FE001B; AVR (AUTO CHANNEL–2)

T&AVTP PANEL: HZT2, PT4, HZT1, VT1/2/3

AS, A1, W1, VAR1, PF1, SPARE, SPARE, SPARE, HZ1, VS1, V1 — ECP — DDCMIS

GREC

CT 8 → LOAD TRANSDUCER MKA02FE001A AND LOAD SHEDDING RELAY TYPE 7UP21 → AVR (AUTO CHANNEL–1)

CT 7 870A, CT 6, CT 5

VT 2, VT 3, CT 9, CT 8

EXCITATION TRANSFORMER, TY, AVR, FBC, FFC, V3, V2, A2

1MKA01 GENERATOR # 1
660MW, 21kV, 3Ph, 50Hz, PF=0.85, Xd"(sat) = 20.2% STATIC EXCITATION

P1, P2

RESISTANCE COUPLING UNIT → SERIES COUPLING UNIT → 64F1 GR1 PART, 64F2 GR2 PART

CT 4 → LOAD TRANSDUCER MKA02FE001C STC → PERFORMANCE TESTING

CT 3 → GR2: 21G2, 32G2, 37G2, 40G2, 27G2, 46G2, 50GDM2, 51G2, 59G2, 60G(VT2), 64G2, 64F2, 64G3, 78G2, 81GUF2, 81GOF2, 87G2, 99G2, 50LBB2, 51V2 — 5

CT 2 → GR1: 21G1, 32G1, 37G1, 40G1, 27G1, 46G1, 50GDM1, 51G1, 59G1, 60G(VT1), 64G1, 64F1, 64G4, 78G1, 81GUF1, 81GOF1, 87G1, 99G1, 50LBB1, 51V1

CT 1 → SPARE

NEUTRAL GROUNDING TRANSFORMER # 1
21/0.5 kV

P1, 10A CT, 10B CT, R, NGR # 1, 64GIT1, 64GIT2, IPT 1 — NG CUBICLE

100% SEF & REF PROTECTION GR1/GR2

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

TITLE: SLD FOR GENERATOR CIRCUIT METERING & PROTECTION [STG] (5)

2X660 MW BIFPCL, BANGLADESH

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

SHEET 8 OF 10 REV. 5

APPROVED
Checked and Approved.

Date: 19-Jul-2018

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DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

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CUSTOMER'S DRAWING NO.

400kV GIS MAIN BUS–I

400kV GIS MAIN BUS–II

GIS KKS TAG 00AC01

401–89A
401–89AE
401–89BE
401–89B
401–52
401–CTA
CORE–1
CORE–2
CORE–3
CORE–4

403–89B
403–89BE
403–89AE
403–89A
403–52 (1ABA01GX)
403–CTB

402–89AE1
402–89AE2
402–89A
402–89BE1
402–89BE2
402–89B
402–CTA
402–52 (1ABA02GX)
402–CTB

TO ICT#1 230kV SIDE

403–89LE
403–89L
403–LA

CT (PX CLASS)

87HV
59NGT
IPT 2

CT 15 CORE 1
CT 15 CORE 2
CT 14 CORE 2
CT 13 CORE 2
CT 13 CORE 1
CT 14 CORE 1
P1
P2

87GT,51NGT

64GT

CT 12
CT 11
S1
S2

FROM PT1 (SH.8)

87OA, 51GT, 99GT

CT 18A
CT 7
CT 18B

1BAT01
GENERATOR TRANSFORMER
1A, 1B, 1C
810 MVA (3x1PH. 270 MVA), OFAF, $\frac{420}{\sqrt{3}}$/21kV,
YNd11, Z=16%, AT 270 MVA BASE,
OLTC +12.5 TO −12.5% IN STEPS OF 1.25%
ON HV SIDE

400kV BUS–1
CVT SUPPLY FROM SWYD PANEL
VT5/6/7
VS2
V4
HZT3
ECP
DDCMIS
DDCMIS

400kV BUS–2
CVT SUPPLY FROM SWYD PANEL
VT8/9/10
VS3
V5
HZT4
ECP
DDCMIS
DDCMIS

SHEET NO. 8

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

TITLE
5
SLD FOR GENERATOR CIRCUIT METERING & PROTECTION [STG]

2X660 MW BIFPCL, BANGLADESH

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

SHEET 9 OF 10 REV. 5

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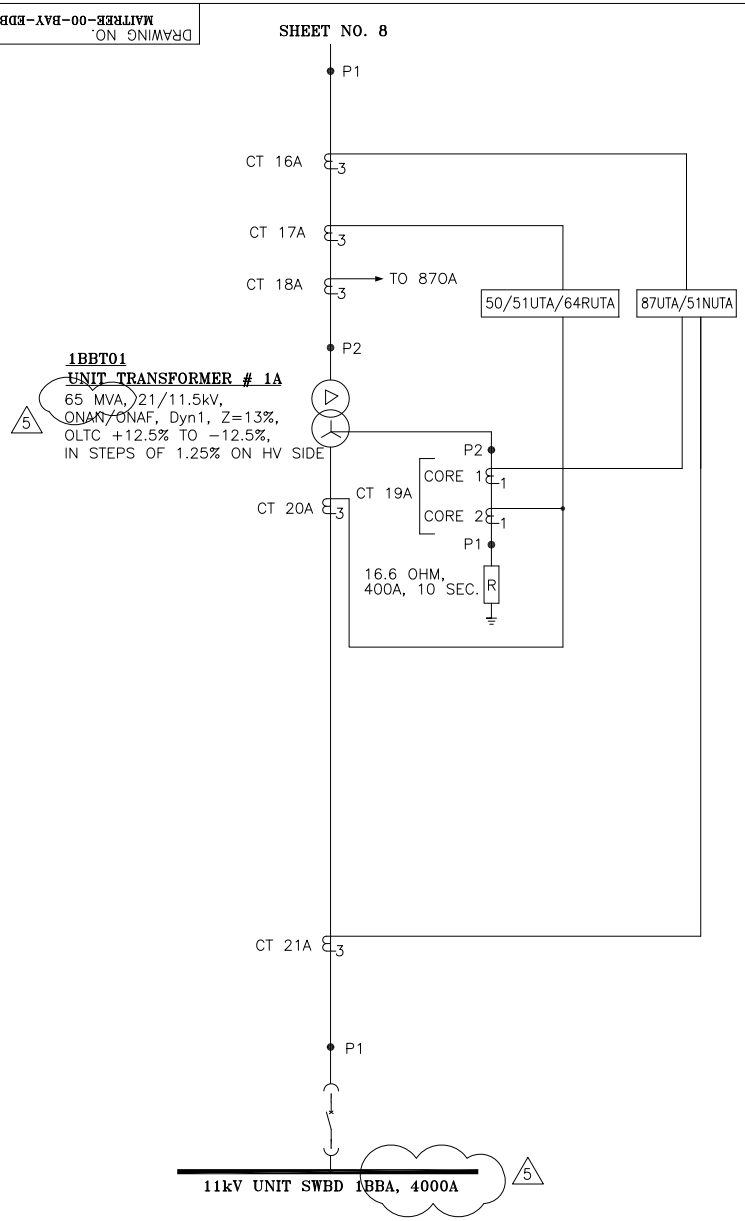
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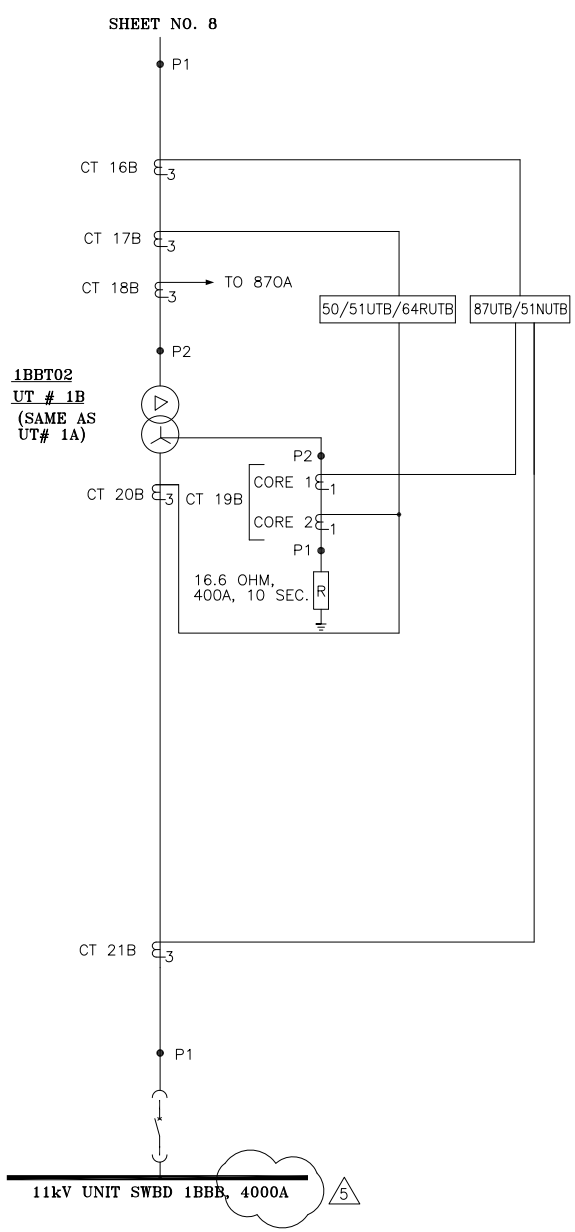
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CUSTOMER'S DRAWING NO.





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BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

TITLE
5
SLD FOR GENERATOR CIRCUIT METERING & PROTECTION [STG]

2X660 MW BIFPCL, BANGLADESH

DRAWING NO. MAITREE-00-BAY-EDB-105034-PEM

SHEET 10 OF 10 REV. 5

APPROVED
Checked and Approved.

Date: 28-Nov-2017

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TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

(MILD STEEL & FIBRE REINFORCED PLASTIC TYPE)

PROJECT		2X660MW BIFPCL MAITREE KHULNA STPP (BANGLADESH)
	OWNER	BANGLADESH–INDIA FRIENDSHIP POWER CO. (Pvt.) LIMITED (BIFPCL)
FICHTNER	OWNER'S CONSULTANT	FICHTNER GmbH & Co KG GERMANY
	EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA(U.P) INDIA

REV	DATE	ALT	CHD	APP
01	16.09.17	MKM	AbA	SL

Drawing revised in line with customer comments dated 09.08.17

Revised portion is marked with cloud R1

DOCUMENT TITLE:

TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

DPT CODE–E

	NAME	SIGN	DATE
DRN	MKM	–SD–	19.07.17
CHD	AbA	–SD–	19.07.17
APP	SL	–SD–	19.07.17

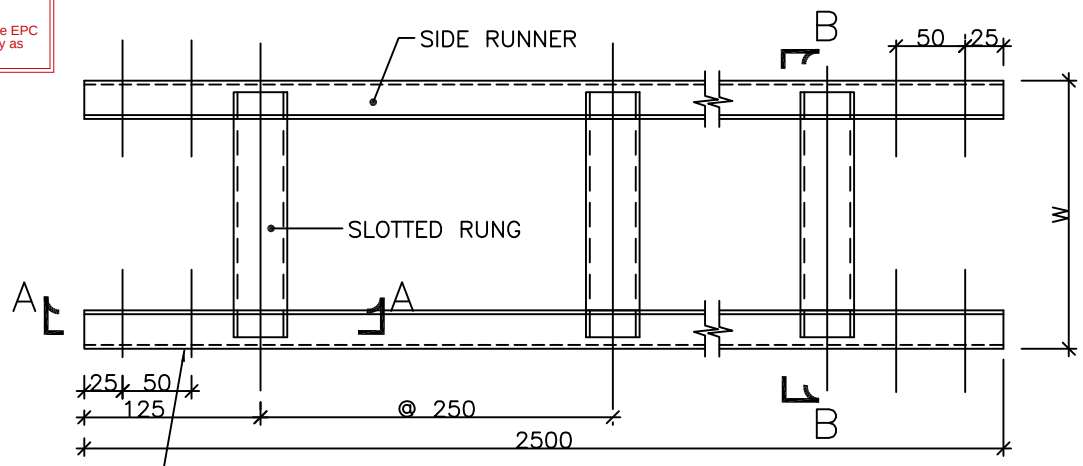
DOCUMENT NO: Maitree–00–BTW–EDB–421507E005–PEM–01

SHT. 01 OF 24 REV.01

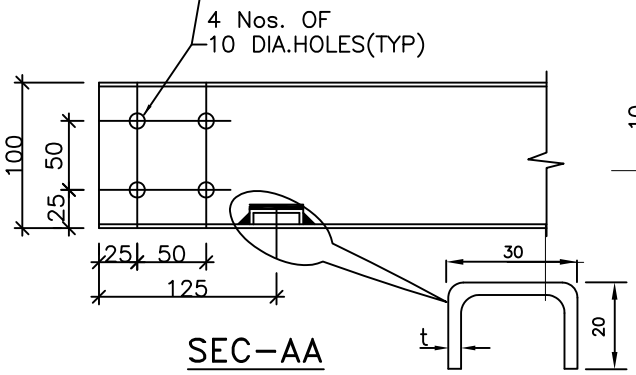
APPROVED
Checked and Approved.

Date: 28-Nov-2017

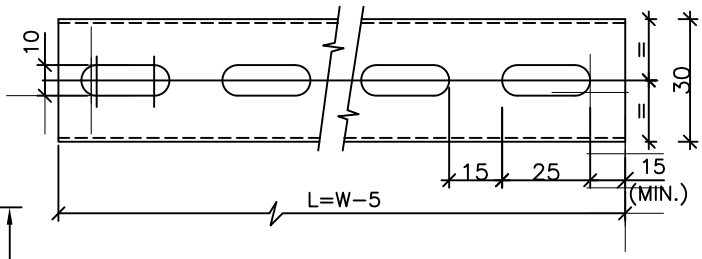
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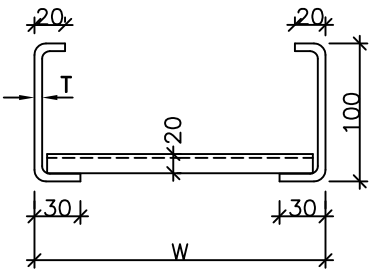
LADDER TYPE CABLE TRAY



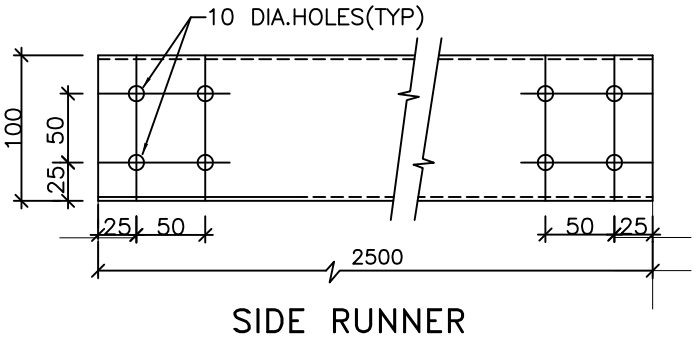
SEC–AA



SLOTTED RUNG



SEC–BB



SIDE RUNNER

W	150	300	450	600
L	145	295	445	595
T	2	2	2	2
t	2	2	2	2

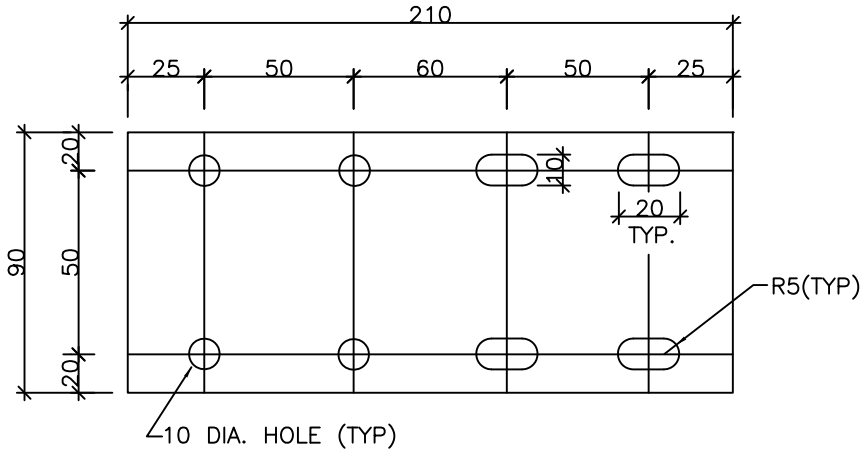
FOR GENERAL NOTES REFER SHEET 10 OF 24

TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree–00–BTW–EDB –421507E005–PEM–01
	SHT. 02 OF 24 REV. 01

APPROVED
Checked and Approved.

Date: 28-Nov-2017

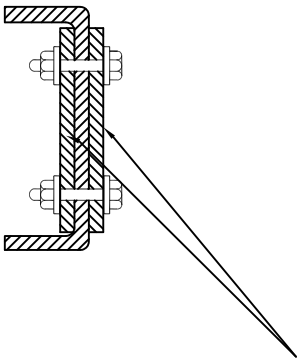
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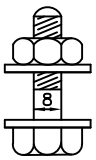
SIDE COUPLER PLATE FOR LADDER/PERFORATED TYPE TRAYS

(600/450/300/150W TRAYS)

QTY. REQUIRED/TRAY SECTION : 4 NOS.

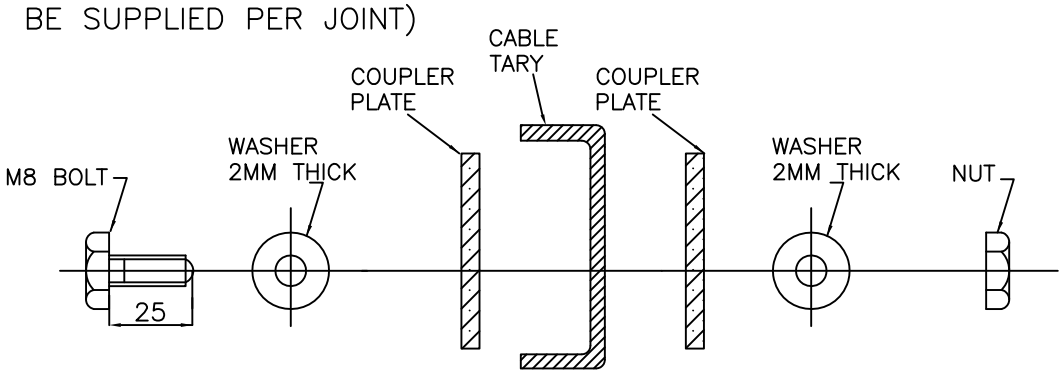


(2 NOS. COUPLER PLATES OF 3 MM THICKNESS TO BE SUPPLIED PER JOINT)



QTY. REQD/TRAY SECTION

A) 16 NOS. M8 BOLTS
B) 16 NOS. NUTS
C) 32 NOS. WASHERS



SEQUENCE OF M8 BOLT, WASHER, NUT, COUPLER PLATE & CABLE TRAY

FOR TYPICAL CABLE TRAY JOINT

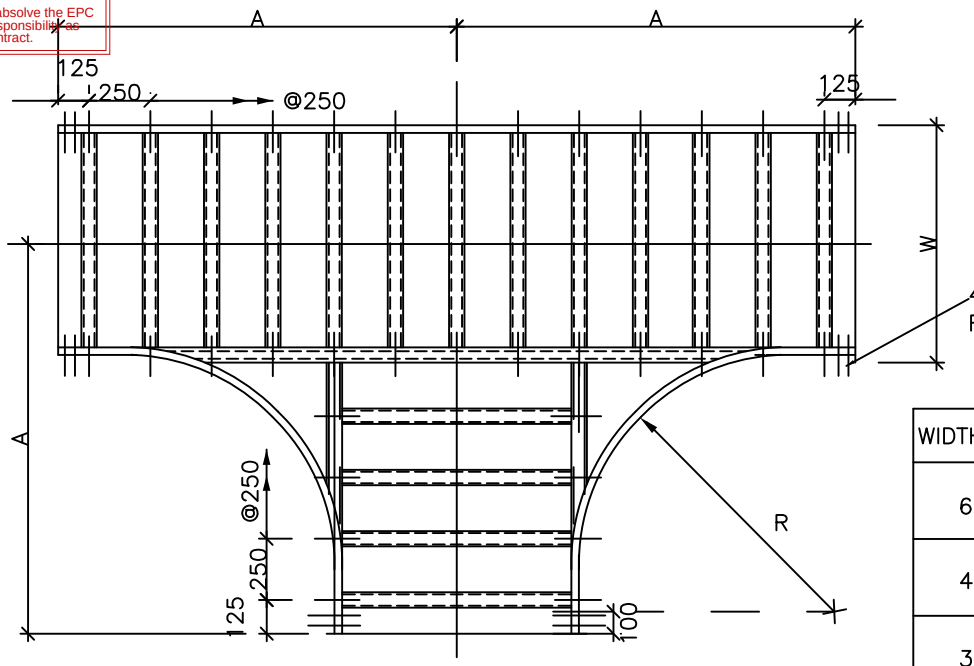
FOR GENERAL NOTES REFER SHEET 10 OF 24

TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree-00-BTW-EDB -421507E005-PEM-01
	SHT. 03 OF 24 REV. 01

APPROVED
Checked and Approved.

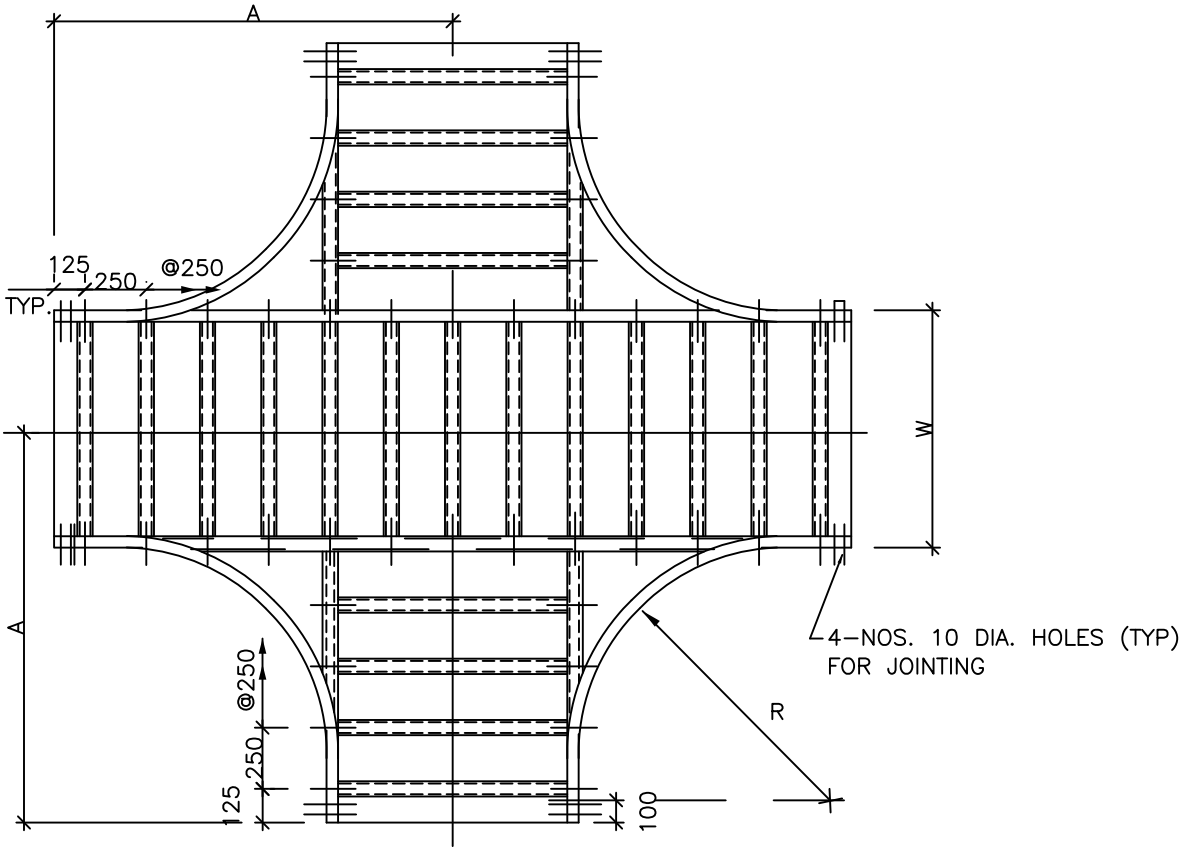
Date: 28-Nov-2017

*Approval doesn't absolve the EPC contractor of it's responsibilities as specified in the Contract.



WIDTH(W)	RADIUS (R)	A
600	600	1000
450	600	925
300	600	850

HORIZONTAL TEE–PLAN



HORIZONTAL CROSS–PLAN

LADDER TYPE ACCESSORIES

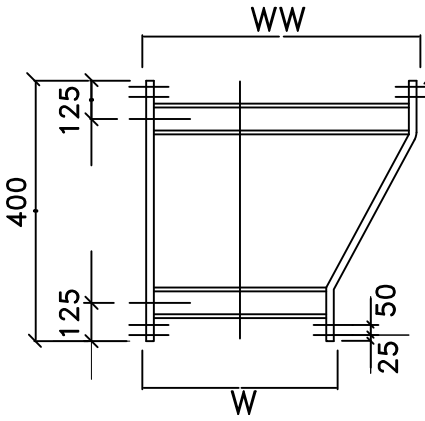
FOR GENERAL NOTES REFER SHEET 10 OF 24

बीएचईएल BHEL	TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree–00–BTW–EDB –421507E005–PEM–01
		SHT. 04 OF 24 REV. 01

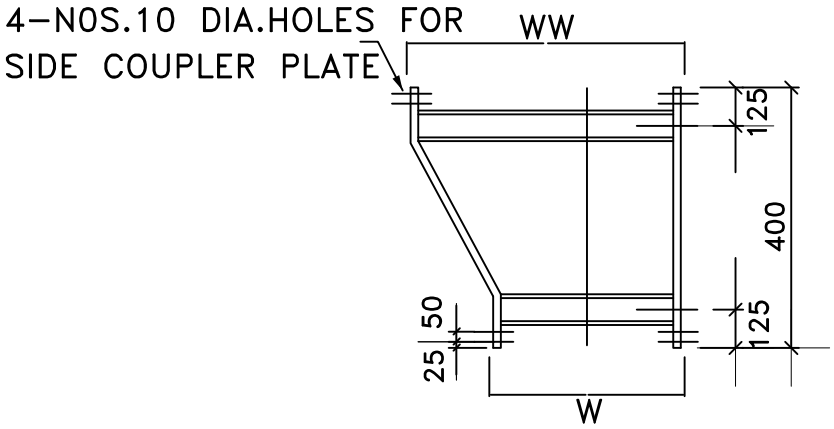
APPROVED
Checked and Approved.

Date: 28-Nov-2017

*Approval doesnt absolve the EPC contractor of it's responsibility as specified in the Contract.



LEFT HAND REDUCER–PLAN



RIGHT HAND REDUCER–PLAN

WIDTH	WW	600	600	450
	W	450	300	300

LADDER TYPE ACCESSORIES

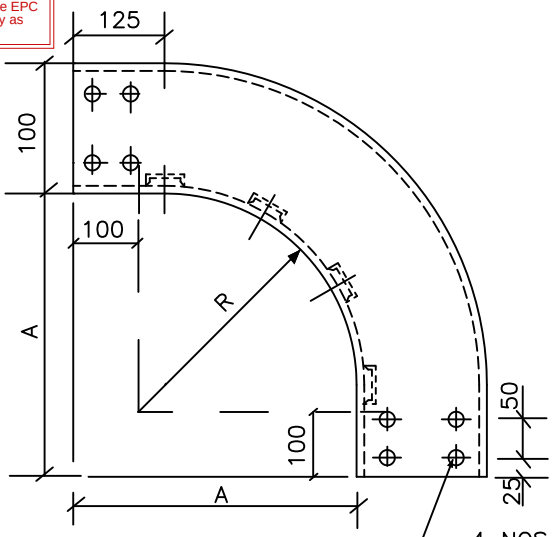
FOR GENERAL NOTES REFER SHEET 10 OF 24

बीएचईएल BHEL	TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree–00–BTW–EDB –421507E005–PEM–01
		SHT. 05 OF 24 REV. 01

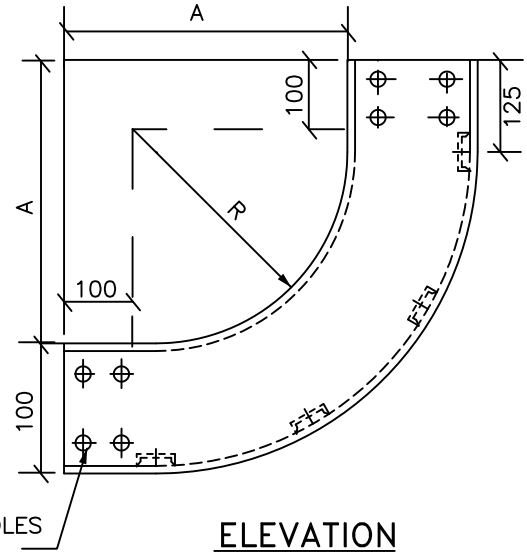
APPROVED
Checked and Approved.

Date: 28-Nov-2017

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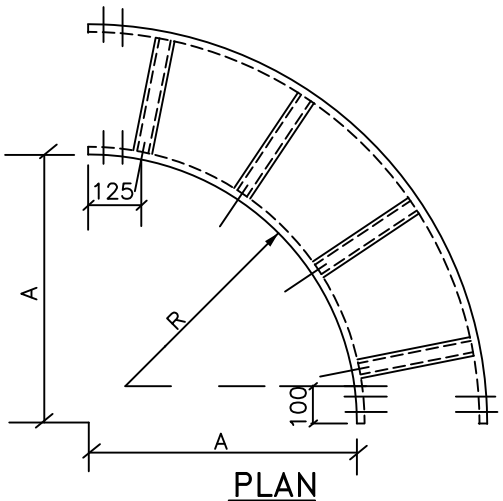
ELEVATION
90° VERTICAL BEND
(OUTSIDE)



ELEVATION
90° VERTICAL BEND
(INSIDE)

LADDER TYPE TRAYS

WIDTH(W)	RADIUS (R)	A
600	600	700
450	600	700
300	600	700



PLAN
90°HORIZONTAL BEND

LADDER TYPE ACCESSORIES

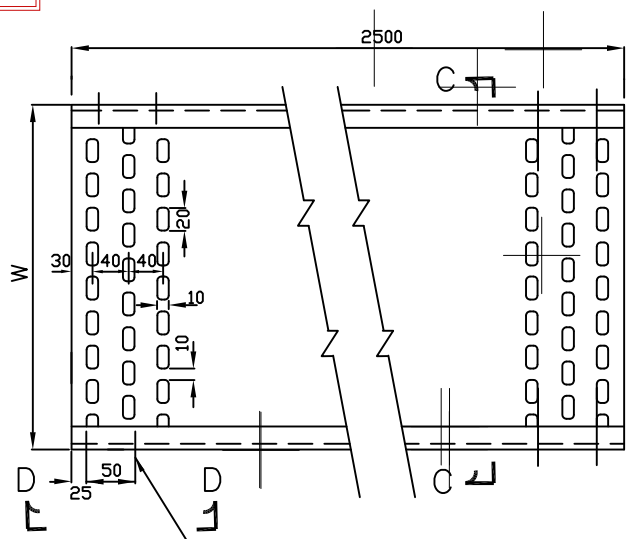
FOR GENERAL NOTES REFER SHEET 10 OF 24

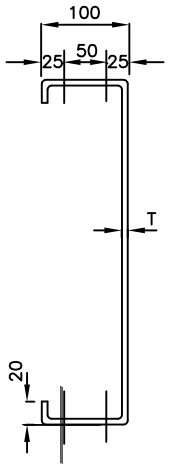
बीएचईएल BHEL	TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree-00-BTW-EDB-421507E005-PEM-01
		SHT. 06 OF 24 REV. 01

APPROVED
Checked and Approved.

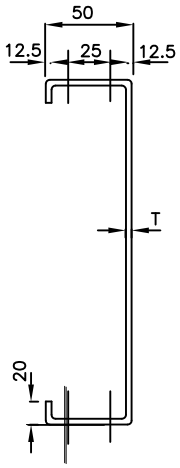
Date: 28-Nov-2017

*Approval doesnt absolve the EPC contractor of it's responsibility as specified in the Contract.

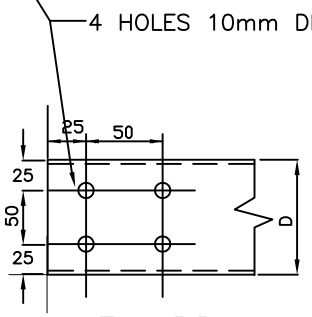




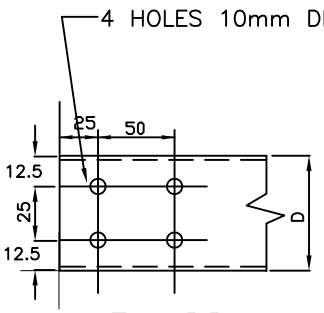
SECTION–CC
(600/450/300/150 TRAYS)



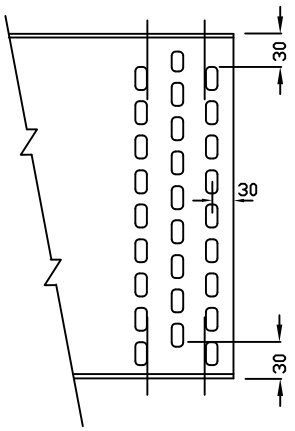
SECTION–CC
(100/50 TRAYS)



VIEW–DD
(600/450/300/150W TRAYS)



VIEW–DD
(100W TRAYS)



ARRANGEMENT OF PERFORATIONS

TRAY WIDTH W (mm)	600	450	300	150	100	50
TRAY DEPTH D (mm)	100	100	100	100	50	50
T (mm)	2	2	2	2	2	2

PERFORATED TYPE TRAY

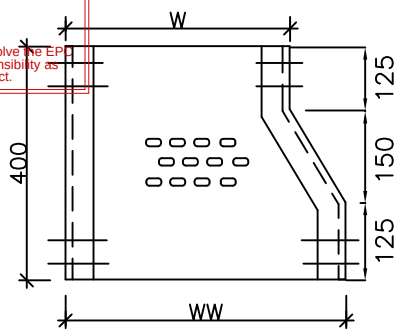
FOR GENERAL NOTES REFER SHEET 10 OF 24

बीएचईएल BHEL	TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree–00–BTW–EDB –421507E005–PEM–01
		SHT. 07 OF 24 REV. 01

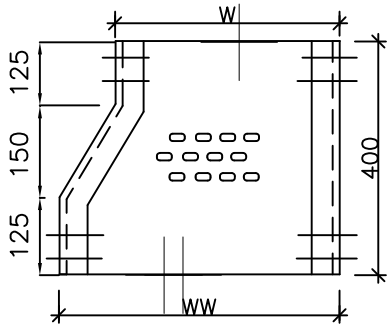
APPROVED
Checked and Approved.

Date: 28-Nov-2017

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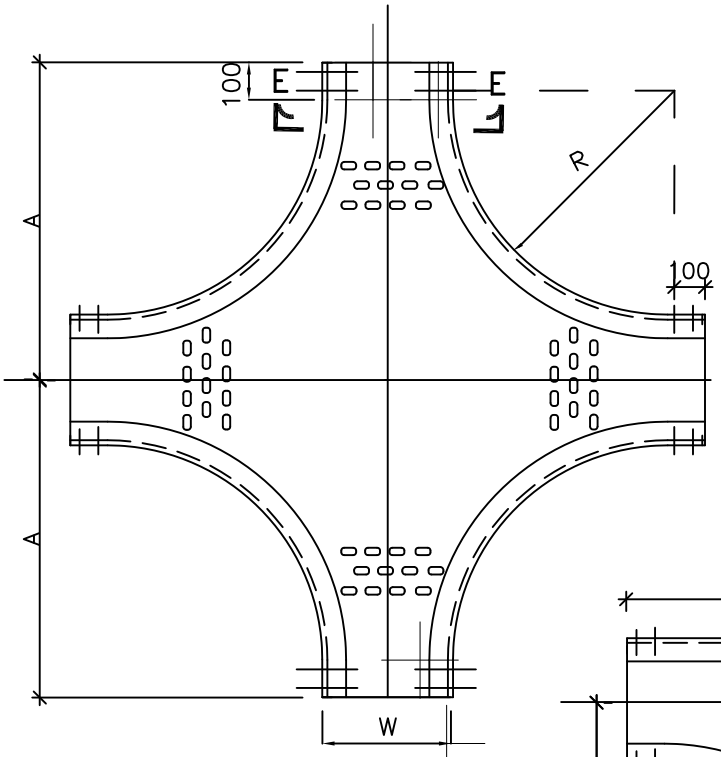
LEFT HAND REDUCER



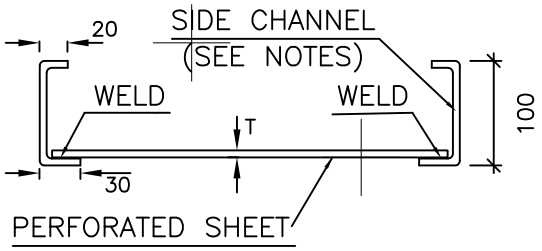
RIGHT HAND REDUCER

WW	W	DEPTH	THICKNESS
600	450	100	2
600	300	100	2
450	300	100	2

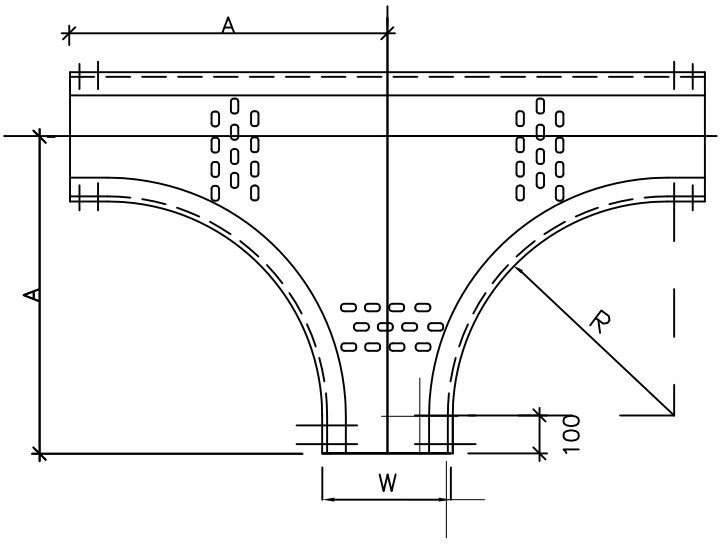
PERFORATED TYPE



CROSS



SECTION–EE



TEE

PERFORATED TYPE

WIDTH(W)	RADIUS (R)	A	T
600	600	1000	2
450	600	925	2
300	600	850	2

PERFORATED TYPE ACCESSORIES

FOR GENERAL NOTES REFER SHEET 10 OF 24

TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES

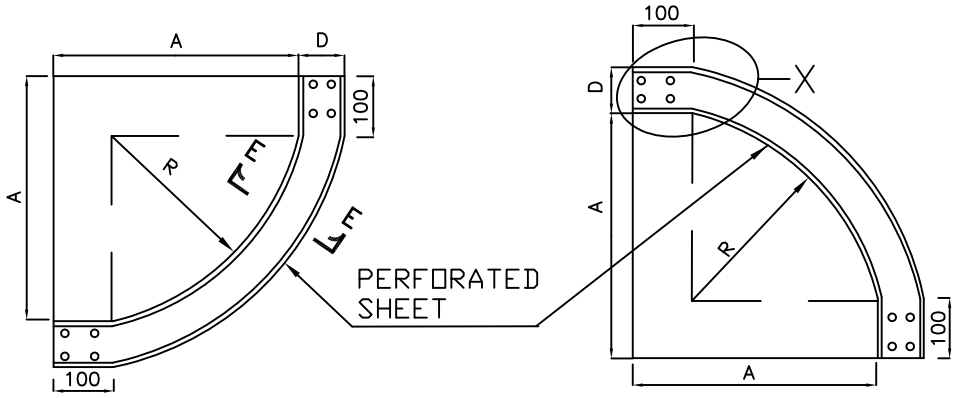
DWG. NO.
Maitree–00–BTW–EDB
–421507E005–PEM–01

SHT. 08 OF 24 REV. 01

APPROVED
Checked and Approved.

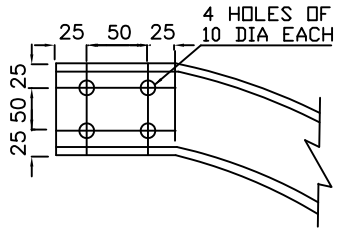
Date: 28-Nov-2017

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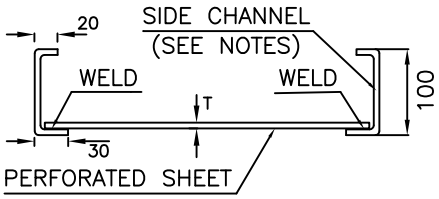


INSIDE TYPE

OUTSIDE TYPE

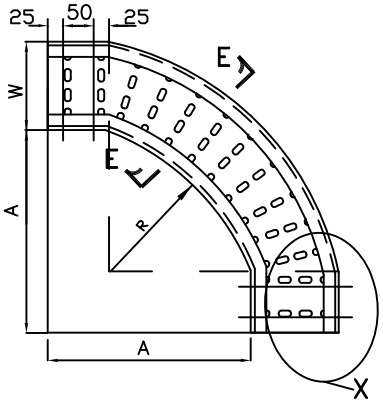


ENLARGED VIEW OF "X"



SECTION–EE

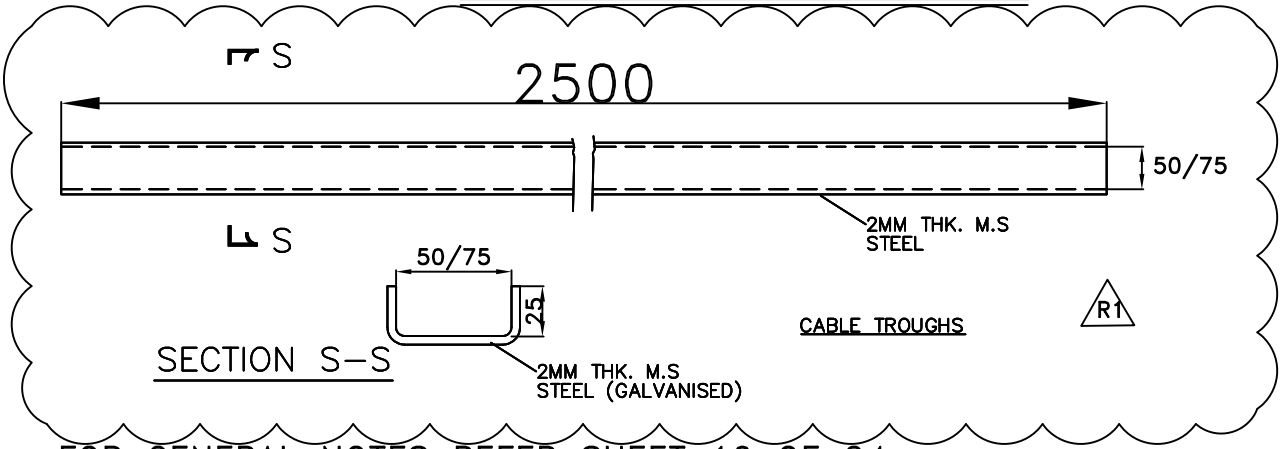
90° VERTICAL BEND – PERFORATED TYPE



WIDTH(W)	RADIUS (R)	A	T
600	600	700	2
450	600	700	2
300	600	700	2

90° HORIZONTAL BEND – PERFORATED TYPE

PERFORATED TYPE ACCESSORIES



FOR GENERAL NOTES REFER SHEET 10 OF 24

बीएचईएल BHEL	TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree–00–BTW–EDB –421507E005–PEM–01
		SHT. 09 OF 24 REV. 01

APPROVED
Checked and Approved.

Date: 28-Nov-2017

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NOTES:-

1. THE LADDER AND PERFORATED TYPE CABLE TRAYS AND ACCESSORIES (INCLUDING SIDE RUNNERS OF LADDER TYPE TRAYS & ACCESSORIES) SHALL BE MADE OF 2MM HOT ROLLED M.S. SHEET. ALL THE COUPLER PLATE SHALL BE 3 MM THICK.
2. THE CABLE TRAYS & ACCESSORIES SHALL BE HOT DIP GALVANISED AS PER IS 2629. THE MASS OF ZINC COATING SHALL BE AS PER ASTM A123/123M R1
3. FOR LADDER TYPE CABLE TRAYS AND ACCESSORIES, ALL RUNGS SHALL BE SLOTTED.
4. PERFORATED TRAYS SHALL BE FABRICATED OUT OF A SINGLE M.S. SHEET.
5. STANDARD TRAY ACCESSORIES SHALL BE WITH THE RADIUS INDICATED IN THIS DRAWING.
6. SIDE CHANNELS OF PERFORATED TYPE CABLE TRAY ACCESSORIES SHALL BE WELDED WITH THE PERFORATED SHEET AT INTERVALS OF 100mm.
7. LENGTH OF WELDING SHALL NOT BE LESS THAN 25mm FOR CABLE TRAYS. THE THICKNESS OF WELDING SHALL BE AS PER IS 9595.
8. ALL TRAY CORNERS SHALL BE SMOOTH AND FREE OF SHARP EDGES.
9. THE DEPTH, WIDTH AND LENGTH OF TRAYS SHALL BE WITHIN A TOLERANCE OF (+/−) 2 mm. THE THICKNESS TOLERANCE IS OF (+/−) 0.2 mm AS PER IS 1852.
10. THE THICKNESS OF THE FINISHED GALVANISED PRODUCT SHALL NOT BE LESS THAN 2MM.
11. TO FACILITATE ASSEMBLY, ALL ACCESSORIES AT ENDS SHALL HAVE 100mm STRAIGHT PORTION.
12. ALL NUTS, BOLTS, WASHERS ETC., SHALL BE HOT DIP GALVANISED AS PER IS:1367 PART XIII FOR SIZES 12 MM & ABOVE, AND ELECTROPLATED/ZINC PASSIVATED FOR SIZES UPTO 12 MM.
13. ALL CUTTING & FORMING OPERATIONS SHALL BE COMPLETED PRIOR TO GALVANIZING.
14. FINISHED TRAYS SHALL BE FREE FROM BURRS AND SHARP EDGES.
15. ALL DIMENSIONS ARE IN mm UNLESS NOTED OTHERWISE.
16. WIDTH OF CABLE TRAYS PROPOSED TO BE USED FOR THE PROJECT ARE AS UNDER:

    A)LADDER TYPE: 600W, 450W, 300W, 150W.

    B)PERFORATED TYPE: 600W, 450W, 300W, 150W ,100W, 50W.
17. THE DEPTH OF 600W, 450W, 300W, 150W TRAYS & ACCESSORIES SHALL BE 100MM.THE DEPTH OF 100W, 50W TRAYS & ACCESSORIES SHALL BE 50MM.
18. 600MM WIDE TYPE CABLE TRAYS SHALL BE SUITABLE FOR A CABLE WEIGHT OF 100 Kg PER METRE (INCLUDING LIVE LOAD) OF RUNNING LENGTH OF TRAY.
19. PEM SHALL BE MARKED ON SIDE RUNNER OF EACH TRAY SECTION.

भा.एच.इ.पी. BHEL	TYPICAL DETAILS OF CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree–00–BTW–EDB –421507E005–PEM–01
		SHT. 10 OF 24 REV. 01

APPROVED
Checked and Approved.

Date: 28-Nov-2017

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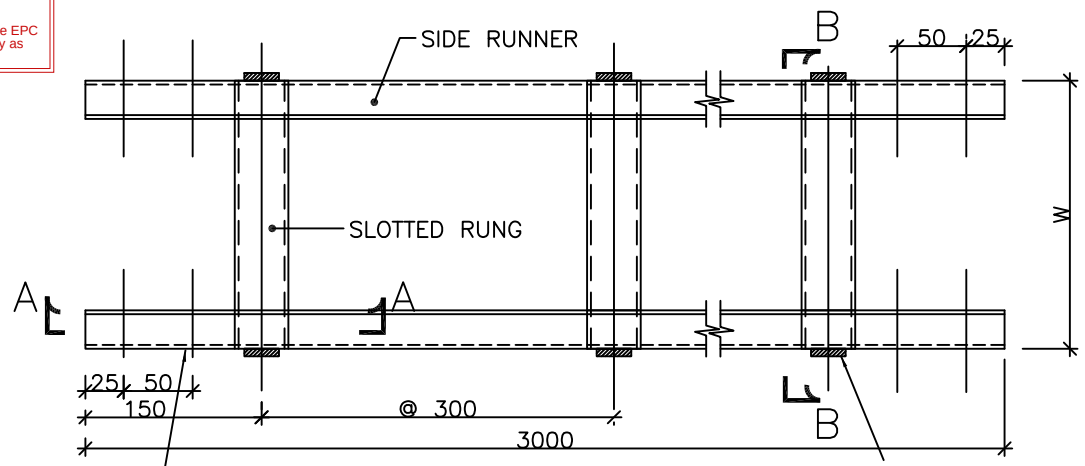
TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES

बीएचईएल BHEL	TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree-00-BTW-EDB -421507E006-PEM-B
		SHT. 11 OF 24 REV. 01

APPROVED
Checked and Approved.

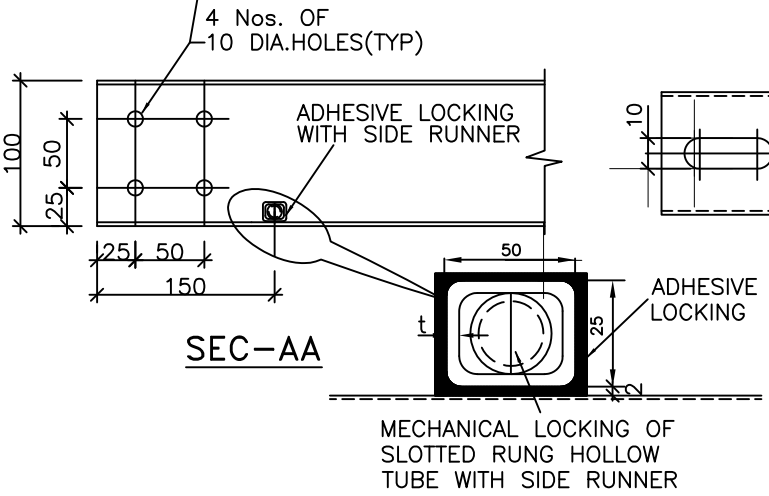
Date: 28-Nov-2017

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

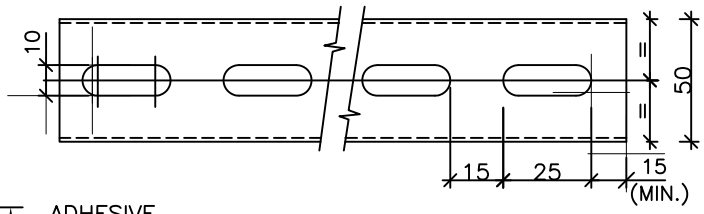


FRP LADDER TYPE CABLE TRAY

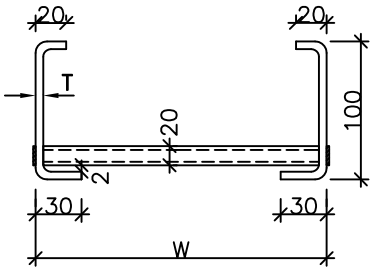
MECHANICAL LOCKING SUITABLE TO WITHSTAND LOADING SPECIFIED IN DATA SHEET–A



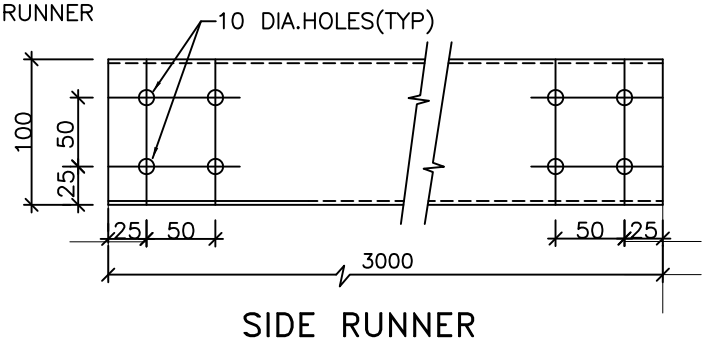
SEC–AA



SLOTTED RUNG



SEC–BB



SIDE RUNNER

W	150	300	450	600
T	4	4	4	4
t	4	4	4	4

FOR GENERAL NOTES REFER SHEET 24 OF 24

TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES

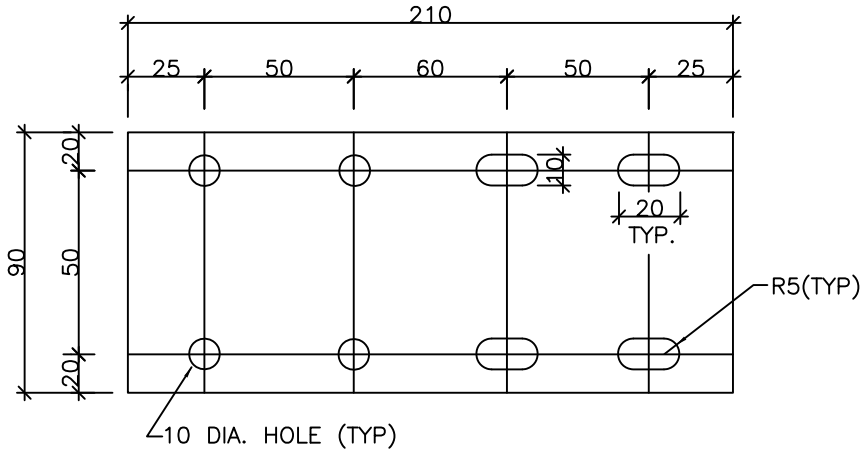
DWG. NO.
Maitree–00–BTW–EDB
–421507E006–PEM–01

SHT. 12 OF 24 REV. 01

APPROVED
Checked and Approved.

Date: 28-Nov-2017

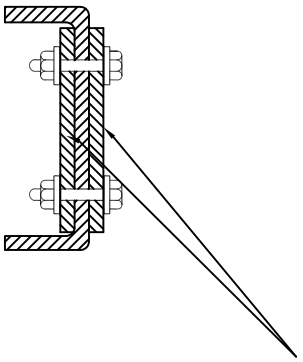
*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.



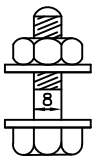
FRP SIDE COUPLER PLATE FOR FRP LADDER/PERFORATED TYPE TRAYS

(600/450/300/150W TRAYS)

QTY. REQUIRED/TRAY SECTION : 4 NOS.

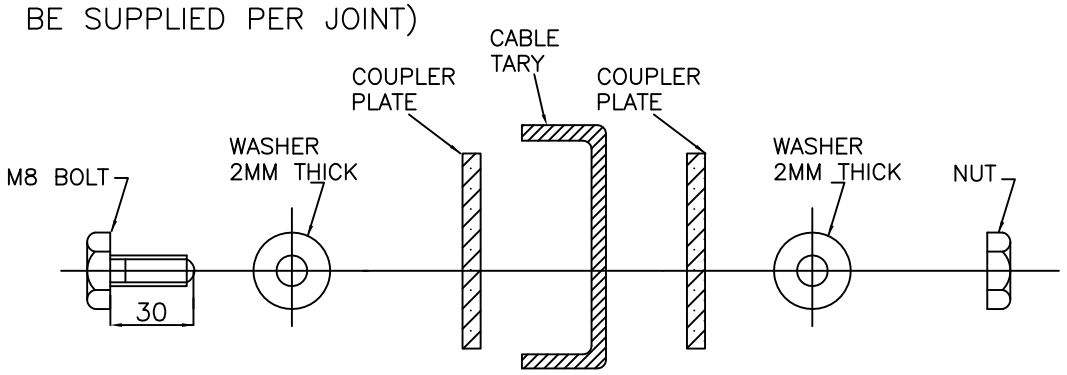


(2 NOS. COUPLER PLATES OF 4 MM THICKNESS TO BE SUPPLIED PER JOINT)



QTY. REQD/TRAY SECTION

A) 16 NOS. M8 BOLTS
B) 16 NOS. NUTS
C) 32 NOS. WASHERS



SEQUENCE OF M8 BOLT, WASHER, NUT, COUPLER PLATE & CABLE TRAY

FOR TYPICAL CABLE TRAY JOINT

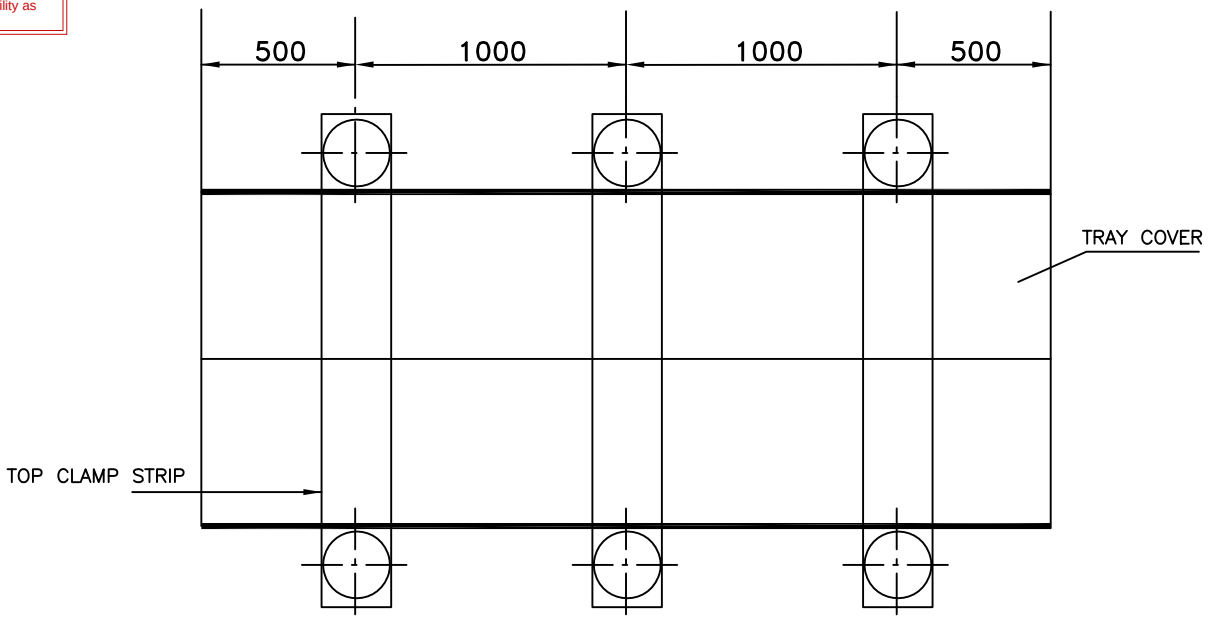
FOR GENERAL NOTES REFER SHEET 24 OF 24

बी एच ई एल BHEL	TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree-00-BTW-EDB-421507E006-PEM-01
		SHT. 13 OF 24 REV. 01

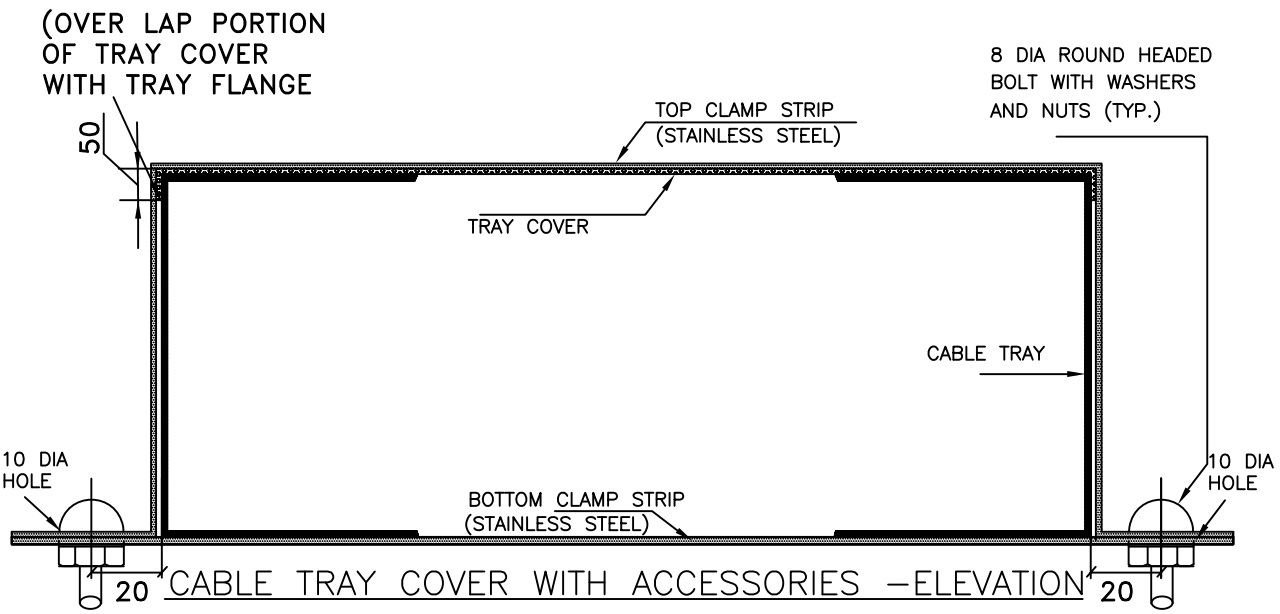
APPROVED
Checked and Approved.

Date: 28-Nov-2017

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.



CABLE TRAY COVER WITH ACCESSORIES –PLAN



CABLE TRAY COVER WITH ACCESSORIES –ELEVATION

TRAY WIDTH(W)	TOP CLAMP SIZE (LxWxT)	BOTTOM CLAMP SIZE (LxWxT)
600	900X20X2	680X20X2
450	750X20X2	530X20X2
300	600X20X2	380X20X2
150	450X20X2	230X20X2

CABLE TRAY COVER SHALL INCLUDE 1 NO. OF TRAY COVER OF 3000MM LENGTH ALONG WITH 3 NOS. OF TOP CLAMP STRIP, 3 NOS. BOTTOM CLAMP STRIP AND 6 NOS. OF BOLTS ALONG WITH NUTS & WASHERS.

CABLE TRAY COVER

FOR GENERAL NOTES REFER SHEET 24 OF 24

बीएचईएल BHEL

TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES

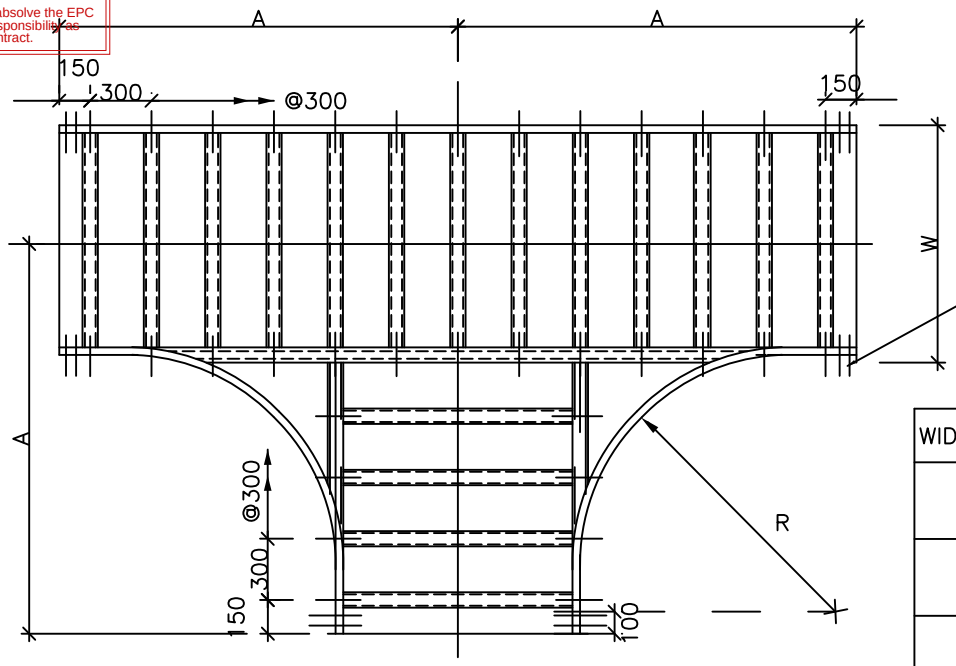
DWG. NO.
Maitree–00–BTW–EDB
–421507E006–PEM–01

SHT. 14 OF 24 REV. 01

APPROVED
Checked and Approved.

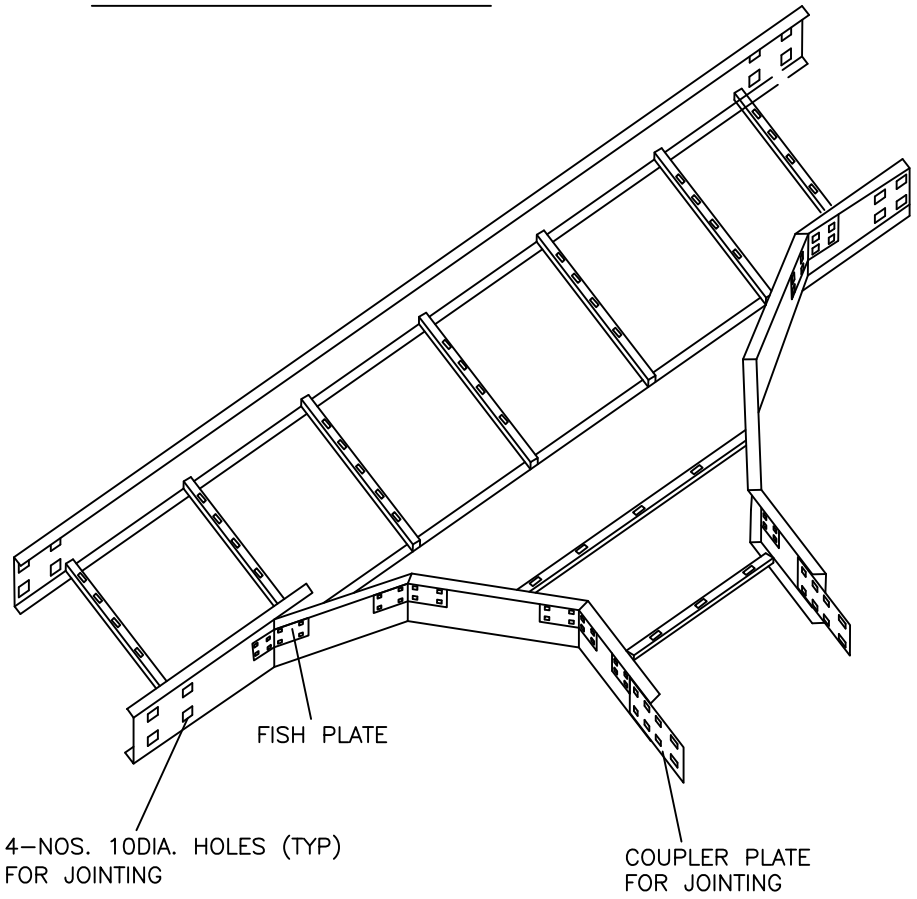
Date: 28-Nov-2017

*Approval doesn't absolve the EPC contractor of it's responsibilities as specified in the Contract.



WIDTH(W)	RADIUS (R)	A
600	600	1000
450	600	925
300	600	850

HORIZONTAL TEE–PLAN



HORIZONTAL TEE

LADDER TYPE ACCESSORIES

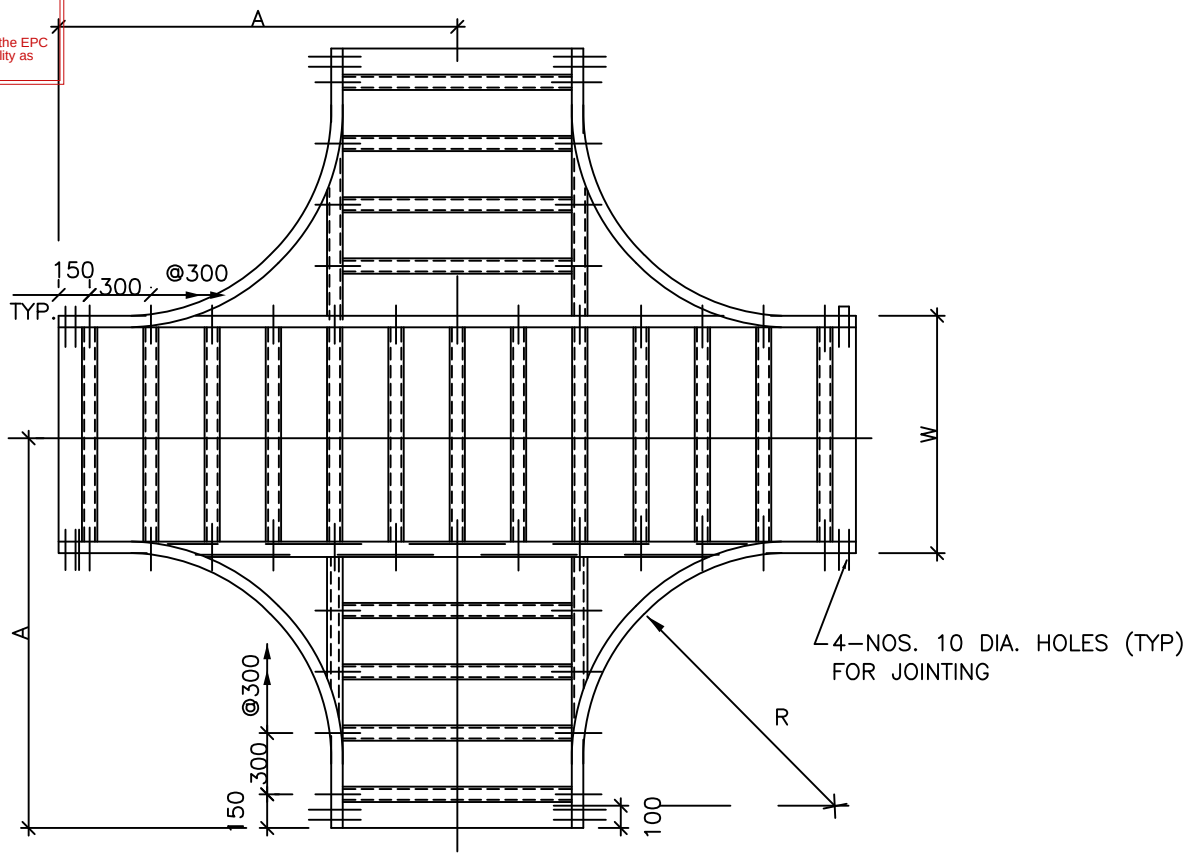
FOR GENERAL NOTES REFER SHEET 24 OF 24

बी एच ई एल BHEL	TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree–00–BTW–EDB –421507E006–PEM–01
		SHT. 15 OF 24 REV. 01

APPROVED
Checked and Approved.

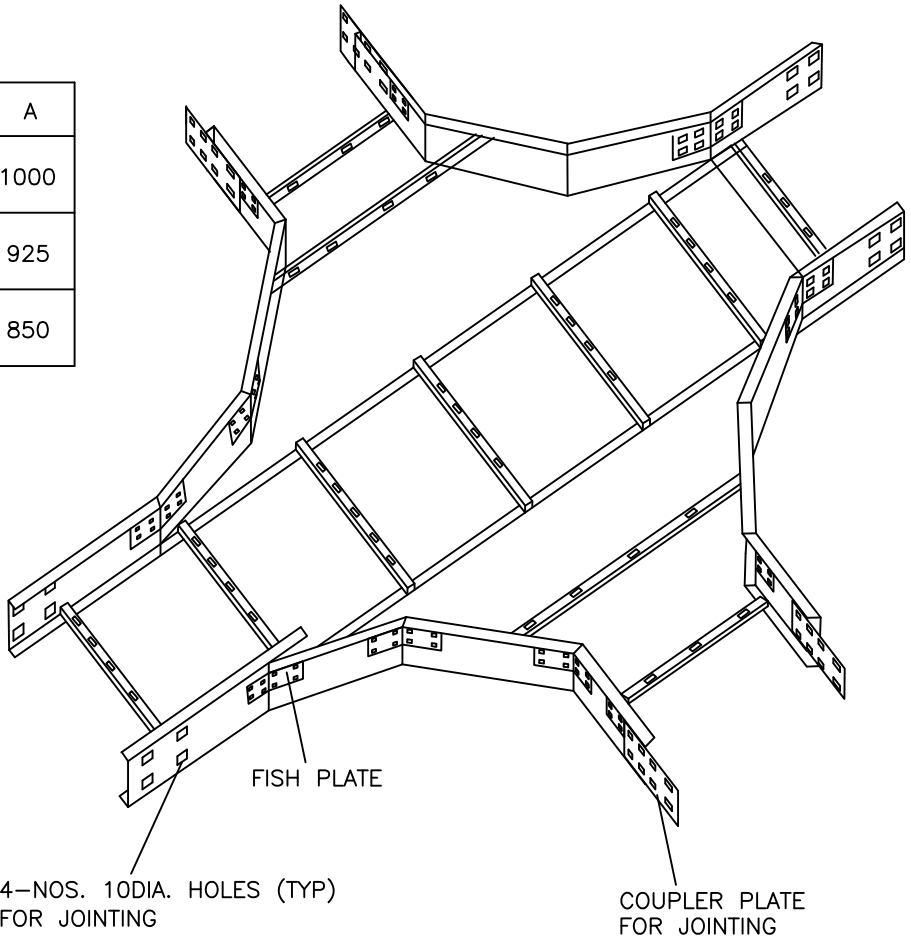
Date: 28-Nov-2017

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.



HORIZONTAL CROSS–PLAN

WIDTH(W)	RADIUS (R)	A
600	600	1000
450	600	925
300	600	850



FOR GENERAL NOTES REFER SHEET 24 OF 24

बीएचईएल BHEL

TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES

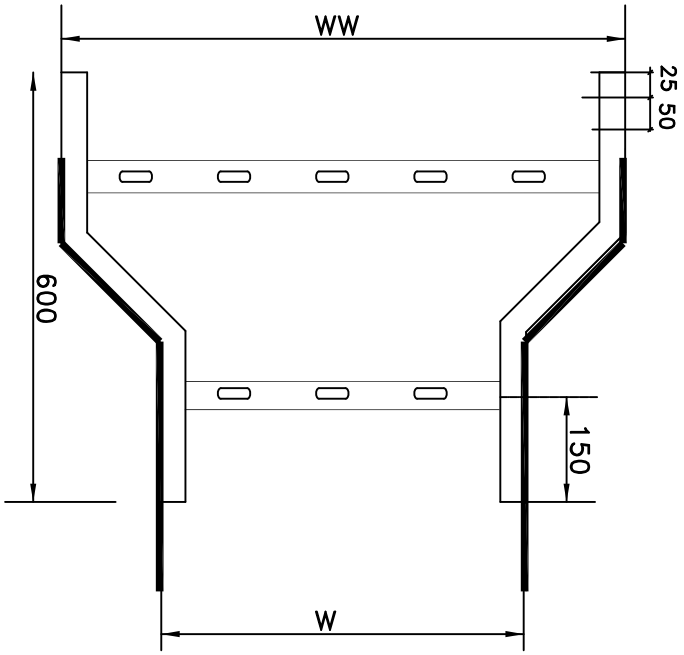
DWG. NO.
Maitree–00–BTW–EDB
–421507E006–PEM–01

SHT. 16 OF 24 REV. 01

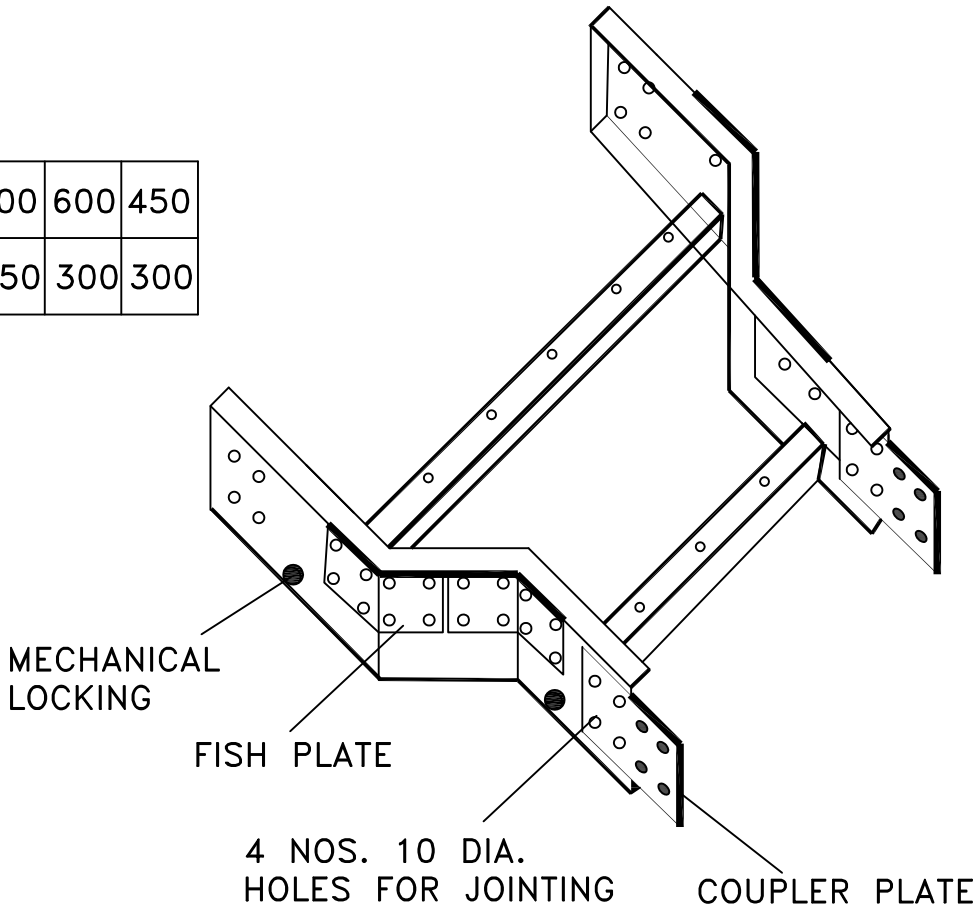
APPROVED
Checked and Approved.

Date: 28-Nov-2017

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WIDTH	WW	600	600	450
	W	450	300	300



REDUCER–LADDER TYPE

LADDER TYPE ACCESSORIES

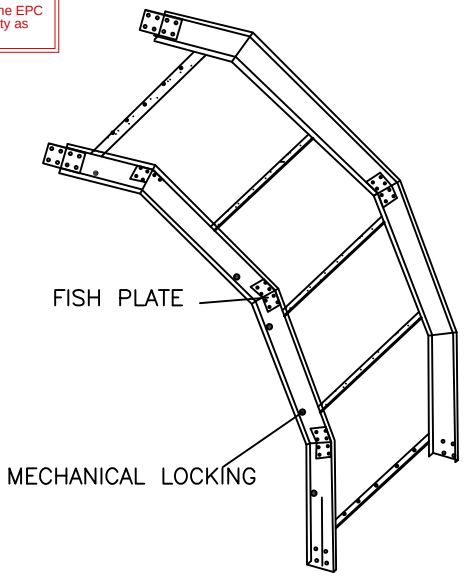
FOR GENERAL NOTES REFER SHEET 24 OF 24

बी एच ई एल BHEL	TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree–00–BTW–EDB –421507E006–PEM–01
		SHT. 17 OF 24 REV. 01

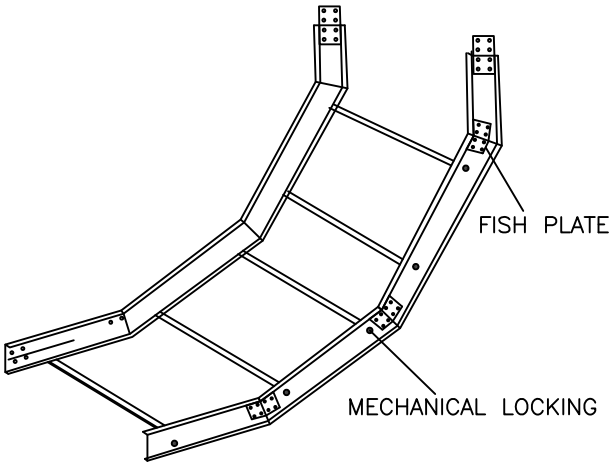
APPROVED
Checked and Approved.

Date: 28-Nov-2017

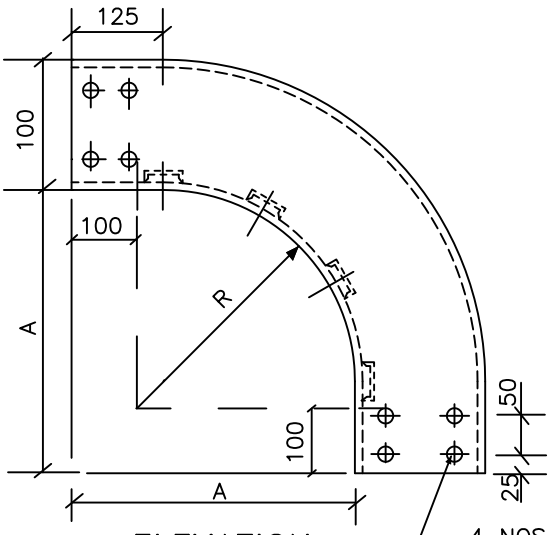
*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.



90° VERTICAL BEND (OUTSIDE)

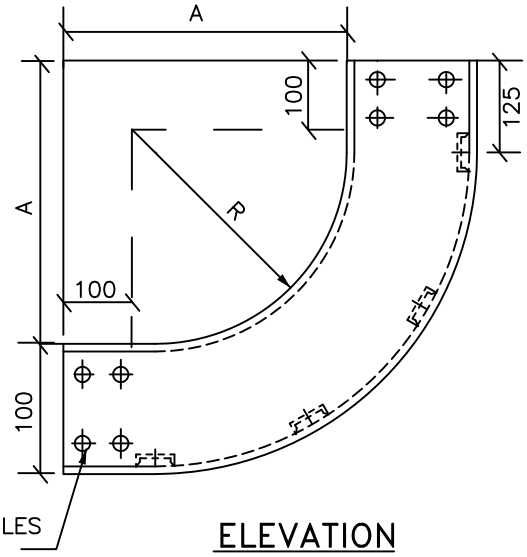


90° VERTICAL BEND (INSIDE)



ELEVATION
90° VERTICAL BEND
(OUTSIDE)

4 NOS. 10 DIA. HOLES FOR JOINTING



ELEVATION
90° VERTICAL BEND
(INSIDE)

WIDTH(W)	RADIUS (R)	A
600	600	700
450	600	700
300	600	700

LADDER TYPE ACCESSORIES

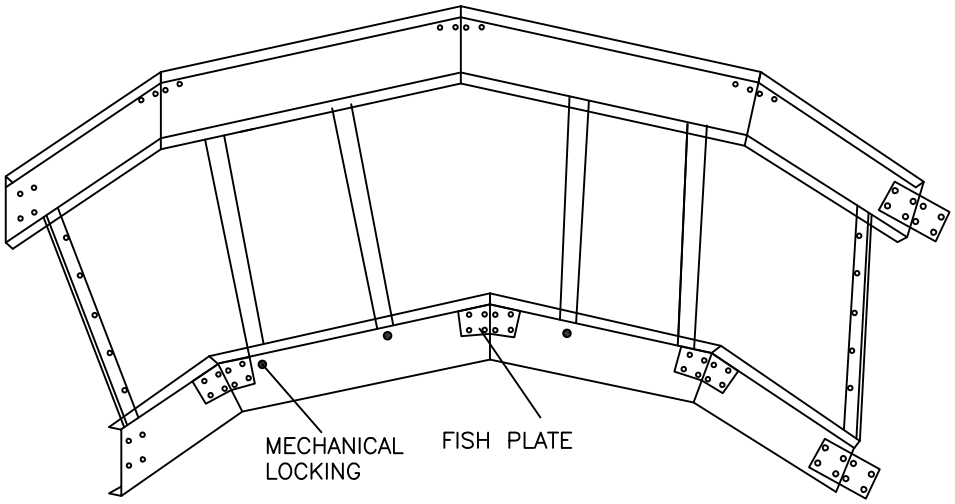
FOR GENERAL NOTES REFER SHEET 24 OF 24

बी एच ई एल BHEL	TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree-00-BTW-EDB -421507E006-PEM-01 SHT. 18 OF 24 REV. 01

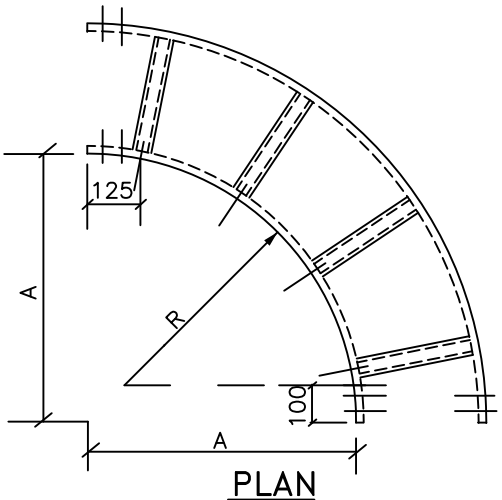
APPROVED
Checked and Approved.

Date: 28-Nov-2017

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.



90° HORIZONTAL BEND



PLAN

90°HORIZONTAL BEND

WIDTH(W)	RADIUS (R)	A
600	600	700
450	600	700
300	600	700

LADDER TYPE ACCESSORIES

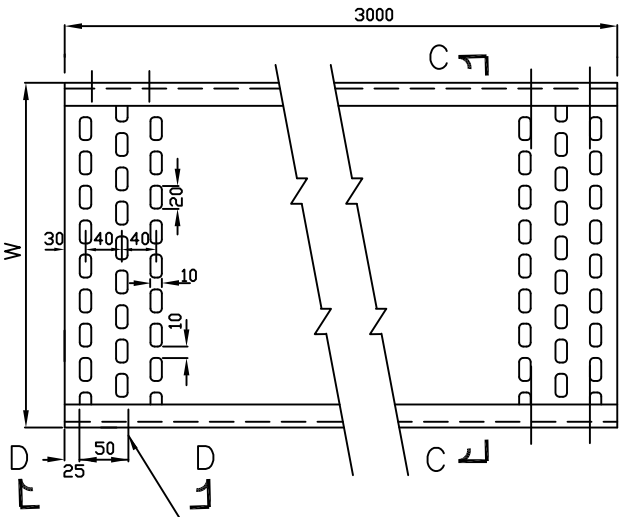
FOR GENERAL NOTES REFER SHEET 24 OF 24

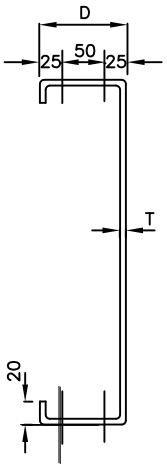
BHEL	TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree–00–BTW–EDB –421507E006–PEM–01
		SHT. 19 OF 24 REV. 01

APPROVED
Checked and Approved.

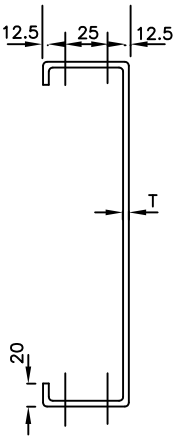
Date: 28-Nov-2017

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

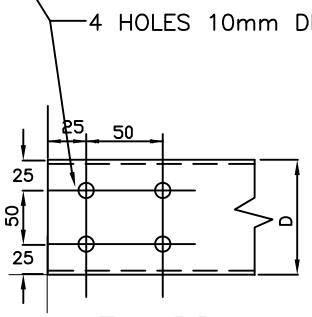




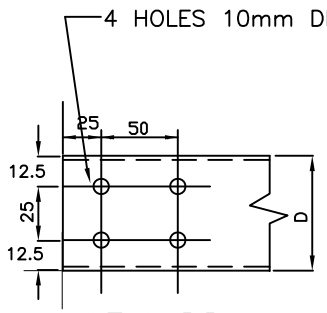
SECTION–CC
(600/450/300/
150 TRAYS)



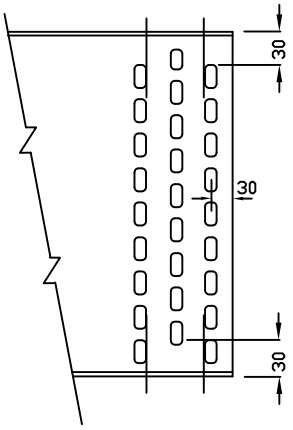
SECTION–CC
(100/50 TRAYS)



VIEW–DD
(600/450/300/
150W TRAYS)



VIEW–DD
(100W/50W
TRAYS)



ARRANGEMENT OF
PERFORATIONS

TRAY WIDTH W (mm)	600	450	300	150	100	50
TRAY DEPTH D (mm)	100	100	100	100	50	50
T (mm)	4	4	4	4	4	4

PERFORATED TYPE TRAY

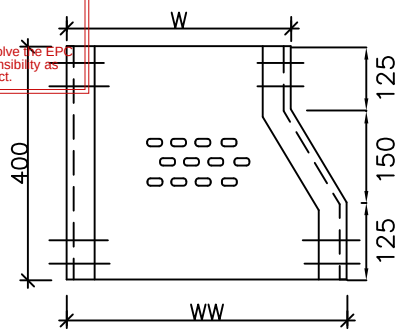
FOR GENERAL NOTES REFER SHEET 24 OF 24

बीएचईएल BHEL	TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree–00–BTW–EDB –421507E006–PEM–01
		SHT. 20 OF 24 REV. 01

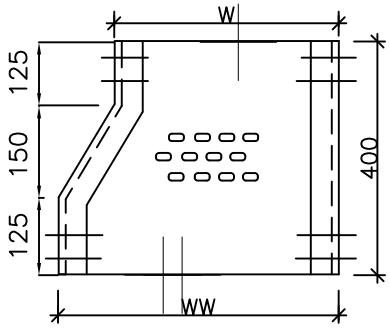
APPROVED
Checked and Approved.

Date: 28-Nov-2017

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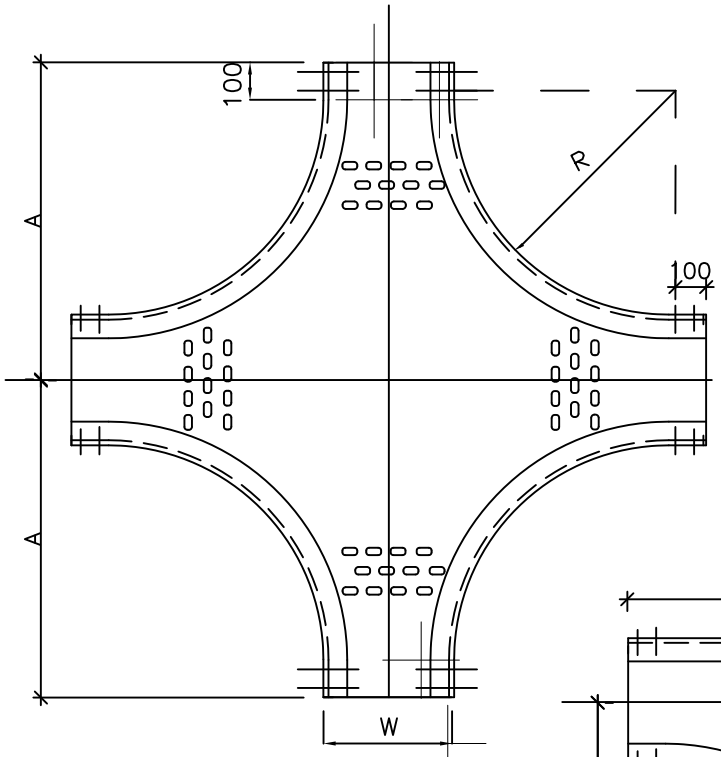
LEFT HAND REDUCER



RIGHT HAND REDUCER

WW	W	DEPTH	THICKNESS
600	450	100	4
600	300	100	4
450	300	100	4

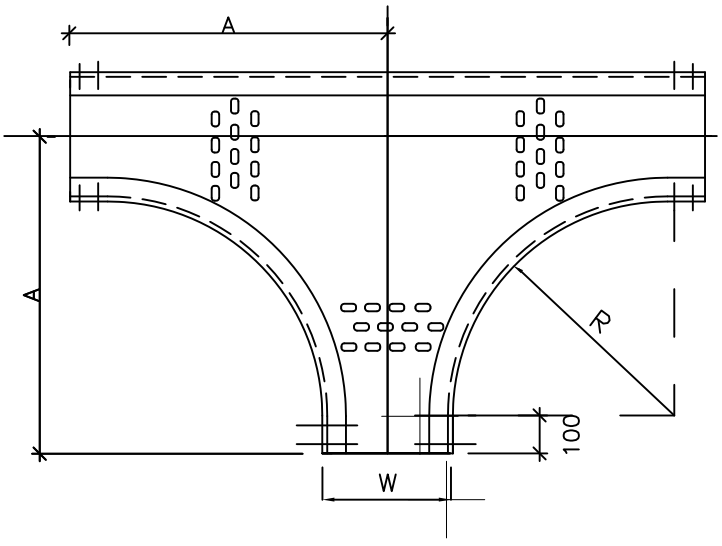
PERFORATED TYPE



CROSS

PERFORATED TYPE

WIDTH(W)	RADIUS (R)	A	THICKNESS
600	600	1000	4
450	600	925	4
300	600	850	4



TEE

PERFORATED TYPE ACCESSORIES

FOR GENERAL NOTES REFER SHEET 24 OF 24

TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES

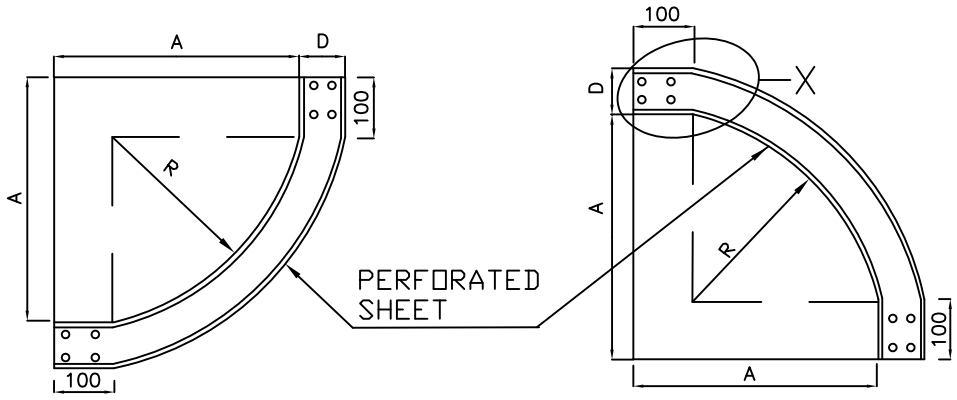
DWG. NO.
Maitree-00-BTW-EDB
-421507E006-PEM-01

SHT. 21 OF 24 REV. 01

APPROVED
Checked and Approved.

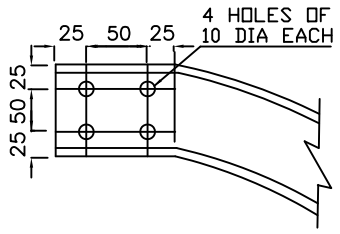
Date: 28-Nov-2017

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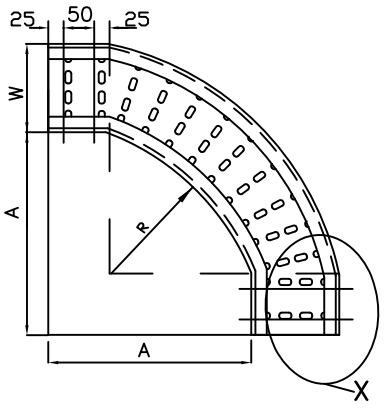
INSIDE TYPE

OUTSIDE TYPE



ENLARGED VIEW OF "X"

90° VERTICAL BEND - PERFORATED TYPE



WIDTH(W)	RADIUS (R)	A	T
600	600	700	4
450	600	700	4
300	600	700	4

90° HORIZONTAL BEND - PERFORATED TYPE

PERFORATED TYPE ACCESSORIES

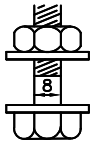
FOR GENERAL NOTES REFER SHEET 24 OF 24

बी एच ई एल BHEL	TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree-00-BTW-EDB-421507E006-PEM-01
		SHT. 22 OF 24 REV. 01

APPROVED
Checked and Approved.

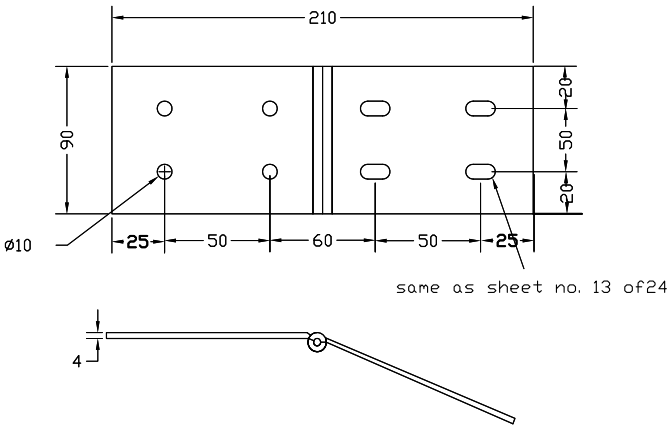
Date: 28-Nov-2017

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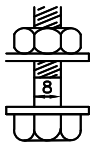


QTY. REQD/TRAY SECTION

A) 8 NOS. M8 BOLTS
B) 8 NOS. NUTS
C) 16 NOS. WASHERS

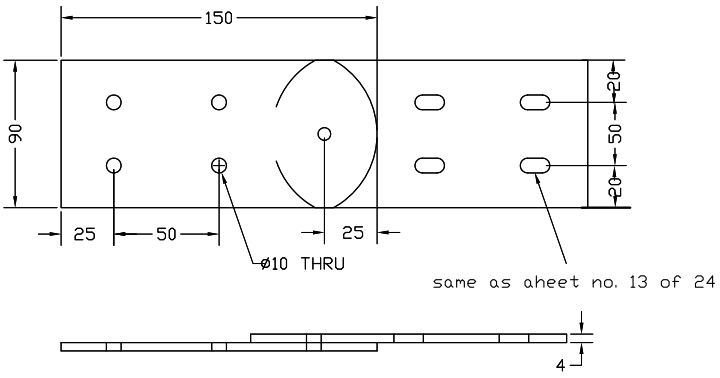


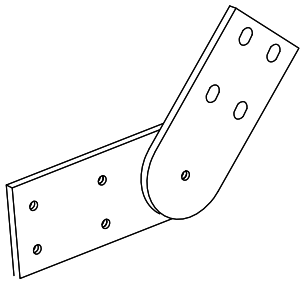
FRP ADJUSTABLE HORIZONTAL SPLICE PLATE



QTY. REQD/TRAY SECTION

A) 8 NOS. M8 BOLTS
B) 8 NOS. NUTS
C) 16 NOS. WASHERS





R1

FRP ADJUSTABLE VERTICAL SPLICE PLATE

NOTES:

- ALL DIMENSIONS ARE IN MM.

FOR GENERAL NOTES REFER SHEET 24 OF 24

	TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree-00-BTW-EDB -421507E006-PEM-01
		SHT. 23 OF 24 REV. 01

APPROVED
Checked and Approved.

Date: 28-Nov-2017

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NOTES:-

1. THE FRP TYPE LADDER AND PERFORATED TYPE CABLE TRAYS AND ACCESSORIES (INCLUDING SIDE RUNNERS OF LADDER TYPE TRAYS & ACCESSORIES) SHALL BE MADE OF 4MM THICKNESS. COUPLER PLATE SHALL BE 4 MM THICK.
2. FOR LADDER TYPE CABLE TRAYS AND ACCESSORIES, ALL RUNGS SHALL BE SLOTTED.
3. STANDARD TRAY ACCESSORIES SHALL BE WITH THE RADIUS INDICATED IN THIS DRAWING.
4. ALL TRAY CORNERS SHALL BE SMOOTH AND FREE OF SHARP EDGES.
5. THE CABLE TRAY COVER (FRP) SHALL BE OF 3MM THICKNESS SHALL BE PROVIDED ON OUTDOOR TRAYS. IT SHALL BE PROVIDED ON TOP MOST CABLE TRAY.
6. THE WIDTH, LENGTH & HEIGHT OF TRAYS & TRAY COVERS SHALL BE WITHIN A TOLERANCE OF (+) 2 mm. THE THICKNESS TOLERANCE SHALL BE (+) 0.5 mm. NO NEGATIVE TOLERANCE IN THICKNESS, WIDTH, HEIGHT OR LENGTH IS PERMITTED.
7. TO FACILITATE ASSEMBLY, ALL ACCESSORIES AT ENDS SHALL HAVE 100mm STRAIGHT PORTION.
8. ALL NUTS, BOLTS, WASHERS ETC., SHALL BE OF STAINLESS STEEL (SS 304).
9. FINISHED TRAYS & COVERS SHALL BE FREE FROM BURRS AND SHARP EDGES.
10. ALL DIMENSIONS ARE IN mm UNLESS NOTED OTHERWISE.
11. WIDTH OF CABLE TRAYS PROPOSED TO BE USED FOR THE PROJECT ARE AS UNDER:

    A)LADDER TYPE: 600W, 450W, 300W, 150W.

    B)PERFORATED TYPE: 600W, 450W, 300W, 150W, 100W, 50W
12. THE DEPTH OF 600W, 450W, 300W, 150W TRAYS & ACCESSORIES SHALL BE 100MM WHILE DEPTH OF 100W & 50W CABLE TRAY SHALL BE 50MM.
13. FOLLOWING SHALL BE LOADING ON CABLE TRAYS AT 1500MM SUPPORT SPAN:-

    FOR LADDER TYPE CABLE TRAYS:-
    600W CABLE TRAY – 90KG/M
    450W CABLE TRAY – 75KG/M
    300W CABLE TRAY – 60KG/M
    150W CABLE TRAY – 30KG/M

    FOR PERFORATED TYPE CABLE TRAYS:-
    600W CABLE TRAY – 90KG/M
    450W CABLE TRAY – 75KG/M
    300W CABLE TRAY – 60KG/M
    150W CABLE TRAY – 30KG/M
    100W CABLE TRAY – 15KG/M
    50W CABLE TRAY – 7.5KG/M

    IN ADDITION TO THIS 80KG POINT LOAD AT MID SPAN SHALL ALSO BE CONSIDERED.

बीएचईएल	TYPICAL DETAILS OF FRP TYPE CABLE TRAYS AND ACCESSORIES	DWG. NO. Maitree-00-BTW-EDB-421507E006-PEM-01
		SHT. 24 OF 24 REV. 01

FIO
FOR INFORMATION ONLY

Date: 23-Oct-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

TYPICAL LIGHTNING PROTECTION DETAILS

Date	Rev	ALT	CHD	APP
		MKM	MKM	SL
03.10.18	05			

Date	Rev	ALT	CHD	APP
		MKM	AbA	SL
23.07.18	04			

Date	Rev	ALT	CHD	APP
		VKS	VY	SL
18.06.18	03			

Revised as per TCS dated 06.06.18
Revised portion is marked with R3

Date	Rev	ALT	CHD	APP
		MKM	AbA	SL
25.04.18	02			

Revised as per TCS dated 02.03.18
Revised portion is marked with R2

Date	Rev	ALT	CHD	APP
		MKM	AbA	SL
30.08.17	01	–sd–	–sd–	–sd–

Revised as per clause no– B0.6.18.6. of customer specification and customer comments dated 06.10.16
Revised portion is marked with R1

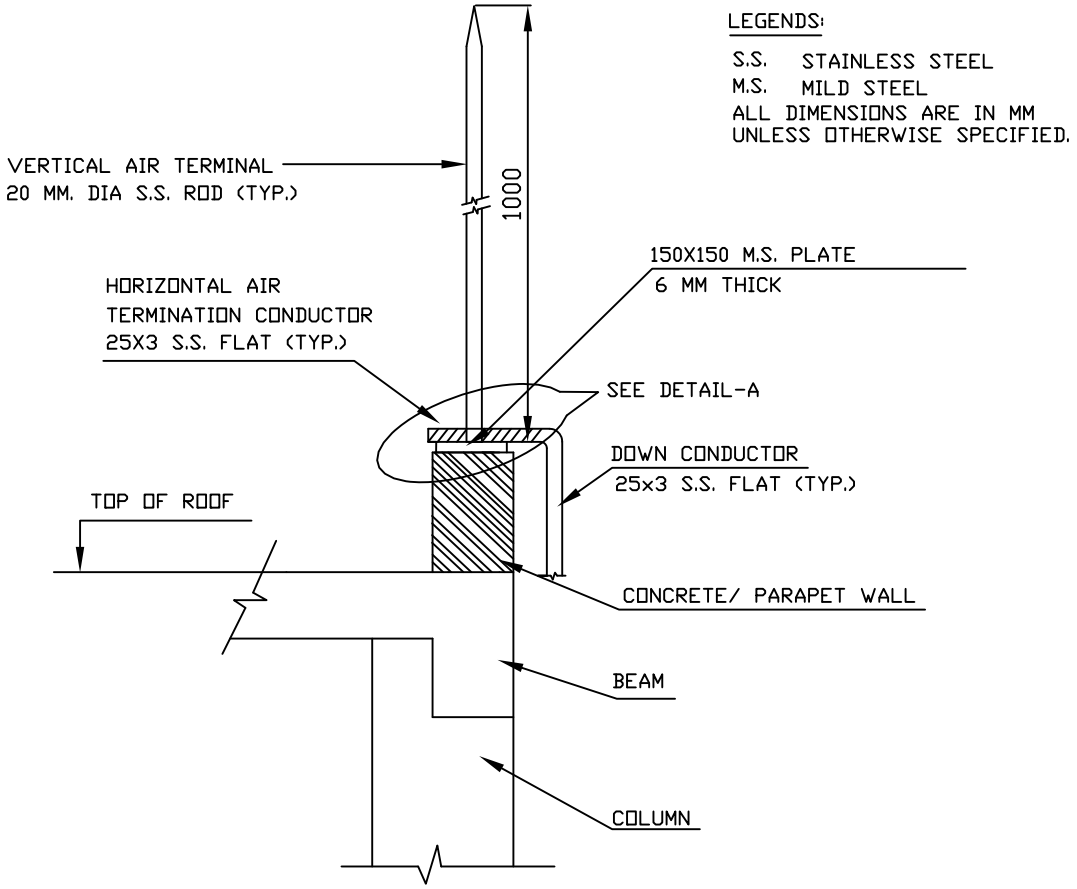
PROJECT	2X660MW BIFPCL MAITREE KHULNA STPP (BANGLADESH)	
	OWNER	BANGLADESH–INDIA FRIENDSHIP POWER CO. (Pvt.) LIMITED (BIFPCL)
FICHTNER	OWNER'S CONSULTANT	FICHTNER GmbH & Co KG GERMANY
BHEL	EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA(U.P) INDIA
DOCUMENT TITLE:	TYPICAL LIGHTNING PROTECTION DETAILS	DPT CODE–E
DOCUMENT NO:	MAITREE–00–BAU–EDB–105012–PEM	REV. 05
BHEL DOCUMENT NO:	PE–DC–421–509–E006	

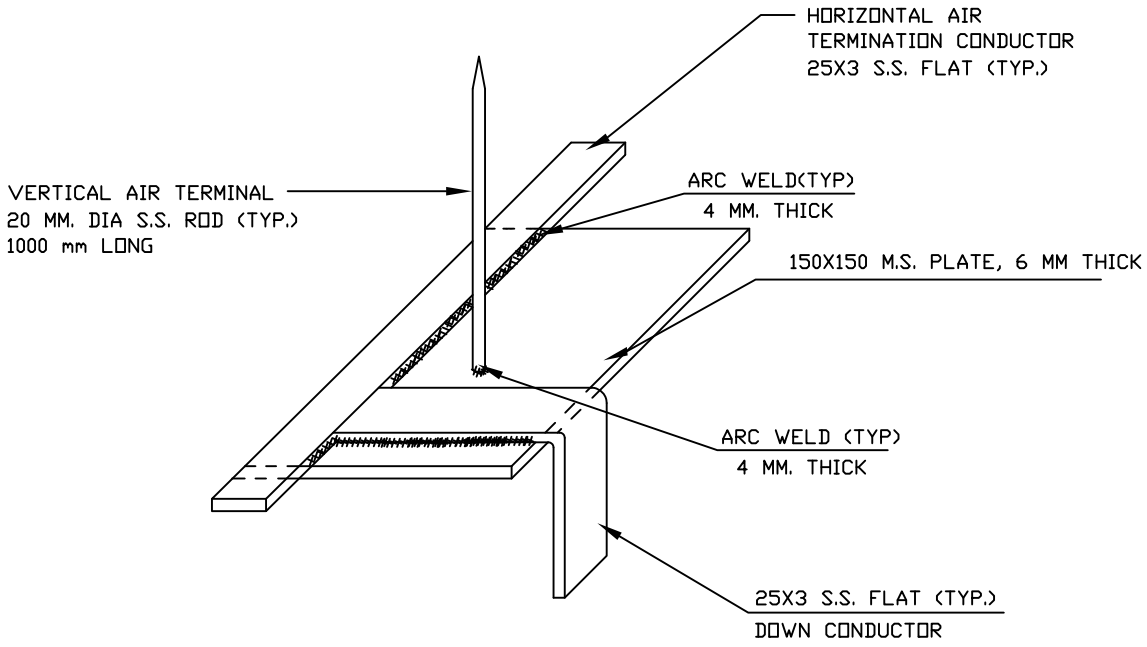
	NAME	SIGN	DATE
DRN	BKR	–sd–	14.06.16
CHD	VY	–sd–	14.06.16
APP	SL	–sd–	14.06.16

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Date: 23-Oct-2018

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DETAIL-A

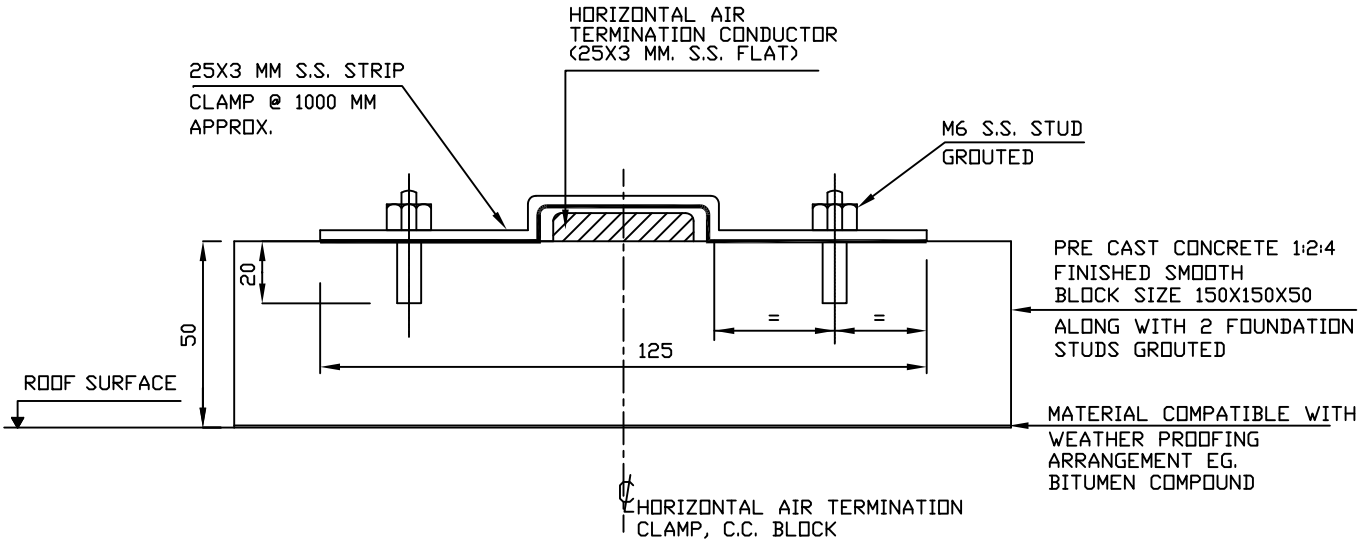
TYPICAL FIXING/CONNECTION DETAILS OF VERTICAL AIR TERMINAL ROD ON THE ROOF OF BUILDING

TITLE **TYPICAL LIGHTNING PROTECTION DETAILS**	Document No: MAITREE-00-BAU-EDB-105012-PEM
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	SHEET 2 OF 9

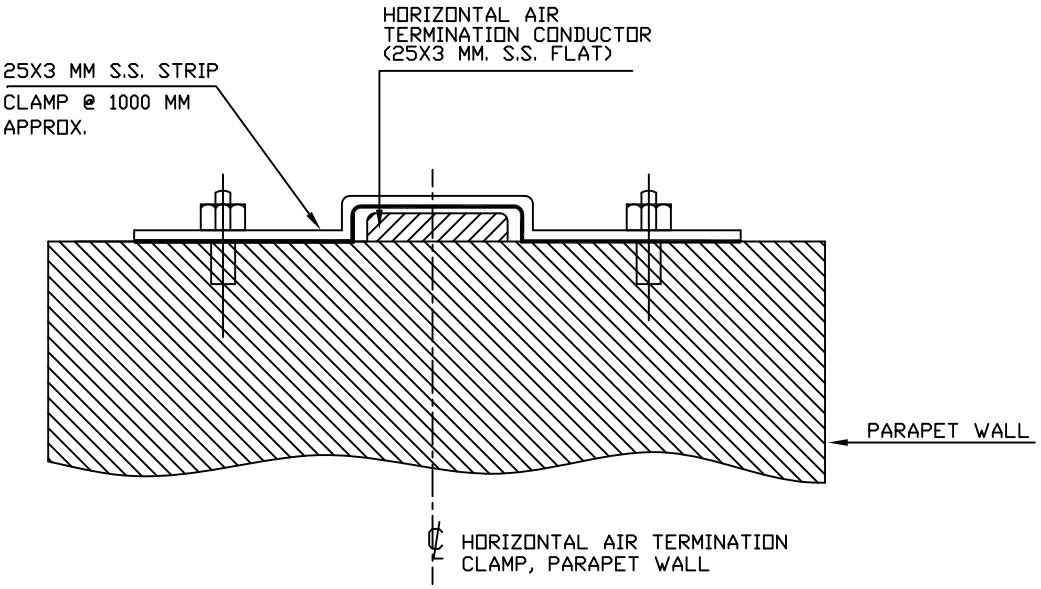
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(A) OVER ROOF SURFACE



(B) OVER PARAPET WALL

TYPICAL DETAILS OF CLAMPING HORIZONTAL AIR TERMINATION

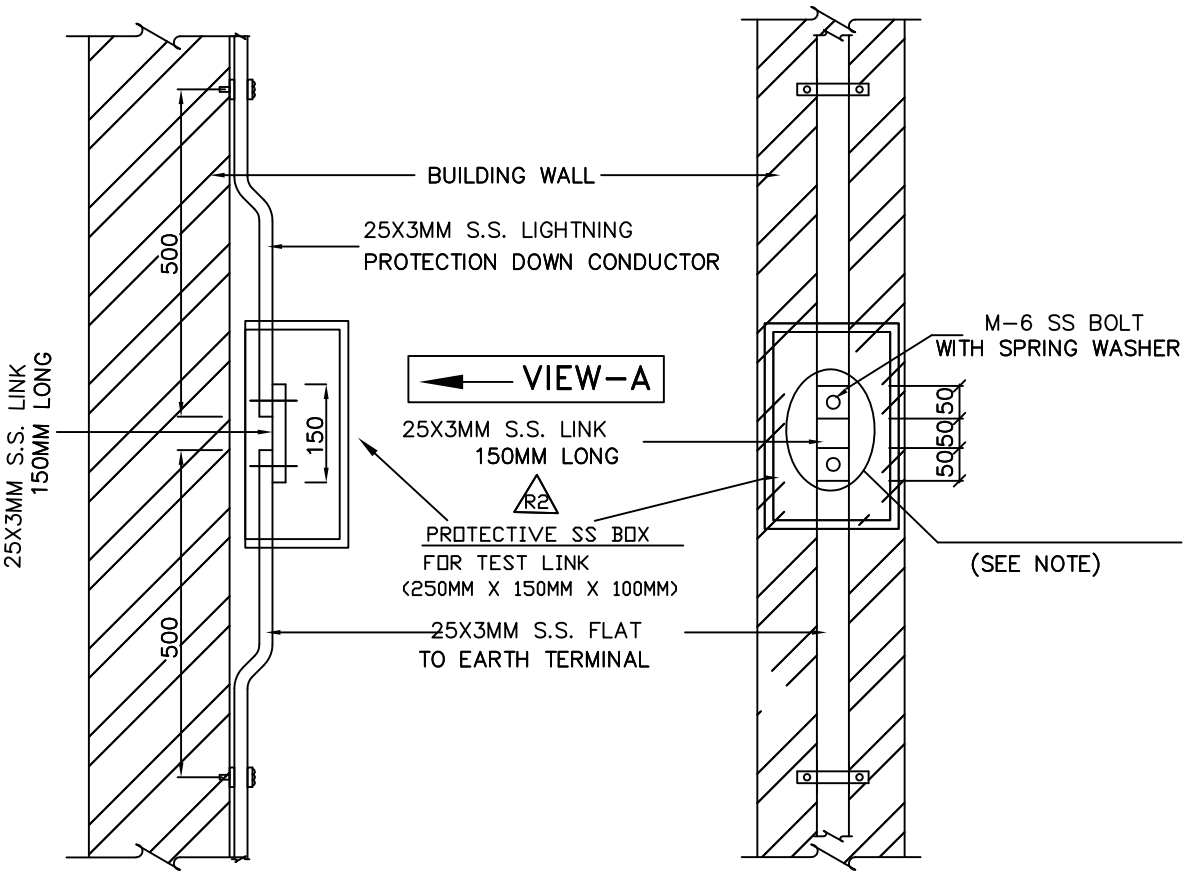
CLAMPING OVER ROOF

TITLE **TYPICAL LIGHTNING PROTECTION DETAILS**	Document No: MAITREE-00-BAU-EDB-105012-PEM
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TEST LINK DETAILS

NOTE: THE LINK SHALL BE 150 MM LONG 25X3MM SS LINK ALONG WITH HARDWARES (2 NOS. OF M-6 SS NUTS & BOLTS & 4 NOS. SPRING WASHERS) & 250X150X100 MM STAINLESS STEEL COVERING BOX (1.6 MM THICK) WITH 4 NOS M12 SCREWS & 4 NOS. RAWL PLUG FOR FIXING THE SAME.

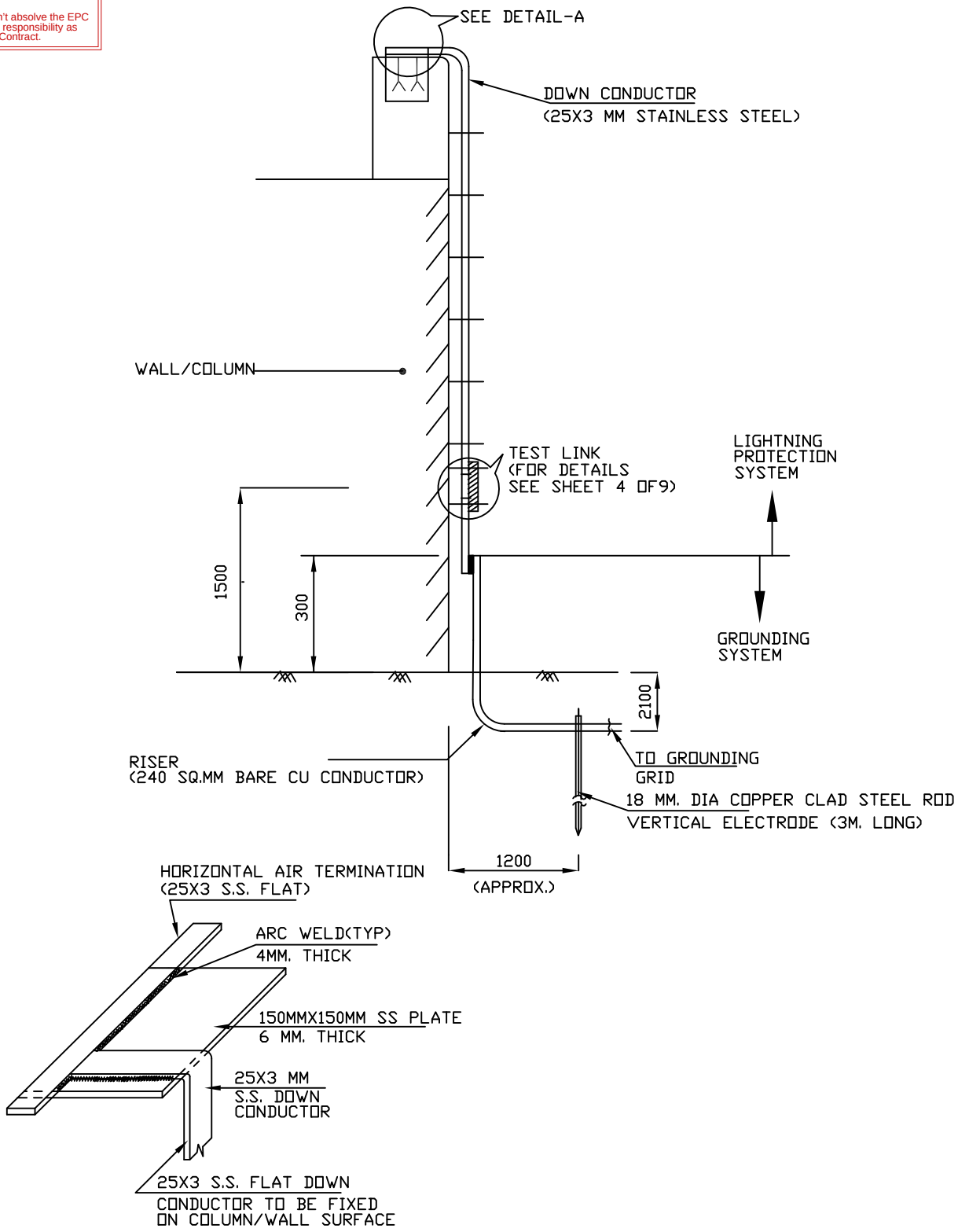
TYPICAL DETAILS OF DOWNCONDUCTOR FIXING AND TEST LINK

TITLE TYPICAL LIGHTNING PROTECTION DETAILS	Document No: MAITREE-00-BAU-EDB-105012-PEM
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DETAIL-A

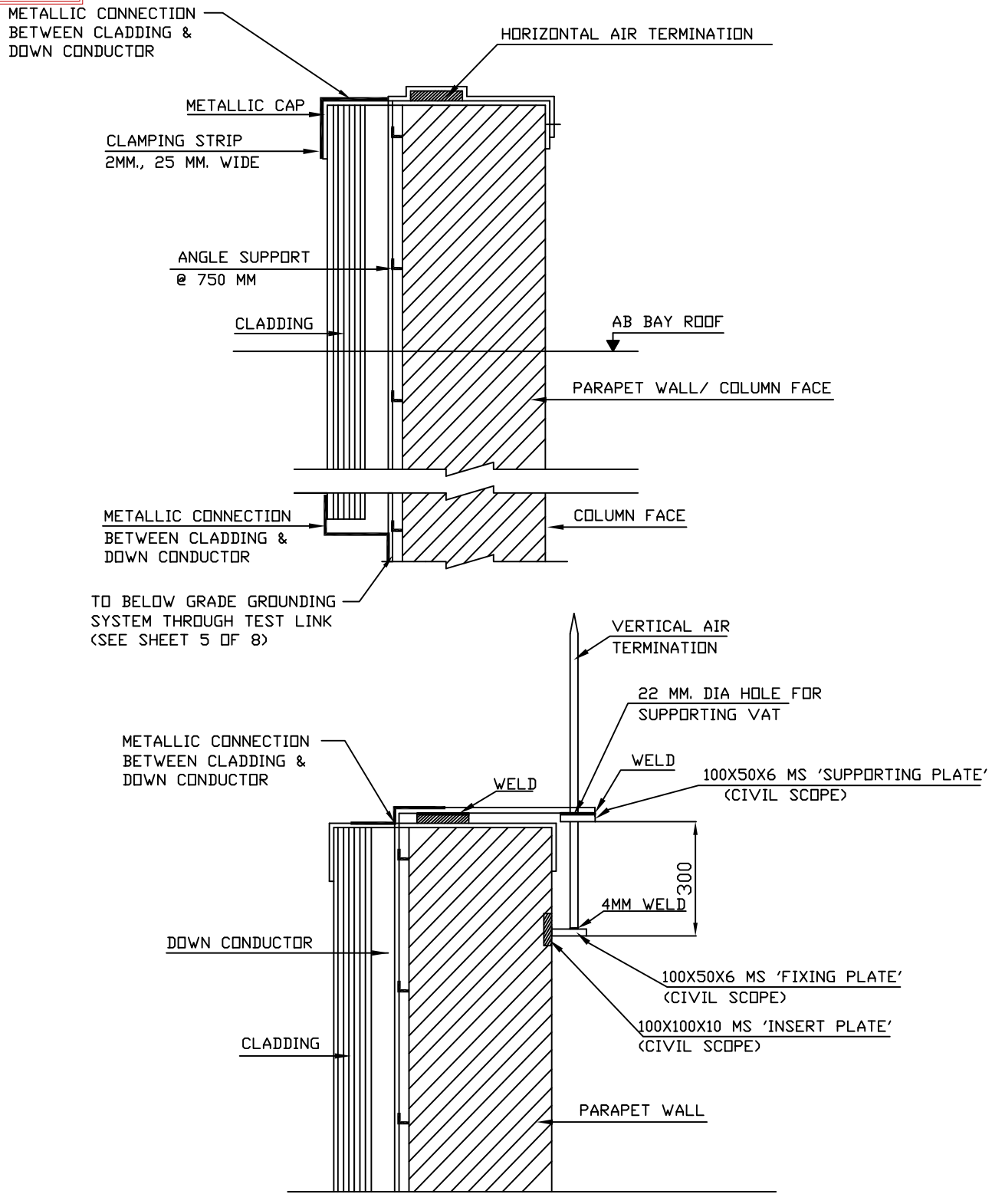
TYPICAL DETAILS OF CONNECTION AMONG HORIZONTAL AIR TERMINAL, DOWN CONDUCTOR AND RISER

TITLE **TYPICAL LIGHTNING PROTECTION DETAILS**	Document No: MAITREE-00-BAU-EDB-105012-PEM
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TYPICAL DETAILS OF CONNECTION AMONG HORIZONTAL AIR TERMINAL, DOWN CONDUCTOR FOR CLADDING

TITLE

TYPICAL LIGHTNING PROTECTION DETAILS

Document No:
MAITREE-00-BAU-EDB-105012-PEM

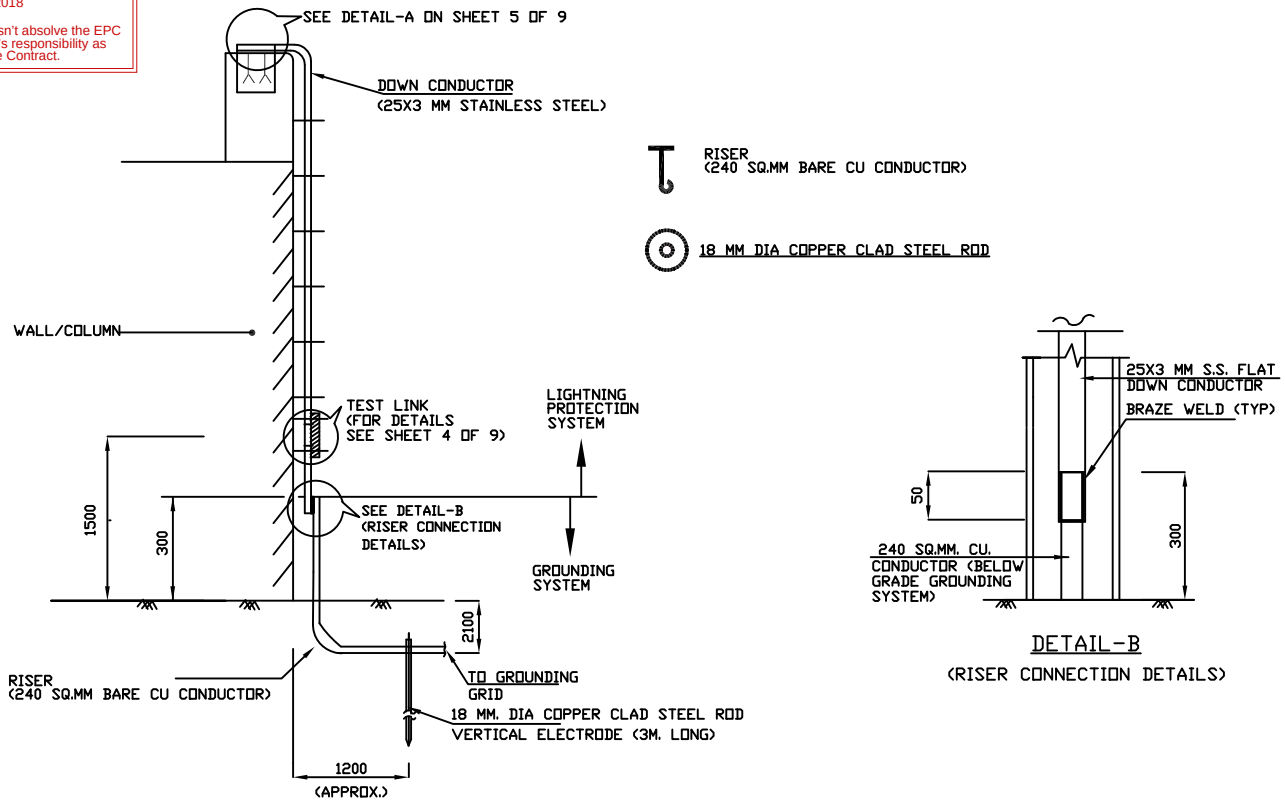
REV. No. 05

SHEET 6 OF 9

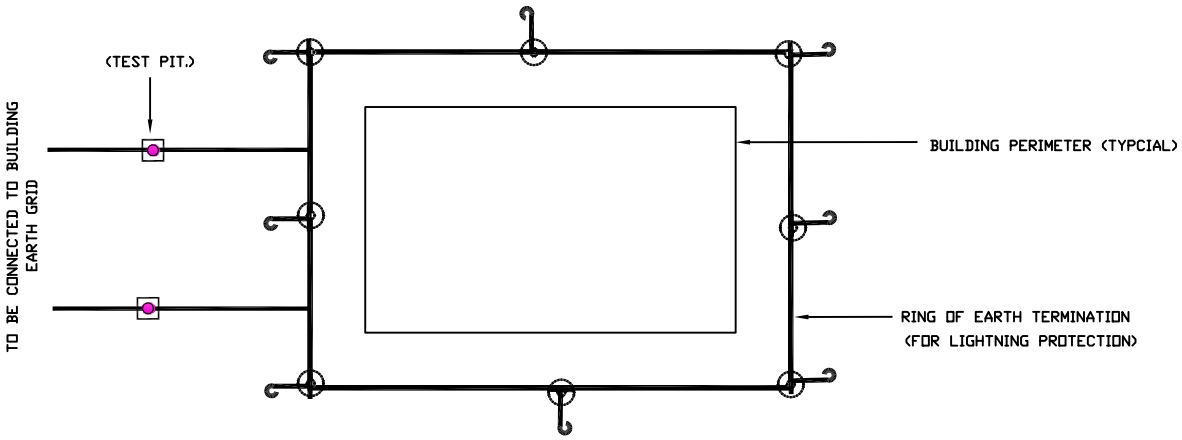
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DETAIL-B
(RISER CONNECTION DETAILS)



NOTES:

1. NUMBER OF 18MM DIA COPPER CLAD STEEL ROD BE EQUAL TO NUMBER OF DOWN COMERS.
2. NUMBER OF RISER OF 240 SQ.MM BARE CU CONDUCTOR SHALL BE EQUAL TO NUMBER OF DOWN COMERS.
3. EARTH RING CONDUCTOR AROUND THE BUILDING SHALL BE BURIED IN EARTH AT A MINIMUM DISTANCE OF 1200MM FROM THE OUTER WALL / FOUNDATION / BOUNDARY OF THE BUILDING,
4. FOR DETAIL OF BELOW GRADE GROUNDING SYSTEM OF PLANT FOLLOWING DRAWING SHALL BE REFERRED

   MAITREE-00-BAU-EDB-105007-PEM- DESIGN MEMORANDUM FOR GROUNDING SYSTEM
   MAITREE-00-BAU-EDB-105009-PEM-TYPICAL BELOW GROUND EARTHING DETAILS
5. ALL TEST LINKS AND ALL TEST PITS FOR LIGHTNING PROTECTION SYSTEM SHALL BE EQUIPPED WITH A TAG FOR EXPLICIT IDENTIFICATION OF THE TEST LINK/PIT.

EARTH TERMINATION SYSTEM

TITLE

TYPICAL LIGHTNING PROTECTION DETAILS

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NOTES:-

1.0 AIR TERMINATIONS

1.1 HORIZONTAL/ VERTICAL AIR TERMINATION NETWORK WILL BE INSTALLED ON THE TOP OF ALL STRUCTURE/ BUILDINGS TO BE PROTECTED FROM LIGHTNING STROKES. THE INSTALLATION WORK SHALL BE DULY COORDINATED BY SITE WITH THE OTHER ACTIVITIES SUCH AS WEATHER PROOFING APPLICATION ON ROOF, ETC.

1.2 HORIZONTAL AIR TERMINATIONS SHALL BE OF 25MM x 3MM STAINLESS STEEL FLATS CLAMPED TO THE SURFACE AT EVERY 1000 MM. VERTICAL AIR TERMINATION'S SHALL BE 20 MM DIA STAINLESS STEEL ROD 1000 MM LONG.

1.3 HORIZONTAL AIR TERMINATION NETWORK SHALL BE LAID OUT AS PER LIGHTNING PROTECTION DRAWING OF RESPECTIVE AREA.

1.4 THE VERTICAL AIR TERMINATION ROD WILL BE PROPERLY FIXED AS PER DETAILS GIVEN IN THE DRAWING ON THE TOP OF THE BUILDING/ STRUCTURE TO WITHSTAND VERY HIGH WIND PRESSURE. THE HORIZONTAL & VERTICAL AIR TERMINATIONS SHALL BE PROPERLY FIXED ON THE TOP OF ROOF OF THE BUILDINGS SUCH AS NOT TO MAKE ANY PENETRATION IN THE WATER PROOFING LAYER.

2.0 DOWN CONDUCTORS

2.1 THE DOWN CONDUCTORS SHALL BE 25MM X 3MM STAINLESS STEEL FLATS. ONE END OF THESE FLATS SHALL BE CONNECTED TO THE VERTICAL / HORIZONTAL AIR TERMINATION NETWORK ON TOP OF ROOF / STRUCTURE AND THE OTHER END TO THE NEAREST EARTH TERMINALS. DOWN CONDUCTORS SHALL BE
(i) PROVIDED AT HORIZONTAL SPACING NOT EXCEEDING 10M FOR CLASS-I OF LPS

2.1(a) DEDICATED DOWN CONDUCTORS WILL BE USED IN THE STEEL COLUMN BUILDINGS INSTEAD OF USING THE STEEL COLUMN FOR LIGHTNING PROTECTION PURPOSE.

2.1(b) LIGHTNING PROTECTION SYSTEM SHALL NOT BE CONNECTED WITH THE CONDUCTORS USED FOR SAFETY EARTHING PURPOSE AT ABOVE GROUND LEVEL.

2.2 EACH DOWN CONDUCTOR WILL BE CONNECTED TO THE BELOW GRADE GROUNDING SYSTEM RISERS. DETAILS OF THE ELECTRODE CONNECTION SHALL BE AS PER DRG NO. MAITREE-00-BAU-EDB-105009-PEM (TYPICAL BELOW GROUND EARTHING DETAILS). NUMBER OF EARTH ELECTRODE SHALL NOT BE LESS THAN THE NUMBER OF DOWN COMER.

2.3 THE CONNECTION BETWEEN EACH DOWN CONDUCTOR AND EARTH TERMINAL WILL BE MADE VIA A TEST LINK LOCATED AT APPROXIMATELY 1500MM ABOVE GROUND LEVEL.

2.4 THE DOWN CONDUCTORS WILL BE LAID STRAIGHT AND SHARP BENDS WILL BE AVOIDED AS FAR AS PRACTICABLE. THESE WILL BE FIXED ON THE OUTSIDE OF THE BUILDING WALL AND OR COLUMNS/STRUCTURES AT INTERVALS OF ABOUT 1000 MM, AS INDICATED IN THE DRAWINGS.

2.5 ALL EXPOSED METALLIC PARTS OF A BUILDING WILL BE BONDED TO THE DOWN CONDUCTORS. SUCH PARTS WILL INCLUDE LADDERS, BALCONIES, CONDUITS, METALLIC SHEET CLADDING, ETC.

TITLE	Document No:
TYPICAL LIGHTNING PROTECTION DETAILS	MAITREE-00-BAU-EDB-105012-PEM
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Date: 23-Oct-2018

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3.0 JOINTING

3.1 MINIMUM NUMBER OF JOINTS IN THE LIGHTNING CONDUCTORS WILL BE PROVIDED.

3.2 ALL THE JOINTS WILL BE DONE BY ARC WELDING PROCESS. OVERLAPPING OF CONDUCTORS AT STRAIGHT JOINTS WILL NOT BE LESS THAN 150MM. THE CONTACT SURFACES WILL BE PROPERLY CLEANED BEFORE JOINTING.

3.3 THE VERTICAL AIR TERMINATION RODS WILL BE COATED WITH WEATHER RESISTANT ANTI-CORROSIVE PAINT. (ZINC CHROMATE FOLLOWED BY TWO COATS OF ALUMINIUM PAINT)

4.0 LIGHTNING PROTECTION SYSTEM INSTALLATION SHALL CONFORM TO IEC-62305 PART-1 TO 4.

5.0 AS PER IEEE : 142, STEEL TANKS (CONTAINING FLAMMABLE LIQUIDS OR GASES) WITH STEEL ROOFS OR FLOATING METAL ROOF HAVING STEEL THICKNESS OF 4.8MM APPROXIMATELY OR MORE ARE TO BE CONSIDERED SELF-PROTECTING TYPE AGAINST LIGHTNING, & SHALL BE PROVIDED WITH MINIMUM TWO EQUALLY SPACED CONNECTIONS TO THE NEAREST BELOW GRADE GROUNDING SYSTEM.

5.0 REFERENCE DRAWINGS

MAITREE-00-BAU-EDB-105010-PEM – DESIGN MEMORANDUM FOR LIGHTNING PROTECTION SYSTEM

MAITREE-00-BAU-EDB-105009-PEM –(TYPICAL BELOW GROUND EARTHING DETAILS).

MAITREE-00-BAU-EDB-105027-PEM – LIGHTNING PROTECTION ARRANGEMENT FOR MAIN PH BUILDING

TITLE

TYPICAL LIGHTNING PROTECTION DETAILS

Document No:
MAITREE-00-BAU-EDB-105012-PEM

REV. No. 05

SHEET 9 OF 9

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

CURRENCY MATRIX

Sl no	Nature	Mode	Currency	Place of Deposit/ Return	Exchange Rate On	Rate Published by	Payable
1	Cost of tender	DD/NEFT/RTGS	Indian Rupees (INR)	India			In INR
		DD/ Telegraphic Transfer	United States Dollars(USD)	India	Tender floating	SBI Card Rate	INR/USD [SBI Card Rate --Bank TT Buying Rate]
		DD/ Telegraphic Transfer	Bangladesh Taka (BDT)	India	Tender floating	BANGLADESH BANK	INR/BDT [BANGLADESH BANK SELLING RATE]
		DD/ Telegraphic Transfer	Other Foreign Currency	India	Tender floating	SBI Card Rate	INR/ Other Foreign Currency [SBI Card Rate --Bank TT Buying Rate]
2	Financial Evaluation of Pre Qualification Criterion		Indian Rupees (INR)	India	Tender floating	SBI Card Rate	INR/USD [SBI Card Rate --Bank TT Selling Rate]
			United States Dollars(USD)	India			In USD
			Bangladesh Taka (BDT)	India	Tender floating	BANGLADESH BANK	BDT/USD [BANGLADESH BANK BUYING RATE]
			Other Foreign Currency	India	Tender floating	SBI Card Rate	Other Foreign Currency / INR [SBI Card Rate - Bank TT Buying Rate] ---------- INR / USD [SBI Card Rate - Bank TT Selling Rate]
3	EMD by Bidder [Upto INR 20 Lakhs--- Compulsory] [More than INR 20 Lakhs --- Optional]	DD/NEFT/RTGS	Indian Rupees (INR)	India			In INR
		DD/ Telegraphic Transfer	United States Dollars(USD)	India	Tender floating	SBI Card Rate	INR/USD [SBI Card Rate --Bank TT Buying Rate]
		DD/ Telegraphic Transfer	Bangladesh Taka (BDT)	India	Tender floating	BANGLADESH BANK	INR/BDT [BANGLADESH BANK SELLING RATE]
		DD/ Telegraphic Transfer	Other Foreign Currency	India	Tender floating	SBI Card Rate	INR/ Other Foreign Currency [SBI Card Rate --Bank TT Buying Rate]

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

CURRENCY MATRIX

Sl no	Nature	Mode	Currency	Place of Deposit/ Return	Exchange Rate On	Rate Published by	Payable
4	EMD by Bidder [More than INR 20 Lakhs -Optional]	Bank Guarantee from Scheduled Bank in India.	Indian Rupees (INR)	India			In INR
		Bank Guarantee from Scheduled Bank in India. In case of Bank Guarantee by Foreign Bank, the bank Gurantee should be counter Guranteeed / Confirmed by any Scheduled Bank in India	United States Dollars(USD)	India	Tender floating	SBI Card Rate	INR/USD [SBI Card Rate --Bank TT Buying Rate]
			Bangladesh Taka (BDT)	India	Tender floating	BANGLADESH BANK	INR/BDT [BANGLADESH BANK SELLING RATE]
			Other Foreign Currency	India	Tender floating	SBI Card Rate	INR/ Other Foreign Currency [SBI Card Rate --Bank TT Buying Rate]
5	Offer by Bidder		**USD Compulsorily (If inadvertently the same is quoted in any other currency , it will be converted to USD at TT Buying rate of SBI as on latest date of Part-I Bid opening). In case of bank holiday , forex rate of previous SBI Working day.**				
6	Reverse Auction		**United States Dollars(USD)**				
7	Price Bid Evaluation		**USD Compulsorily (If inadvertently the same is quoted in any other currency , it will be converted to USD at TT Buying rate of SBI as on latest date of Part-I Bid opening). In case of bank holiday , forex rate of previous SBI Working day.**				
8	Order by BHEL		**United States Dollars(USD) / Evaluated USD**				
9	Return of EMD to unsucessful Bidder [Net of Bank Charges]	DD/NEFT/RTGS	Indian Rupees (INR)	India			At the Actual amount received in INR
		DD/ Telegraphic Transfer	United States Dollars(USD)	India			At the Actual amount received in USD
		DD/ Telegraphic Transfer	Bangladesh Taka (BDT)	India			At the Actual amount received in BDT
		DD/ Telegraphic Transfer	Other Foreign Currency	India			At the Actual amount received in Other Foreign Currency

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

CURRENCY MATRIX

Sl no	Nature	Mode	Currency	Place of Deposit/ Return	Exchange Rate On	Rate Published by	Payable
10	Conversion of EMD to SD for successful Bidder	Book Adjustment in BHEL	Indian Rupees (INR)	India	Tender floating	SBI Card Rate	INR/USD [SBI Card Rate --Bank TT Selling Rate]
			United States Dollars(USD)	India			At Actual USD
			Bangladesh Taka (BDT)	India	Tender floating	BANGLADESH BANK	BDT/USD [BANGLADESH BANK SELLING RATE]
			Other Foreign Currency	India	Tender floating	SBI Card Rate	Other Foreign Currency / INR [SBI Card Rate - Bank TT Buying Rate] ---------- INR / USD [SBI Card Rate - Bank TT Selling Rate]
11	Billing	By Sub-contractor (Hord Copy)	United States Dollars(USD)	Bangladesh			In USD
12	Payment against contract execution [Currency of the Contract USD]	Cheque/ EFT / SWIFT	For Service : United States Dollars(USD)	Bangladesh			In USD
			For Service: Bangladesh Taka (BDT) -- (At the discretion of BHEL only if payment in USD is not possible)	Bangladesh	Date of Payment	Buying Rate of Banker of BHEL	USD / BDT [BHEL's Bangladesh Banker's Buying Rate]
			For Supply (Indian Bidder): INR	India/USD	Date of Payment	Buying Rate of Banker of BHEL	USD/INR [SBI Card Rate --Bank TT Selling Rate]
			For Supply (Bidder outside India): USD	Bangladesh			
13	Balance SD	As per Tender (Deposit before start of work / Recovery from RA Bills)	United States Dollars(USD)-- (After adjusting 100% EMD converted to SD)	India			
			INR-- (After adjusting 100% EMD converted to SD)	India	Tender floating	SBI Card Rate	INR/USD [SBI Card Rate --Bank TT Selling Rate]
14	Performance Bank Guarantee (where applicable)	Bank Guarantee from Scheduled Bank in India. In case of Bank Guarantee by Foreign Bank, the bank Gurantee should be counter Guranteeed / Confirmed by any Scheduled Bank in India	INR-- (After adjusting 100% EMD converted to SD)	India	Tender floating	SBI Card Rate	INR/USD [SBI Card Rate --Bank TT Selling Rate]
			United States Dollars(USD)	India			In USD

TECHNICAL SPECIFICATIONS FOR SMARTBUILD BUILDINGS	
Structural Members for Roof and wall	Design, Supply and erection of • Light gauge high strength framing system manufactured from (55% aluminum-zinc alloy coated G550 Zincalume AZ150 steel complying with AS1397. • The stud-Cee profiles shall be manufactured using 1.0mm BMT G550 AZ150 Zincalume with depth of 75mm/100mm and flange 40mm/50mm with lip size of 8.0mm/12.0mm & R 5.0 mm respectively. • The roof purlin/roof batten should be Top hat section, manufactured using 1.0mm BMT with 61mm depth and top width of 36.5 mm with flute length of 14.0 mm & leg of 6.0 mm with R 2.5 mm, and shall be fixed using self-tapping and drilling screws. • The ceiling battens should be Top hat section and manufactured using 0.75mm BMT with 40mm depth and top width of 32.0 mm with flute of 12.5 mm & leg of 4.0 mm, shall be fixed using self-tapping and drilling screws. • The framing system shall be design using SupraCadd software & complying to design codes of AS/ NZS 4600-2005, AS: 4055-2006 & AS/NZS: 1170-2002. All accessories like nogging, lintel, screws etc. shall be used as per manufacturer recommendations. The building shall be designed with max. 50 m/s wind speed or as per local wind conditions. • All the material shall be manufactured by reputed manufacturer (Tata BlueScope Steel or equivalent) Necessary material test certificate to be issued by the manufacturer.
Outer Roofing and Wall Panels	• Supply of COLORBOND panels of width 1015mm shall be roll formed from nominal 0.45 mm base metal thickness and minimum yield strength of 550 MPa, coated with an aluminum /zinc alloy i.e. Zincalume, AZ150 (min 150 gm/m2 total on both side), conforms to Australian standard AS1397, pre-painted with Colorbond steel quality paint coat as per AS/NZS 2728 Class 3. The paint finish thickness shall have a total coating thickness of nominal 35 µm, comprising of nominal 20 µm on exterior face and nominal 5 µm reverse coat on interior face over nominal 5 µm epoxy primer coat on both surfaces of approved color shade. • **Profile dimensions:** Trapezoidal type profile sheet shall have min 1015 mm effective cover width (Trimdek), min 28 mm deep ribs with subtle square fluting in the five pans at min 203 mm centre to centre. The end rib shall be designed for anti-capillary action, to avoid any seepage of water through the lateral overlap. • All the material shall be manufactured by reputed manufacturer (Tata BlueScope Steel or equivalent) Necessary material test certificate to be issued by the manufacturer.

Inner Roof and Wall Liners	• Supply of Zincalume panels shall be roll formed from nominal 0.45 mm base metal thickness of minimum yield strength of 550 MPa, coated with an aluminum /zinc alloy i.e. Zincalume, AZ150 (min 150 gm/m2 total on both side), confirms to Australian standard AS1397 • **Profile dimensions:** Profile sheeting shall have 1110 mm effective cover width (Panelrib) profile with nominal 3.5 mm deep ribs at pitch of nominal 48 mm center to center distance • All the material shall be manufactured by reputed manufacturer (Tata BlueScope Steel or equivalent) Necessary material test certificate to be issued by the manufacturer.
Trims & Flashings	• All the openings and sheet terminations to be closed with appropriate factory made flashings / Trims (Ridge, Corner Flashings, Gable Ends, framed opening etc.) Finish /Color of the material will be same as roof /Wall / Liner panels. • Eave gutters, downspouts and rain water down take pipes are cold-formed from the same material (color & finish) as wall panels or approved by concern authority.
Fasteners	• Supply of Self tapping/ drilling fasteners shall be min. 40 µm Zinc coated / min. 25 µm Zinc-Tin alloy coated, Hex head, self-drilling screw as per AS 3566-2002 Class 3 fasteners of approved make (Buildex or equivalent). The fastener size shall be calculated as per the design and recommendation of the manufacturer. • The fasteners shall be a minimum of 12 gauge, 14 threads per inch and of material AISI 1022 heat treated carbon steel. The other details are as below; • Screw Hex steel CTEKS 12-14X20 HGS (Unpainted) • Wafer Head SDS CTEKS 10-24X22 without washer • Screw Hex Steel CTEKS 10-16X16 HGS Unpainted with washer • M5X45 fully threaded bolt assembly with nut & washer fully threaded ASTM A325M • Expansion bolt HST- M12X115/20, Anchor - 80MM Grip - 20mm
Protection accessories and flashings	• Special grade of silicone sealant non-hardening, neutral cure type of GE or approved equivalent make and grade shall be applied at all side laps and end laps (with flowable mastic) as per manufacturer's recommendation and as approved by the Project Management Consultant / Chief Architect/Engineer
Foam closures	• Providing foam closures to match the panel profile made of expanded polyurethane or similar approved material by Project Management Consultant / Chief Architect/Engineer

Erection and installation	• Installation shall be done in accordance to the standard practices as specified by the manufacturer and as approved by the Project Management Consultant. All sheets and accessories must be stored and finally erected without any damage. The Vendor will be required to submit design calculations in support of the proposed profile of the sheet and standard loading etc. to the satisfaction of the design consultant and the Architect. The Vendor shall also submit methodology for fixing and also a maintenance manual for routine maintenance. Special flashing, ridge capping and trims shall be fixed as per manufacturer's recommendation. The shape and girths shall be as per design requirement.

APPROVED
Checked and Approved.

Date: 23-Apr-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

FIELD QUALITY PLAN
FOR
GENERATOR TRANSFORMER &
START-UP TRANSFORMER

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED

OWNER'S CONSULTANT

FICHTNER

Fichtner GmbH & Co. KG, Germany

BIFPCL DOC. NO. : MAITREE-00-BAT-QA-300028-PSE, REV. NO. : 1

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-EL-51
REV No.: 1

APPROVED
Checked and Approved.

Date: 23-Apr-2018

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FIELD QUALITY PLAN
FOR
GENERATOR TRANSFORMER &
START-UP TRANSFORMER

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-BAT-QA-300028-PSE, REV. NO. : 1

PREPARED BY	BHEL, PSER KOL-91 QUALITY DEPT. DE/QLY, BHEL, PSER	APPROVED BY	HEAD / QLY, BHEL, PSER
FQP NO.		**QPE-MTE-660-EL-51**	
ORIGINAL DATE OF ISSUE		31/01/2018	
REVISION NO. & DATE		1, Dt. 11/04/2018	
COPY NO.			
ISSUED TO			
DATE OF ISSUE			
PURPOSE :			
ISSUED BY (SIGNATURE & DESIGNATION)		DE/QLY, BHEL, PSER	

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

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Date: 23-Apr-2018

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PSER	FIELD QUALITY PLAN FOR GENERATOR TRANSFORMER & START-UP TRANSFORMER	FQP NO: MAITREE-00-BAT-QA-300028-PSE BHEL Doc. No. : QPE-MTE-660-EL-51
		Rev. No. : 1
		SHEET 1 / 1 SHEETS

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		REV. NO. : 1
		SHEET 1 / 1 SHEETS

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 31.01.18	Document prepared as per the owner's specifications
02	All	1, Dtd.: 11.04.18	The document is revised as per the comments dated 22/02/18 from BIFPCL/OE & is similar to NTPC approved FQP No. 4410-001-215-QVE-G-067, Rev-1: FQP for Power Transformers for NTPC - North Karanpura STPP (3x660MW) with additional tests e.g. SFRA, etc., as per the requirement of FTS.

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AUTHORISATION FOR DIFFERENT CATEGORY OF CONSTRUCTION/ ERECTION CHECKS & NONCONFORMITY DISPOSITION

Category of Check	Inspection Authority	Witness Authority	Nonconformity (if any) Disposition Authority	Accepting Authority
'A' (Customer Hold Point)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'B' (Formal intimation shall be forwarded by BHEL. Check shall commence at notified time whether parties show-up or not)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'C'	BHEL Engineer	BHEL Engineer	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BHEL HOS

Abbreviations used:

HOS – Head of Section

Note:

1. Nonconformity Disposition authority for all categories of checks shall be as under:

   Product nonconformities: BHEL Engineering Centre.

   Process/System nonconformities: Head (Quality): BHEL, PS ER.

2. Wherever log sheet is not called for, suitable record shall be maintained in protocol / Site register.

3. In case of nonconformity, accepting authority will consider the solution for the nonconformity as proposed by the Nonconformity Disposition Authority before acceptance, and such solution shall be reflected in the log sheets/protocols.

4. Owner's Engineer is authorized to carry out surveillance in any of B & C category of checks at his discretion.

5. Concerned agencies shall ensure that instruments having valid calibration are only used for measurements.

6. Quantum of check shall be 100% for all characteristics unless otherwise mentioned specifically in Field Quality Plan/ reference documents.

7. Only authorised persons with proper safety gears to enter construction area

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		REV. NO. : 1
		SHEET 01 / 09 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	POWER TRANSFORMER
Sub-system :	GENERATOR TRANSFORMER & START-UP TRANSFORMER
Area :	ERECTION & TESTING

NOTES :

1. As an evidence of having carried out the work satisfactorily, a general purpose log sheet, L-00 shall be maintained for all the checks.
2. Abbreviations used:

   R – Record Verification

   V – Visual Check

   P – Physical Check

   M – Measurement

   T – Test

   MTC – Manufacturer's Test Certificate

   SR – Site Register

   MDR – Material Discrepancy Report
3. Latest revision of Standards & Specification shall apply

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SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: GENERATOR TRANSFORMER & START-UP TRANSFORMER	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*		*7*	*8*	*9*
A	**GENERAL REQUIREMENTS**								
A.01	Ensure availability of requisite equipment in good working condition well before commencement of concerned activity. All MMRs in the field shall be calibrated before commencement of tests and then at interval as per manufacturer's recommendations and as per direction of BIFPCL / OE.	P & R	-	A	Once prior to start of work and thereof monthly OR immediately after an Instrument damaging incident	Technical Specifications & Drawing	The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	SR	- Functioning of MMRs in proper working condition to be verified on monthly basis. - calibration of MMRs shall be done by approved lab and the report shall be submitted to BIFPCL/ OE. - Wherever practical, a label shall be affixed on the Instrument, indicating the validity of Calibration
A.02	Ensure availability of approved drawings	R	-	A	100% for each transformer before start of activity	List of Latest Revision of Approved Drawings	Owner's Technical Specifications	SR	
B	**MATERIAL RECEIPT**								
B.01	Check availability of Bill of materials (BOM) / packing slip, dispatch documents.	V	-	C	100%	-	Compliance to requirement of Column No. 2	-	
B.02	Check materials for completeness, correctness, and shortages / excesses as per Bill of Materials / Dispatch documents / Packing slip.	V	-	C	100%	BOM / Dispatch documents / Packing slip	Compliance to requirement of Column No. 2	L-01	
B.03	Retrieve the impact recorders and send to BHEL-Bhopal (OEM) for analysis and review record of reading of shock recorder as per the manufacturer's recommendations.	P & R	As required	A	100%	OEM's Instruction Manual	- Direction of rail : 0.8g - Perpendicular to direction of rail : 0.8g - Vertical direction : 0.5g	Logbook	- Report submission by OEM for review. - In cas of deviation, OEM to be consulted.
B.04	Check components / boxes carefully for physical condition (In case of damage to contents, check the contents to ascertain the nature & quantum of damage. Re-pack contents in original packing & follow step B.05)	V	-	C	100%	OEM's Instruction Manual & Packing list	No physical damage	Logbook	
B.05	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	Work instructions for site Operations	Work instructions for site Operations	MDR	

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SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: GENERATOR TRANSFORMER & START-UP TRANSFORMER	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*		*7*	*8*	*9*
B.06	Unloading of transformer main tank	P	As required	C	100%	Approved Method statement	OEM's Instruction Manual	-	
B.07	Check Nitrogen pressure in tank for positive pressure. (in case of absence of positive pressure follow step B.08 with a communication to OEM)	M	Pressure gauge	A	Once on receipt	OEM's Instruction Manual	over pressure of minimum 0.17 kg/cm2 at RT	Logbook	
B.08	In case of absence of positive pressure, Communicate to OEM and arrange for nitrogen filling as per the instructions of OEM.	P & M	As required	A	Once on receipt	OEM's Instruction Manual	over pressure of minimum 0.17 kg/cm2 at RT	Logbook	
B.09	Check IR of core-end frame-tank at 500V	M	IR Tester	A	Once on receipt	IEC 60076-1	Acceptance value: Min. 500 MΩ	Logbook	
B.10	Control of receipt and issue of all components	V	-	C	100%	Work instructions for site Operations	Work instructions for site Operations	Register	
C	**STORAGE & PRESERVATION**								
C.01	Check Bushings for any damage (to be stored in the crate in which it is supplied. Oil to SF6 Bushings to be stored indoor.)	V	As required	C	Once in three months	OEM's Instruction Manual	No physical damage	SR	
C.02	Check oil drums for any leakage and tampering. (They should be stored in lying position with both the closed openings also in horizontal position , bung at approx. 45 deg. position).	V	As required	C	Once in three months	OGA Drawing, Shipping List	No physical damage	SR	Provide secondary containment.
C.03	Check Fragile items like marshalling boxes, fans, pumps, instruments & their fittings, Gas Relays, oil level indicators, breathers, drying agents, terminal boxes, Tap changer cabinets, gaskets, Copper/ earthing strips and turrets with built-in CTs, DGA kits. Online dryout system, testing kits for any damage (to be stored indoors).	V	As required	C	Once in three months	OGA Drawing, Shipping List	No physical damage	SR	Marshalling boxes are to be stored vertical in their respective cases.
C.04	Check Oil conservator, radiator and coolers with blanking plates for all openings and structure supporting conservator for any damage (they may be stored outdoors on raised platform, above ground & covered with tarpaulin).	V	As required	C	Once in three months	OGA Drawing, Shipping List	No physical damage	SR	
C.05	Record nitrogen gas pressure during storage.	M	Pressure gauge	A	Weekly	OEM's Instruction Manual	over pressure of minimum 0.17 kg/cm2 at RT	SR	If the storage time without oil exceeds 18 months, OEM to be consulted for measures to be taken.

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SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: GENERATOR TRANSFORMER & START-UP TRANSFORMER	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*		*7*	*8*	*9*
C.06	Check paint Condition & Touch up painting to be carried out, if required	V	-	B	Once on receipt	Owner's Technical Specifications	Approved painting schedule	SR	
D	**PRE-ERECTION CHECKS**								
D.01	Check availibility of shop protocols	R	-	C	Once before start of erection	OEM's Instrcution Manual	OEM's Instrcution Manual	-	
D.02	Check availability of proper tools and tackes including jacking pad for carrying out inspection	R	-	C	Before start of erection & During Erection	OEM's Instrcution Manual	OEM's Instrcution Manual	-	
D.03	Checking of foundation	M	Water level, tape & Piano wire	A	100%	OGA Drawing & Layout drawing	OGA Drawing & Layout drawing	Logbook	
D.04	Where rollers are applicable, check that rollers are greased properly before assembly of transformer.	V	As required	C	100%	OGA Drawing	Free movement of rollers	SR	
D.05	Ensure oil filtration plant, oil tankers of adequate capacity to process & fill the oil in transformer	V	-	B	100%	OEM's Instrcution Manual	Approved Method statement	-	
D.06	Check that all pipes are free from rust and dust. Ensure cleaning of Radiators/ coolers and pipes.	P	-	B	100%	OEM's Instrcution Manual	OEM's Instrcution Manual	SR	
D.07	Check all bushings are free from physical damage, oil leakage & have oil level up to mark.	V	-	B	100%	Drawing	Oil up to mark	SR	
D.08	Check condenser bushings for IR Value & Capacitance / Tan delta test. Capacitance & Tan delta (dissipation factor) measurement shall be made at 2 KV, 5kV and 10 KV. (as applicable)	M	2.5kV IR Tester & Tan delta kit	A	100%	IEC 60076-1	IR > 5000 MΩ tan-delta < 0.007	Logbook	
D.09	Check turret CT polarity, turn ratio, knee point voltage, winding resistance & IR before erection	M	As required	B	100%	IEC 60076 & Shop Test records	Comparable with shop test result	L-05	
D.10	Check IR of core-end frame-tank at 500V	M	IR Tester	A	100%	IEC 60076 & Shop Test records	Comparable with shop test result	Logbook	
D.11	Check tightness of core earthing after checking IR value between core and earth.	P	As required	B	100%	OEM's instruction Manual	IR > 1 MΩ	Logbook	

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		REV.NO.: 1	
		SHEET 05 / 09 SHEETS	
SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: GENERATOR TRANSFORMER & START-UP TRANSFORMER	AREA: ERECTION	

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*		*7*	*8*	*9*
E	**ERECTION CHECKS**								
E.01	Ensure placement of transformer on the foundation as per Drawing.	P & V	As required	B	100%	OGA Drawing, OEM's Instrucion Manual	Approved Method statement	Logbook	
E.02	Ensure use of new gaskets during final erection of turrets, bushings and piping	V	-	B	100%	OGA Drawing	Compliance to requirement of Column No. 2	Logbook	
E.03	Ensure installation of tap changing system & it's oil filling	V	-	B	100%	Drawing	OEM's Instruction Manual	Logbook	
E.04	Where dispatched separately, ensure installation of Cooling banks/ radiators & other accessories as per drawing.	V	-	C	100%	Drawing	OEM's Instruction Manual	Logbook	
E.05	Internal inspection of transformer after removal of N2 gas - a) Ensure removal of metallic winding lead support. b) Detailed inspection as per checklist.	V	Dry air unit	B	100%	OGA Drawing & Checklist	No physical damage & loose items	Logbook	
E.06	Checks during HV bushing erection : - Check winding lead connections with bushing from inside - Check original hardware supplied by OEM with Bushings. - Ensure joint assembly as per drawing. - Check tightness with proper tool and required torque. - Check clearance of leads from tank body.	P & V	As required	C	100%	OEM's Instruction Manual & Drawing	Approved method statement	Logbook	- suitable crane and nylon slings to be used to avoid damage to the bushings
E.07	After inspection transformer man holes to be closed and Nitrogen gas pressure to be maintained. (applicable for nitrogen filled transformers only)	V	As required	C	100%	OEM's Instruction Manual	an over pressure of minimum 0.17 kg/cm2 at room temperature	SR	Dew point of - 50 deg C or better to be ensured on Nitrogen cylinder
E.08	Ensure proper earthing of turret , earthing of bushing test tap, top tank & bottom tank and other earthing points.	V	-	B	100%	OEM's Instruction Manual	Drawing & IEC 60076	Logbook	
E.09	Leakage test of tank after erection & before oil filling by a) N2 pressure at 0.3 kg/cm2. and b) Vacuum at 1 Torr for 3 hours.	T	Pressure gauge & vacuum gauge	A	100%	OEM's Instruction Manual	Method statement & IEC 60076	Logbook	
E.10	Pressure test of conservator air cell	T	Pressure gauge	B	100%	OEM's Instruction Manual	Method statement & IEC 60076	Logbook	

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SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: GENERATOR TRANSFORMER & START-UP TRANSFORMER	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*		*7*	*8*	*9*
E.11	Pressure test of cooling banks	T	Pressure gauge	B	100%	OEM's Instruction Manual	Method statement & IEC 60076	Logbook	
E.12	Ensure proper tightness of valves and air release plugs	P	As required	B	100%	OEM's Instruction Manual	no leakage	Logbook	
E.13	Functioning of hand operated air release valve	P	As required	C	100%	OEM's Instruction Manual	Drawing & IEC 60076	SR	
E.14	Body earthing of Transformer as per drawing.	V	As required	B	100%	Drawing & IEEE 81	OEM's Instruction Manual	Logbook	
E.15	Check continuity and IR value of internal cables to marshalling	T	Continuity tester	B	100%	IEC 60076	OEM's Instruction Manual	L-02	
E.16	Hand operation of taps of tap changing system Verify tap position in Motor drive unit (if applicable)	P	As required	B	100%	Drawing & Schematics	OEM's Instruction Manual	Logbook	
E.17	Dry out by Vacuum treatment and Nitrogen purging of transformer before oil filling as applicable (Dew point of - 50 deg C or better to be ensured on N2 cylinder) : Ensure fitting of equalizing pipe between main tank diverter chamber of tap changer during vacuum treatment of transformer	M	Vacuum gauge, Dew point meter, filtration machine	A	100%	OEM's Instruction Manual	OEM's Instruction Manual	Logbook	
E.18	Oil shall be circulated in oil storage tank to achieve required BDV before starting filling in Transformer. Filter machine heater temperature to be adjusted to maintain oil temperature (55 -60 Deg C)	P & T	oil filtration plant, oil tankers	A	100%	OEM's Instruction Manual	IEC 60296	Logbook	
E.19	Ensure oil filling in transformer main tank under vacuum	V	oil filtration plant, oil tankers	B	100%	OEM's Instruction Manual	OEM's Instruction Manual	Logbook	
E.20	Hot oil circulation for dry out	P	Oil filtration plant, oil tankers & thermometer	B	100%	OEM's Instruction Manual	OEM's Instruction Manual	L-02 & L-04	

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SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: GENERATOR TRANSFORMER & START-UP TRANSFORMER	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*		*7*	*8*	*9*
E.21	Ensure following tests on transformer oil sample in NABL accredited / BIFPCL approved lab after filling in transformer and hot oil circulation & review of records: a) Specific Gravity b) BDV c) Moisture content (ppm) d) DGA e) Resistivity f) Tan delta g) IFT	R	-	A	100%	OEM's Instruction Manual	IEC 60296	Logbook	
E.22	Ensure removal of equalizing pipe between main tank diverter chamber of tap changer after oil filling upto core level.	V	-	B	100%	Drawing & Schematics	OEM's Instruction Manual	Logbook	
E.23	Check Oil level in main tank and bushings	V	-	B	100%	Drawing	OEM's Instruction Manual	Logbook	
E.24	Check oil leakage from tank bottom surface and from different flange joints and valves	V	-	B	100%	Drawing	OEM's Instruction Manual	Logbook	
E.25	Ensure proper tightness of neutral grounding arrangement.	V	-	B	100%	Drawing	OEM's Instruction Manual	Logbook	
F	**ELECTRICAL TESTS AFTER OIL FILLING**								
F.01	CC-CL-tank isolation test @ 500V	M	500V IR Tester	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	Logbook	
F.02	Polarity of all CTs	M	Galvanometer	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	L-05	
F.03	Polarity and Vector group	M	Galvanometer & multimeter	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	L-05	
F.04	Magnetizing current	M	multimeter & clamp meter	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	Logbook	
F.05	Magnetic balance	M	multimeter & clamp meter	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	Logbook	

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SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: GENERATOR TRANSFORMER & START-UP TRANSFORMER	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*		*7*	*8*	*9*
F.06	TTR at all taps (NA for Reactors)	M	TTR Kit	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	Logbook	
F.07	Winding resistance in all taps.	M	WRM Kit	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	L-06	
F.08	IR test of windings @ 5kV	M	5KV IR Tester	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	L-03	
F.09	SFRA (Sweep frequency response analysis)	M	SFRA kit	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	Joint Protocol	
F.10	Short circuit impedance (at low voltage)	M	multimeter & clamp meter	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	Logbook	
F.11	Phase sequence of power supply at Marshalling kiosk. Check control supply.	M	Phase sequence meter	A	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	Logbook	
F.12	Direction of rotation of motors & fans.	V	-	B	100%	OEM's Instruction Manual	OEM's Instruction Manual	SR	
F.13	Functioning of tap changer manually and electrically in case of OLTC.	V	-	A	100%	Schematics	OEM's Instruction Manual	SR	
F.14	Functioning of oil pump from manual, local and remote controls as per approved schematics	V	-	A	100%	Schematics	OEM's Instruction Manual	SR	
F.15	Functional checks on oil flow indicator as applicable.	V	-	B	100%	OEM's Instruction Manual	OEM's Instruction Manual	SR	
F.16	Sequential operation of cooling system as per approved schematics.	V	-	A	100%	OEM's Instruction Manual	OEM's Instruction Manual	SR	
F.17	Functioning of fire alarm system and fire protection system.	V	-	A	100%	OEM's Instruction Manual	OEM's Instruction Manual	SR	

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SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: GENERATOR TRANSFORMER & START-UP TRANSFORMER	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*		*7*	*8*	*9*
F.18	Record of tap changer- motor current and control voltage.	M	Multimeter & Stopwatch	B	100%	OEM's Instruction Manual	OEM's Instruction Manual	Logbook	
F.19	Check operation of Bucholz relay and PRV	V	-	A	100%	OEM's Instruction Manual	OEM's Instruction Manual	SR	
F.20	Check operation of all protective devices and interlocks	V	-	A	100%	OEM's Instruction Manual	OEM's Instruction Manual	SR	
F.21	Verification of temperature indicators	V	-	B	100%	OEM's Instruction Manual	OEM's Instruction Manual	SR	
F.22	Stability test for electrical protection check	M	multimeter & clamp meter	B	100%	OEM's Instruction Manual & IEC 60076-1	OEM's Instruction Manual	Logbook	
F.23	Measurement of Earth pit Resistance	M	Earth Test meter	B	100%	Datasheet & IEEE 81	Acceptable value is < 1 Ω	Logbook	
F.24	Erection completion check & Handing over for commissioning.	V & R	-	A	100%	Drawing & Protocols / Log sheets	OEM's Instruction Manual	Joint Protocol	Review of all Log Sheets, protocols and disposition status of NCRs (if any)

Commissioing Checks shall be as per Approved Procedure & FTS of BIFPCL

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Checked and Approved.

Date: 23-Apr-2018

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PSER

RECORD OF QUALITY CHECKS

SHEET NO. OF FQP	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	INSPECTED BY SIGN. & DATE	CLEARED BY SIGN. & DATE	REMARKS

Note : Any protocol made is to be numbered & mentioned in "Format of Record" column.

		SYSTEM	SUB-SYSTEM	AREA	FQP NO.: QPE-MTE-660-EL-51
PROJECT					REV. NO. 1
UNIT NO.					LOG SHEET NO. L-00
RATING					SHEET / SHEETS

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	INSTRUMENT REG. NO./TAG. NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

CHECKLIST FOR INSPECTION ON RECEIPT OF MATERIAL

Sl. No.	Name of Transformer Accessory	OK / NOT OK

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-51
PROJECT		CHECKED BY			REV.NO. 1
UNIT NO.		ACCEPTED BY			LOG SHEET NO. **L-01**
RATING		CUSTOMER			PAGE **1** OF **1**

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	INSTRUMENT REG. NO./TAG NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

OIL DIELECTRIC STRENGTH:

GAP SETTING: mm

		Time & condition				
Sl. No.	Oil Sample from	Date	Time	Breakdown Voltage	ppm obtained	Remarks
a.	Top of main transformer tank					
b.	Bottom of main transformer tank					
c.	Cooling System Radiators					
d.	Tap changer chamber (if On Load Tap Changer is provided)					

INSULATION RESISTANCE TEST **Date:**

Sl. No.	Description	Megger rating	IR Value Obtained (MΩ)	Remarks
1.	Control wiring	500 V		
2.	Cooling system:	-do-		
a)	Motor fan	-do-		
b)	Motor pump	-do-		
c)	Control wiring	-do-		

Note: IR Value shall be recorded in each fan and pump motor wherever applicable.

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-51
PROJECT		CHECKED BY			REV.NO. 1
UNIT NO.		ACCEPTED BY			LOG SHEET NO. **L-02**
RATING		CUSTOMER			PAGE **1** OF **1**

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PSER					
	INSTRUMENT REG. NO./TAG NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

Transformer Sl. No. :

INSULATION RESISTANCE TEST

Sl. No.	Description	Megger rating	IR Value Obtained (Mega ohms)	Remarks
3.	Main winding : Between	2500 V or 5000 V		
a)	HV & E + LV			
b)	LV & E + HV			
c)	HV & LV			

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-51
PROJECT		INSPECTED BY			REV.NO. 1
UNIT NO.		CLEARED BY			LOG SHEET NO. L-03
RATING		CUSTOMER			SHEET 1 / 1 SHEETS

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PSER	INSTRUMENT REG. NO./TAG. NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

TRANSFORMER DRY-OUT

Transformer Sl. No. :

Date	Time	Winding Temperature	IR Values			BDV of various samples (once in 24 hrs)
			HV to E	LV to E	HV to LV	

NOTE : Minimum 1 KV Megger is to be used.

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-51
PROJECT		INSPECTED BY			REV.NO. 1
UNIT NO.		CLEARED BY			LOG SHEET NO. L-04
RATING		CUSTOMER			SHEET 1 / 1 SHEET

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PSER	INSTRUMENT REG. NO./TAG. NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

Transformer Sl. No. :

BUSHING TURRET CTs

Sl. No.	Description	Status / value achieved	Remarks
1.	Polarity		
2.	Ratio		
3.	IR with 500 V Megger		
4.	Magnetising Current		

RATIO CHECK OF TRANSFORMER

Tap Position No.	Voltage applied			Voltage Measured			Ratio Obtained			Remarks
							a	b	c	

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-51
PROJECT		INSPECTED BY			REV.NO. 1
UNIT NO.		CLEARED BY			LOG SHEET NO. L-05
RATING		CUSTOMER			SHEET 1 / 2 SHEETS

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	INSTRUMENT REG. NO./TAG. NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

VECTOR GROUP CHECK

Vector Group	Diagram of connections as required	Diagram of connections as connected for test

VOLTAGE SUPPLIED (as applicable)

Phase A				Phase B				Phase C				Remarks
A-a	B-b	C-c	A-n	A-a	B-b	C-c	A-n	A-a	B-b	C-c	A-n	

Conditions to be proved:

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PSER	INSTRUMENT REG. NO./TAG. NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

Transformer Sl. No. :

WINDING RESISTANCE

WINDING	TAP NO	VALUE	TEMPERATURE	REMARKS
HV Winding	Tap No. - 1 Highest Tap			
LV Winding				

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-51
PROJECT		INSPECTED BY			REV.NO. 1
UNIT NO.		CLEARED BY			LOG SHEET NO. L-06
RATING		CUSTOMER			SHEET 1 / 1 SHEETS

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PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

Transformer Sl. No. :

			NAME	SIGNATURE & DATE	FQP NO.: QPE-MTE-660-EL-51
PROJECT		INSPECTED BY			REV. NO. 1
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

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FIELD QUALITY PLAN
FOR
EARTHING SYSTEM

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED

OWNER'S CONSULTANT

FICHTNER

Fichtner GmbH & Co. KG, Germany

BIFPCL DOC. NO. : MAITREE-00-BAU-QA-300041-PSE, REV. NO. : 3

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-EL-66
REV No.: 3

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Date: 30-Jan-2018

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FIELD QUALITY PLAN
FOR
EARTHING SYSTEM

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-BAU-QA-300041-PSE, REV. NO. : 3

PREPARED BY	DE/QLY, BHEL- PSER	APPROVED BY	HEAD / QLY, BHEL- PSER
FQP NO.		**QPE-MTE-660-EL-66**	
ORIGINAL DATE OF ISSUE		25/07/2017	
REVISION NO. & DATE		3, Dt. 24/01/2018	
COPY NO.			
ISSUED TO			
DATE OF ISSUE			
PURPOSE :			
ISSUED BY (SIGNATURE & DESIGNATION)		DE/QLY, BHEL, PSER	

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

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FIELD QUALITY PLAN FOR EARTHING SYSTEM

FQP NO.: MAITREE-00-BAU-QA-300041-PSE

BHEL Doc. No. : QPE-MTE-660-EL-66

REV No.: 3

SHEET 1 / 1 SHEETS

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3.0	Authorization for checks and nonconformity disposition	01
4.0	Statement of Checks	05
5.0	Log Sheets	02

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PSER	FIELD QUALITY PLAN FOR EARTHING SYSTEM	FQP NO.: MAITREE-00-BAU-QA-300041-PSE BHEL Doc. No. : QPE-MTE-660-EL-66
		REV No.: 3
		SHEET 1 / 1 SHEETS

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	A, Dated 25/07/2017	Document prepared as per Technical Specifications of BIFPCL
02	Sheet 01, 02, 04 & 05 of 'Statement of Checks'	1, Dated 26/09/2017	Revised as per comment dated 11/09/2017 from BIFPCL / OE
03	Sheet 05 of 'Statement of Checks' & 'Authorisation For Different Category Of Construction/ Erection Checks & Nonconformity Disposition'	2, Dated 12/12/2017	Revised as per comment dated 24/11/2017 from BIFPCL / OE
04	Sheet 01, 02 & 05 of 'Statement of Checks'	3, Dated 24/01/2018	Revised as per comment dated 24/01/2018 from BIFPCL / OE

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AUTHORISATION FOR DIFFERENT CATEGORY OF CONSTRUCTION/ ERECTION CHECKS & NONCONFORMITY DISPOSITION

Category of Check	Inspection Authority	Witness Authority	Nonconformity (if any) Disposition Authority	2 Accepting Authority
'A' (Customer Hold Point)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'B' (Formal intimation shall be forwarded by BHEL. Check shall commence at notified time whether parties show-up or not)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'C'	BHEL Engineer	BHEL Engineer	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BHEL HOS

Abbreviations used:

HOS – Head of Section

Note:

1. Nonconformity Disposition authority for all categories of checks shall be as under:

   Product nonconformities: BHEL Engineering Centre.

   Process/System nonconformities: Head (Quality): BHEL, PS ER.

2. Wherever log sheet is not called for, suitable record shall be maintained in protocol / Site register.

3. 2 In case of nonconformity, accepting authority will consider the solution for the nonconformity as proposed by the Nonconformity Disposition Authority before acceptance, and such solution shall be reflected in the log sheets/protocols.

4. Owner's Engineer is authorized to carry out surveillance in any of B & C category of checks at his discretion.

5. Concerned agencies shall ensure that instruments having valid calibration are only used for measurements.

6. Quantum of check shall be 100% for all characteristics unless otherwise mentioned specifically in Field Quality Plan/ reference documents.

7. Only authorised persons with proper safety gears to enter construction area.

8. Safety precaution during all erection & testing work shall be done as per approved HSE Plan.

2

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PSER	FIELD QUALITY PLAN FOR EARTHING SYSTEM	FQP NO.: MAITREE-00-BAU-QA-300041-PSE BHEL Doc. No. : QPE-MTE-660-EL-66
		REV. NO. : 3
		SHEET 01 / 05 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	ELECTRICAL SYSTEM
Sub-system :	EARTHING SYSTEM & LIGHTENING PROTECTION SYSTEM
Area :	CONSTRUCTION & TESTING

NOTES : △3

1. As an evidence of having carried out the work satisfactorily, a general purpose log sheet, L-00 shall be maintained for all the checks.
2. Checks for Structures for conventional heat generation (including coal bunker) is covered under document number MAITREE-00-UH-QA-300006-PSE
3. Abbreviations used:

   R – Record Verification
   V – Visual Check
   P – Physical Check
   M – Measurement
   T – Test
   MTC – Manufacturers Test Certificate
   SR – Site Register
   MDR – Material Discrepancy Report
   MDCC – Material Dispatch Clearance Certificate
4. Latest revision of Standards & Specification shall apply.
5. Materials shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
6. Welding / brazing shall be carried out by Qualified Welders/ brazer, with traceable WPQ, in line with approved WPS and Qualified PQR, as per ASME Section IX
7. Only approved welding / brazing consumables shall be used, as per Approved Welding Consumable list.
8. Procedure shall be established and followed, for Procurement, Storage, Issue and Control of welding / brazing Consumables.
9. NDT shall be carried out by Qualified Personnel with compliance to Approved NDT procedures and Acceptance Norms, as per ASME Section V.
10. Preheating and Post Weld Heat treatment shall be in compliance with Approved Procedures.
11. Gauges and measuring Instruments, with valid calibration only shall be used

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BHARAT HEAVY ELECTRICALS LIMITED
PS:ER, KOLKATA

TENDER NO. PSER:SCT:KLN-E2060:20
FIELD QUALITY PLAN
FOR
EARTHING SYSTEM
(STATEMENT OF CHECKS)

FQP NO.: **MAITREE-00-BAU-QA-300041-PSE**
BHEL Doc. No. : QPE-MTE-660-EL-66
REV.NO.: 3
SHEET 02 / 05 SHEETS

SYSTEM: ELECTRICAL | SUB-SYSTEM: EARTHING | AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
A	**GENERAL REQUIREMENTS AND RECEIPT OF EARTHING MATERIAL & CONSUMABLES**							
A.01 △3	Ensure availability of requisite equipment in good working condition well before commencement of concerned activity. All MMRs in the field shall be calibrated before commencement of tests and then at interval as per manufacturer's recommendations and as per direction of BIFPCL / OE.	P & R	-	A	Once prior to start of work and thereof monthly OR immediately after an Instrument Damaging incident	- Technical Specifications & Drawing -The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	SR	-Functioning of MMRs in proper working condition to be verified on monthly basis. -calibration of MMRs shall be done by approved lab and the report shall be submitted to BIFPCL/ OE. - Wherever practical, a label shall be affixed on the Instrument, indicating the validity of Calibration
A.02 △3	Ensure availability of approved drawings	R	-	A	100% for each area before start of activity	List of Latest Revision of Approved Drawings and Owner's Technical Specifications	SR	
A.03	Earthing Material - Check for type, quantity, damage and correct size	P & R	-	B	100%	Drawing & Owner's Technical Specifications	LOG BOOK / DAY BOOK	Packing List & MDCC to be reviewed
A.04	Report shortage / damage, if any.	V	-	C	100%	No shortage /damage	MDR	MDR in case of shortage or damage
A.05	Brazing & Welding Consumables - Check for type, quantity and damage	R	-	B	100%	Drawing, IEEE 837 & BIFPCL / OE approved consumables list	LOG BOOK	- Exothermic Weld System to meet IEEE 837 Standard. - Review of MTC and physical verification of consumables. - Damaged / rejected material shall be taken out of project site
B	**STORAGE OF EARTHING MATERIAL & CONSUMABLES**							
B.01	Earthing Material - To be stored with proper identification. Each type of electrode to be segregated & stored separately	P	-	C	To be checked once every month	Storage level : covered shed (on raised surface, properly stacked and free from water logging and loading / undue weight) △1	SR	Any damage / shortage observed shall be immediately reported
B.02	Brazing / Welding Consumables - To be stored with proper identification.	P	-	C	To be checked once every week	Storage level : indoor clean conditions (in store. the storage area shall be dry and there shall not be acid/ chemicals in vicinity)	SR	Manufacturer's recommendation to be followed. Damaged material shall be stored separately and shall be replaced
C	**PRE-ERECTION CHECKS**							
C.01	Proper Handling to avoid damage to Tin coating / copper cladding	V	-	C	Each consignment	No damage to coating	SR	To be handled carefully
C.02	Availability of approved procedure/method for thermit welding & brazing △1	V	-	A	100%	IEEE 837, ASME SEC-IX	SR	
C.03	Select proper size of conductor / electrode.	V	-	B	100%	Drawing	SR	
C.04	Testing of welding operator	V	-	A	Each operator	Mech Test as per IEEE 837	SR	
C.05	Testing of brazer	V	-	A	Each brazer	ASME SEC-IX	SR	

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BHARAT HEAVY ELECTRICALS LIMITED
PS:ER, KOLKATA

TENDER NO. PSER:SCT:KLN-E2060:20
FIELD QUALITY PLAN
FOR
EARTHING SYSTEM
(STATEMENT OF CHECKS)

FQP NO.: **MAITREE-00-BAU-QA-300041-PSE**
BHEL Doc. No. : QPE-MTE-660-EL-66
REV.NO.: 3
SHEET 03 / 05 SHEETS

SYSTEM: ELECTRICAL | SUB-SYSTEM: EARTHING | AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
D	**ERECTION CHECKS**							
D.01	EARTHING OF PILE							
D.01A	Identification of Piles to be earthed	V	-	B	100%	Drawing	SR	
D.01B	Fixing of earth flat to the reinforcement cages (Size & length of flat and fixing arrangement to be checked)	V	-	B	100%	Drawing	SR	
D.01C	Visual Inspection of Thermit welding of flats (if required)	V	As required	A	100%	Drawing & Approved procedure	SR	There should not be any Oil, grease, moisture or foreign material on conductors before welding.
D.02	BURIED EARTH CONDUCTOR							
D.02A	Correctness of layout and alignment & laying level below ground	M	As required	B	100%	Drawing	SR	
D.02B	Preparation of conductor for welding / brazing	V	-	C	100%	Drawing	SR	There should not be any Oil, grease, moisture or foreign material on conductors before welding. Tested operator / brazor to be deployed
D.02C	Visual Inspection of Thermit welded or brazed joints	V	As required	A	100%	Drawing & Approved procedure	SR	
D.02D	Back filling in layers & compaction by portable plate compactor	V	-	C	100%	Drawing	SR	Backfilling should not be done with stones, cinders or similar materials, but with earth liable to retain moisture.
D.03	ABOVE GROUND EARTH CONDUCTOR							
D.03A	Correctness of layout and alignment	M	As required	B	100%	Drawing	SR	
D.03B	Clamping / Supports (when required)	V	-	B	100%	Drawing	SR	
D.03C	Preparation of conductor for welding / brazing	V	-	C	100%	Drawing	SR	There should not be any Oil, grease, moisture or foreign material on conductors before welding. Tested operator / brazor to be deployed

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PS:ER, KOLKATA

TENDER NO. PSER:SCT:KLN-E2060:20
FIELD QUALITY PLAN
FOR
EARTHING SYSTEM
(STATEMENT OF CHECKS)

FQP NO.: **MAITREE-00-BAU-QA-300041-PSE**
BHEL Doc. No. : QPE-MTE-660-EL-66
REV.NO.: 3
SHEET 04 / 05 SHEETS

SYSTEM: ELECTRICAL | SUB-SYSTEM: EARTHING | AREA: ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
D.03D	Visual Inspection of Thermit welded or brazed joints	V	-	A	100%	Drawing & Approved procedure	SR	the brazed joints to be protected by suitable primer coat
D.04	EARTHING ROD & EARTH PIT							
D.04A	Proper preparation of Earth pits for electrodes	V	-	B	100%	Owner's Tech. Specifications, Drawing	SR	
D.04B	Installation of electrode & welding with earth conductors	V	-	B	100%	Drawing	SR	There should not be any Oil, grease, moisture or foreign material on conductors before welding. Tested operation / brazor to be deployed
D.05	Earthing of metallic frame / fence of all electrical equipment & structures △1	V	-	B	100%	Drawing	SR	
D.06	Earthing of Crane rails, Tracks, Metal pipes & Conduits	V	-	B	100%	Drawing	SR	
D.07	Earthing of Steel Column & Stair etc	V	-	B	100%	Drawing	SR	
D.08	Earthing of RCC Column & Stair etc.	V	-	B	100%	Drawing	SR	
D.09	Neutral point of HT Transformer	V	-	B	100%	Drawing	SR	
D.10	Lightening Protection System △1	V	-	B	100%	Drawing & Clause No. E.7.2.3 of BS EN 62305-3:2011	SR	
E	**INSPECTION & TESTING**							
E.01	Resistance of Joints	T	Micro Ohm Meter	B	10% Random	Owner's Tech. Specifications / Resistance of the joint shall not be more than the resistance of equivalent length of conductor	JOINT PROTOCOL	To confirm continuity of earth conductors, all the joints to be checked visually and to be monitored by planned job progress through mapping on layout.
E.02	Grid Resistance	T	Micro Ohm Meter & Earth Resistance Tester	C	100%	Owner's Tech. Specifications / Grid Resistance should be less than 0.5Ω	JOINT PROTOCOL	

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLN-E2060:20 FIELD QUALITY PLAN FOR **EARTHING SYSTEM** (STATEMENT OF CHECKS)	FQP NO.: **MAITREE-00-BAU-QA-300041-PSE** BHEL Doc. No. : QPE-MTE-660-EL-66 REV.NO.: 3 SHEET 05 / 05 SHEETS

SYSTEM: ELECTRICAL | SUB-SYSTEM: EARTHING | AREA: ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
E.03 △2	Earth resistance of Treated earth pits only	T	Earth Resistance Tester	A	100%	Owner's Tech. Specifications, IEEE 80-2000, IEEE 81 & Owner's Tech. Specifications / Earth resistance of Treated earth pits should be less than 1Ω (clause no. 14.1 of IEEE 80-2000) △3	JOINT PROTOCOL	
E.04 △2	Measurement of Ground Potential Rise	M	Ground Test Kit	B	Randomly in each building location before start of erection of super structure	Owner's Tech. Specifications, IEEE 80-2000, IEEE 81 & Design Memorandum for Grounding System (Maitree-00-BAU-EDB-421509E002-PEM) △3	JOINT PROTOCOL	
E.05 △1	Measurement of Touch & Step Voltage	M	Ground Test Kit	B	Around each major installations	Owner's Tech. Specifications, IEEE 80-2000 & Design Memorandum for Grounding System (Maitree-00-BAU-EDB-421509E002-PEM) △3	JOINT PROTOCOL	
△1 E.06	Check the continuity of down conductor of lightening protection system to the earth pit	T	Multi Meter	B	100%	Clause No. E.7.2.4 of BS EN 62305-3:2011	JOINT PROTOCOL	
△1 E.07	Check the earth resistance values of earth electrode individually	T	Earth Resistance Tester	B	100%	Clause No. E.7.2.4 of BS EN 62305-3:2011	JOINT PROTOCOL	

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RECORD OF QUALITY CHECKS

SHEET NO. OF FQP	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	INSPECTED BY SIGN. & DATE	CLEARED BY SIGN. & DATE	REMARKS

Note: Any protocol made is to be numbered & mentioned in "Format of Record" column.

		SYSTEM	SUB-SYSTEM	AREA	FQP NO. QPE-MTE-660-EL-66
PROJECT					REV. NO.: 3
UNIT NO.					LOG SHEET NO. : L- 00
RATING					PAGE 1 OF 1

APPROVED
Checked and Approved.

Date: 30-Jan-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

			NAME	SIGNATURE & DATE	FQP NO.: QPE-MTE-660-EL-66
PROJECT		INSPECTED BY			REV.NO.: 3
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

APPROVED
Checked and Approved.

Date: 10-Apr-2018

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FIELD QUALITY PLAN
FOR
MEDIUM VOLTAGE SWITCHGEAR

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED

OWNER'S CONSULTANT

FICHTNER

Fichtner GmbH & Co. KG, Germany

BIFPCL DOC. NO. : MAITREE-00-BBA-QA-300033-PSE, REV. NO. : 0

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-EL-57
REV No.: 0

APPROVED
Checked and Approved.

Date: 10-Apr-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

FIELD QUALITY PLAN
FOR
MEDIUM VOLTAGE SWITCHGEAR

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-BBA-QA-300033-PSE, REV. NO. : 0

PREPARED BY	 DE/QLY, BHEL-PSER	APPROVED BY	 HEAD / QLY, BHEL-PSER

FQP NO.	**QPE-MTE-660-EL-57**
ORIGINAL DATE OF ISSUE	30/03/2018
REVISION NO. & DATE	0, Dt. 30/03/2018
COPY NO.	
ISSUED TO	
DATE OF ISSUE	
PURPOSE :	
ISSUED BY (SIGNATURE & DESIGNATION)	DE/QLY, BHEL, PSER

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

APPROVED
Checked and Approved.

Date: 10-Apr-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

PSER	FIELD QUALITY PLAN FOR MEDIUM VOLTAGE SWITCHGEAR	FQP NO: MAITREE-00-BBA-QA-300033-PSE BHEL Doc. No. : QPE-MTE-660-EL-57
		Rev. No. : 0
		SHEET 1 / 1 SHEETS

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4.0	Statement of Checks	05
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6.0	Log Sheets	04

APPROVED
Checked and Approved.

Date: 10-Apr-2018

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PSER	FIELD QUALITY PLAN FOR MEDIUM VOLTAGE SWITCHGEAR	FQP NO: MAITREE-00-BBA-QA-300033-PSE BHEL Doc. No. : QPE-MTE-660-EL-57
		Rev. No. : 0
		SHEET 1 / 1 SHEETS

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	-	0, Dtd.: 30.03.18	Document prepared as per the owner's technical specifications & is similar to NTPC approved FQP No. 4410-001-205-QVE-Q-003, Rev-0 for NTPC - North Karanpura STPP (3x660MW).

APPROVED
Checked and Approved.

Date: 10-Apr-2018

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PSER

AUTHORISATION FOR DIFFERENT CATEGORY OF CONSTRUCTION/ ERECTION CHECKS & NONCONFORMITY DISPOSITION

Category of Check	Inspection Authority	Witness Authority	Nonconformity (if any) Disposition Authority	Accepting Authority
'A' (Customer Hold Point)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'B' (Formal intimation shall be forwarded by BHEL. Check shall commence at notified time whether parties show-up or not)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'C'	BHEL Engineer	BHEL Engineer	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BHEL HOS

Abbreviations used:

HOS – Head of Section

Note:

1. Nonconformity Disposition authority for all categories of checks shall be as under:

   Product nonconformities: BHEL Engineering Centre.

   Process/System nonconformities: Head (Quality): BHEL, PS ER.

2. Wherever log sheet is not called for, suitable record shall be maintained in protocol / Site register.

3. In case of nonconformity, accepting authority will consider the solution for the nonconformity as proposed by the Nonconformity Disposition Authority before acceptance, and such solution shall be reflected in the log sheets/protocols.

4. Owner's Engineer is authorized to carry out surveillance in any of B & C category of checks at his discretion.

5. Quantum of check shall be 100% for all characteristics unless otherwise mentioned specifically in Field Quality Plan/ reference documents.

6. Only authorised persons with proper safety gears to enter construction area

APPROVED
Checked and Approved.

Date: 10-Apr-2018

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PSER	FIELD QUALITY PLAN FOR MEDIUM VOLTAGE SWITCHGEAR	FQP NO: MAITREE-00-BBA-QA-300033-PSE BHEL Doc. No. : QPE-MTE-660-EL-57
		Rev. No. : 0
		SHEET 01 / 05 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	ELECTRICAL
Sub-system :	MEDIUM VOLTAGE SWITCHGEAR
Area :	ERECTION

NOTES :

1. As an evidence of having carried out the work satisfactorily, a general purpose log sheet, L-00 shall be maintained for all the checks.
2. Abbreviations used:
   R – Record Verification
   V – Visual Check
   P – Physical Check
   M – Measurement
   T – Test
   MTC – Manufacturers Test Certificate
   SR – Site Register
   MDR – Material Discrepancy Report
3. Latest revision of Standards & Specification shall apply.
4. Materials shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
5. Welding shall be carried out by Qualified Welders, with traceable WPQR, in line with approved WPS and Qualified PQR, as per ASME Section IX
6. Only approved welding consumables shall be used, as per Approved Welding Consumable list.
7. Procedure shall be established and followed, for Procurement, Storage, Issue and Control of Welding Consumables.
8. NDT shall be carried out by Qualified Personnel with compliance to Approved NDT procedures and Acceptance Norms, as per ASME Section V.
9. The Agency carrying out RT shall be approved by Local Authorities.
10. Field Radiography shall be carried out in compliance with Local Statutory requirements and safety precautions by Approved Agency.
11. Radiography Source handling and control procedure shall be established as per Local Statutory requirements and complied.
12. Preheating and Post Weld Heat treatment shall be in compliance with Approved Procedures.
13. Gauges and measuring Instruments, with valid calibration only shall be used
14. Cleaning, preservation and Painting of products shall be carried out as per Approved Painting Schedule.

APPROVED
Checked and Approved.
Date: 10-Apr-2020
*Approval covers only those aspects of the EPC contractor's responsibilities as specified in the Contract.

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLH-EL2060.20 FIELD QUALITY PLAN FOR **MEDIUM VOLTAGE SWITCHGEAR** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-BBA-QA-300033-PSE** BHEL Doc. No. : QPE-MTE-660-EL-57 REV.NO.: 0 SHEET 02 / 05 SHEETS
SYSTEM: ELECTRICAL	SUB-SYSTEM: MEDIUM VOLTAGE SWITCHGEAR	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
A	**GENERAL REQUIREMENTS**								
A.01	Ensure availability of requisite equipment in good working condition well before commencement of concerned activity. All MMRs in the field shall be calibrated before commencement of tests and then at interval as per manufacturer's recommendations and as per direction of BIFPCL / OE.	P & R	-	A	Once prior to start of work and thereof monthly OR immediately after an Instrument Damaging incident	Owner's FTS & Drawing	The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	SR	- Calibration of MMRs shall be done by approved lab and the report shall be submitted to BIFPCL/ OE. - Wherever practical, a label shall be affixed on the Instrument, indicating the validity of Calibration
A.02	Ensure availability of assembly / layout drawings, as applicable.	R	-	A	100% for each component before start of activity	Owner's Technical Specifications	List of Latest Revision of Approved Drawings	SR	
A.03	Ensure availability of permanent benchmark at convenient places.	V & P	As required	A	Before start of erection	Plot Plan & GA Drawing	Availability of permanent benchmark	Joint Protocol	
B	**MATERIAL RECEIPT, STORAGE & HANDLING**								
B.01	Before unloading check the packing case no. on the packing case and check the packing case for external damage if any.	V	-	C	100%	Packing Slip	No external damage	SR	
B.02	Check for any loose items or accessories sent along with breakers such as hardware, bus-bars, spare items, maintenance tools and O & M manual	V	-	C	100%	Packing Slip	Packing Slip	SR	
B.03	Check and ensure the crates are unpacked properly, inspect for any damage and then repacked. Ensure that damaged/shortage items are reported to units	V	-	C	100%	Packing Slip	No damage / Shortage	MDR	
B.04	Check for any damage to painted surface.	V	-	C	100%	Packing Slip	No damage	SR	In case of any damage to painting, repair to be done as per OEM's reconemdations
B.05	Ensure that all the items have been stored properly (away from sunlight, rain water, inflammable material) as per manufacturer's instruction.	V	-	B	100%	OEM's Storage Instruction	Storage Instruction	SR	
B.06	Ensure the wire ropes of adequate capacity are used through slings.	V	-	C	100%	OEM's Storage Instruction	O&M Manual	SR	For circuit breakers wire ropes should never be attached on conductors and insulating parts

APPROVED
Checked and Approved.
Date: 10-Apr-2024
*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLH-EL2060.20 FIELD QUALITY PLAN FOR **MEDIUM VOLTAGE SWITCHGEAR** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-BBA-QA-300033-PSE** BHEL Doc. No. : QPE-MTE-660-EL-57 REV.NO.: 0 SHEET 03 / 05 SHEETS
SYSTEM: ELECTRICAL	SUB-SYSTEM: MEDIUM VOLTAGE SWITCHGEAR	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
B.07	Ensure locking of breakers, wherever provided to stop movement before transportation inside site and during storage.	V	-	C	100%	-	Compliance to Col. No. 2	SR	
B.08	Check the breaker is placed on raised platform to prevent the ingress of water.	V	-	C	100%	OEM's Storage Instruction	Elevated level	SR	
B.09	Check the items of VCB are well protected with plastic sheets	V	-	C	100%	OEM's Storage Instruction	No ingress of water / foreign item	SR	
B.10	Ensure the equipments are transported and stored in a vertical direction.	V	-	C	100%	OEM's Storage Instruction	Compliance to Col. No. 2	SR	
B.11	Ensure that the cut outs on the instrument panel are covered with plastic sheets	V	-	C	100%	OEM's Storage Instruction	Compliance to Col. No. 2	SR	
B.12	Control receipt and issue of all components	V	-	C	100%	Work instructions for site Operations	Work instructions for site Operations	Stock Register	
C	**CHECKS ON FOUNDATION**								
C.01	Check completeness of civil works	V & P	-	C	100%	Approved Drawing	Approved Drawing	SR	
C.02	Check layout, size & spacing of all cable trenches and floor openings for control cable and power cables	M	Measuring Tape	B	100%	Approved layout drawing	Approved layout drawing	SR	
C.03	Check level of inserts	M	Measuring Tape & water level	B	100%	Approved Drawing	level within ±5mm	SR	
D	**ERECTION CHECKS**								
D.01	Ascertain the position of the switchboard in the respective floor	V	-	B	100%	Appd Layout drg	Appd Layout drg		
D.02	Ensure the min. distance between the unit and the wall as per drg.	M	Measuring Tape	B	100%	Appd Layout drg	Appd Layout drg		
D.03	Check the panel sequence as per layout drgs.	V	-	C	100%	Appd Layout drg	Appd Layout drg		

APPROVED
Checked and Approved.
Date: 10-Apr-2024
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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLH-E2060.20 FIELD QUALITY PLAN FOR **MEDIUM VOLTAGE SWITCHGEAR** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-BBA-QA-300033-PSE** BHEL Doc. No. : QPE-MTE-660-EL-57 REV.NO.: 0 SHEET 04 / 05 SHEETS
SYSTEM: ELECTRICAL	SUB-SYSTEM: MEDIUM VOLTAGE SWITCHGEAR	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
D.04	Ensure that each unit is erected properly and truly vertical by using shims of various thickness	V	-	B	100%	Appd drg	Appd drg		
D.05	Ensure the panels are lined up properly/Plumb line & line	V	-	C	1	Appd drg	Appd drg		
D.06	Ensure the coupling bolts and bus bar connections of the panels are tightened properly.	P	Torque wrench	B	100%	Appd drg/ O&M Manual	O&M Manual		5% surveilance check at random by BIFPCL/OE
D.07	Ensure the base frame is tack welded	P	-	C	100%	OEM's Instruction Manual	OEM's Instruction Manual		Tack welding shall be last activity.
D.08	Ensure that all site connections have been done properly	P	-	C	100%	Appd drg	Appd drg		
D.09	Check the earthing lead of cable is connected properly and connection to station earth is done.	P	-	C	100%	Appd drg	Appd drg		
D.10	Check the electrical clearances Phase to Phase & Phase to Earth	P	As required	C	100%	Appd drg	Appd drg		
D.11	Check CT ratios and polarity marking	M	Primary injection kit & galvanometer	C	100%	Appd datasheet/ drg.	Appd datasheet/ drg.	L-01	Check CT secondary is not shorted
D.12	Check voltage ratio of PTs in case mounting is done at site	M	3 phase variac & multimeter	C	100%	Appd datasheet/ drg.	Appd datasheet/ drg.	L-02	Check CT secondary is not shorted
D.13	Check the pad locking of the doors	P		C	100%	Appd drg	Appd drg		
D.14	Ensure the vacuum interrupter has not suffered any damage	V		C	100%	Appd drg	No damage		
D.15	Ensure the panel earthing done for all the units	V		B	100%	Appd drg	Appd drg		
D.16	Check the interchangeability of the breaker trolleys	P		C	Random sampling	Specn/ drg	Specn/ drg		
D.17	Check for the earth bus continuity and earth continuity from door to the earth bus.	M	multimeter	C	100%	Appd drg	Appd drg		

APPROVED
Checked and Approved.
Date: 10-Apr-2020
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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLH-E2060.20 FIELD QUALITY PLAN FOR **MEDIUM VOLTAGE SWITCHGEAR** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-BBA-QA-300033-PSE** BHEL Doc. No. : QPE-MTE-660-EL-57 REV.NO.: 0 SHEET 05 / 05 SHEETS
SYSTEM: ELECTRICAL	SUB-SYSTEM: MEDIUM VOLTAGE SWITCHGEAR	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
D.18	Check the phase sequence of the busduct and ensure correct phase sequence on the incomer panel by using phase-sequence meter	V	-	B	100%	Appd drg	Correct phase sequence	Log sheet	
D.19	Ensure the bolting surfaces are free from dust grease and other contamination	P	-	C	100%		Free from rusting/contamination		
D.20	Ensure the unplated components if any are thoroughly cleaned and electrical jointing compound applied on the surface after scratching with fine emery sheets	V	-	C	100%		Compliance to Col. No. 2		
D.21	Check the tightness of fasteners on the busbar connections. Torque wrench	P	-	C	100%	O&M Manual	O&M Manual	Log sheet	5% surveilance check at random by BIFPCL/OE
D.22	Check completeness of erection activities.	V	-	A	100%	Drawing	OEM's Instruction Manual	Logbook	
E	**FINAL CHECK / TESTS**								
E.01	Check for completeness of inter panel wiring as per scheme.	V	-	C	100%	Wiring Diagram	Compliance to Col. No. 2		
E.02	Check for CT secondary is shorted where remote instruments are to be used	V	-	B	100%	Wiring Diagram	Should be shorted		
E.03	Check HV and IR before/after HV	M	HV Test kit & IR tester	A	100%	IEC 62271-100	IEC 62271 -100	Log sheet	
E.04	Check degree of protection by paper Pulling Method	V	-	B	At random	-	Paper should not come out easily		
E.05	Check Final Earthing with Grid	M	Multimeter	B	100%		Continuity	Log sheet	
E.06	Check alignment of Power Contacts of Breaker and Panel	V	-	B	100%		proper Alignment		

APPROVED
Checked and Approved.

Date: 10-Apr-2018

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BHARAT HEAVY ELECTRICALS LTD.
BHOPAL-462022
SWITCHGEAR ENGINEERING DIVISION

GENERAL HANDLING INSTRUCTIONS OF SWITCHGEARS:

The crates shall be unpacked carefully after selecting a dust free area. Remove dust sticking to the crates & take off the polythene cover. During handling ensure that the slings are of adequate strength and secured properly, that no parts are subjected to undue strain, that surfaces are neither scratched nor damaged. *For circuit breakers wire ropes should never be attached on conductors and insulating parts.*

STORAGE & PRESERVATION OF INDOOR SWITCHGEARS:

It is recommended that the switchgear panel shall be put immediately in its permanent location. If this is not possible and storage is intended for long duration, following precautions must be taken to ensure the proper storage of the units:

a) Panels shall be kept in a dry indoor place.
b) Keep them in a place free of dust, corrosive gas and humidity.
c) When any work is done in the vicinity of the storage place, the panels should be protected with suitable covers.

STORAGE & PRESERVATION OF OUTDOOR SWITCHGEARS:

If the circuit breakers are not to be erected immediately, they should be repacked and preferably stored in covered, well ventilated shed. If this is not possible, then the packed cases should be kept on raised ground to prevent accumulation of rain water and submergence of the units. Preferably cover units with water proof tarpaulins.

APPROVED
Checked and Approved.

Date: 10-Apr-2018

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PSER

RECORD OF QUALITY CHECKS

SHEET NO. OF FQP	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	INSPECTED BY SIGN. & DATE	CLEARED BY SIGN. & DATE	REMARKS

Note : Any protocol made is to be numbered & mentioned in "Format of Record" column.

		SYSTEM	SUB-SYSTEM	AREA	FQP NO.: QPE-MTE-660-EL-57
PROJECT					REV. NO. : 0
UNIT NO.					LOG SHEET NO. L-00
RATING					SHEET / SHEETS

APPROVED
Checked and Approved.

Date: 10-Apr-2018

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PSER	INSTRUMENT REG. NO./TAG NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

C.T. POLARITY AND RATIO TEST

Phase	Marked Ratio	Observed Ratio	Polarity (O.K. / NOT O.K.)	
			Protection Core	
			Metering Core	
			Differential Protection Core	
			Protection Core	
			Metering Core	
			Differential Protection Core	
			Protection Core	
			Metering Core	
			Differential Protection Core	

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-57
PROJECT		INSPECTED BY			REV. NO. : 0
UNIT NO.		CLEARED BY			LOG SHEET NO. L-01
RATING		CUSTOMER			SHEET 1 / 1 SHEETS

APPROVED
Checked and Approved.

Date: 10-Apr-2018

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PSER	INSTRUMENT REG. NO./TAG NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

P.T. POLARITY AND RATIO TEST

Phase	Marked Ratio	Observed Ratio	Polarity (O.K. / NOT O.K.)	
			Protection Core	
			Metering Core	
			Protection Core	
			Metering Core	
			Protection Core	
			Metering Core	

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-57
PROJECT		INSPECTED BY			REV. NO. : 0
UNIT NO.		CLEARED BY			LOG SHEET NO. L-02
RATING		CUSTOMER			SHEET 1 / 1 SHEETS

APPROVED
Checked and Approved.

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*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

			NAME	SIGNATURE & DATE	FQP NO. : QPE-MTE-660-EL-57
PROJECT		INSPECTED BY			REV. NO. : 0
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

APPROVED
Checked and Approved.

Date: 22-Mar-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

FIELD QUALITY PLAN
FOR
ISOLATED PHASE BUSDUCT

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED

OWNER'S CONSULTANT

FICHTNER

Fichtner GmbH & Co. KG, Germany

BIFPCL DOC. NO. : MAITREE-00-BBS-QA-300031-PSE, REV. NO. : 1

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-EL-55
REV No.: 1

APPROVED
Checked and Approved.

Date: 22-Mar-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

FIELD QUALITY PLAN
FOR
ISOLATED PHASE BUSDUCT

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-BBS-QA-300031-PSE, REV. NO. : 1

PREPARED BY	BHEL, PSER KOL-91 QUALITY DEPT. DE/QLY, BHEL- PSER	APPROVED BY	HEAD / QLY, BHEL-PSER
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BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

APPROVED
Checked and Approved.

Date: 22-Mar-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

PSER	FIELD QUALITY PLAN FOR ISOLATED PHASE BUSDUCT	FQP NO: MAITREE-00-BBS-QA-300031-PSE BHEL Doc. No. : QPE-MTE-660-EL-55
		Rev. No. : 1
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APPROVED
Checked and Approved.

Date: 22-Mar-2018

*Approval doesn't absolve the EPC contractor of it's responsibility as specified in the Contract.

PSER	FIELD QUALITY PLAN FOR ISOLATED PHASE BUSDUCT	FQP NO: MAITREE-00-BBS-QA-300031-PSE BHEL Doc. No. : QPE-MTE-660-EL-55
		Rev. No. : 1
		SHEET 1 / 1 SHEETS

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 02.02.18	Document prepared as per the owner's specifications
02	All	1, Dtd.: 23.02.18	As per comments dated 21/02/2018 from BIFPCL / OE, the FQP is aligned with valid NTPC RFQP no 0000-999-QVE-T-031, Rev-0 for IPBD and the copy of the RFQP is attached. The codes/standards referred in this FQP are as per accepted codes/standards in FTS of BIFPCL.

APPROVED
Checked and Approved.

Date: 22-Mar-2018

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PSER

AUTHORISATION FOR DIFFERENT CATEGORY OF CONSTRUCTION/ ERECTION CHECKS & NONCONFORMITY DISPOSITION

Category of Check	Inspection Authority	Witness Authority	Nonconformity (if any) Disposition Authority	Accepting Authority
'A' (Customer Hold Point)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'B' (Formal intimation shall be forwarded by BHEL. Check shall commence at notified time whether parties show-up or not)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'C'	BHEL Engineer	BHEL Engineer	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BHEL HOS

Abbreviations used:

HOS – Head of Section

Note:

1. Nonconformity Disposition authority for all categories of checks shall be as under:

   Product nonconformities: BHEL Engineering Centre.

   Process/System nonconformities: Head (Quality): BHEL, PS ER.

2. Wherever log sheet is not called for, suitable record shall be maintained in protocol / Site register.

3. In case of nonconformity, accepting authority will consider the solution for the nonconformity as proposed by the Nonconformity Disposition Authority before acceptance, and such solution shall be reflected in the log sheets/protocols.

4. Owner's Engineer is authorized to carry out surveillance in any of B & C category of checks at his discretion.

5. Concerned agencies shall ensure that instruments having valid calibration are only used for measurements.

6. Quantum of check shall be 100% for all characteristics unless otherwise mentioned specifically in Field Quality Plan/ reference documents.

7. Only authorised persons with proper safety gears to enter construction area

APPROVED
Checked and Approved.

Date: 22-Mar-2018

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PSER	FIELD QUALITY PLAN FOR ISOLATED PHASE BUSDUCT	FQP NO: MAITREE-00-BBS-QA-300031-PSE BHEL Doc. No. : QPE-MTE-660-EL-55
		Rev. No. : 1
		SHEET 01 / 06 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	BUS DUCT
Sub-system :	ISOLATED PHASE BUSDUCT
Area :	ERECTION

NOTES :

1. As an evidence of having carried out the work satisfactorily, a general purpose log sheet, L-00 shall be maintained for all the checks.
2. Abbreviations used:

   R – Record Verification

   V – Visual Check

   P – Physical Check

   M – Measurement

   T – Test

   MTC – Manufacturer's Test Certificate

   SR – Site Register

   MDR – Material Discrepancy Report
3. Latest revision of Standards & Specification shall apply
4. Materials shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
5. Welding shall be carried out by Qualified Welders, with traceable WPQ, in line with approved WPS and Qualified PQR, as per AWS D1.2
6. Only approved welding consumables shall be used, as per Approved Welding Consumable list.
7. Procedure shall be established and followed, for Procurement, Storage, Issue and Control of Welding Consumables.
8. NDT shall be carried out by Qualified Personnel with compliance to Approved NDT procedures and Acceptance Norms, as per AWS D1.2.
9. The Agency carrying out RT shall be approved by Local Authorities.
10. Field Radiography shall be carried out in compliance with Local Statutory requirements and safety precautions by Approved Agency.
11. Radiography Source handling and control procedure shall be established and complied

APPROVED
Checked and Approved.

Date: 22-Mar-2018

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLN-E2060:20 FIELD QUALITY PLAN FOR **ISOLATED PHASE BUSDUCT** (STATEMENT OF CHECKS)	FQP NO.: **MAITREE-00-BBS-QA-300031-PSE** BHEL Doc. No. : QPE-MTE-660-EL-55 REV.NO.: 1 SHEET 02 / 06 SHEETS
SYSTEM: ELECTRICAL	SUB-SYSTEM: ISOLATED PHASE BUSDUCT	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
A	**GENERAL REQUIREMENTS**							
A.01	Ensure availability of requisite equipment in good working condition well before commencement of concerned activity. All MMRs in the field shall be calibrated before commencement of tests and then at interval as per manufacturer's recommendations and as per direction of BIFPCL / OE.	P & R	-	A	Once prior to start of work and thereof monthly OR immediately after an Instrument damaging incident	- Technical Specifications & Drawing -The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	SR	-Functioning of MMRs in proper working condition to be verified on monthly basis. -calibration of MMRs shall be done by approved lab and the report shall be submitted to BIFPCL/ OE. - Wherever practical, a label shall be affixed on the Instrument, indicating the validity of Calibration
A.02	Ensure availability of BOM, Erection & Layout drawings and OEM's (BHEL-Rudrapur) Instruction Manual	R	-	A	100% for each equipment before start of activity	- List of Latest Revision of Approved Drawings and - Owner's Technical Specifications	SR	
B	**RECEIPT & STORAGE OF BUSDUCT MATERIAL**							
B.01	Ensure unloading of busduct components with use of strap belt / manila ropes near the support channel	V	-	C	100%	OEM's Instruction Manual	Logbook	
B.02	Check for - a) packing condition, transit damages (puncture, bend, scratch etc.) and b) completeness of supply of items viz. bus ducts, wall frames, support structures, bushings, rubber bellow, gaskets, splice plates, flexibles, LA, CT, VT, NGR, NGT etc. as per BOM, packing list & BIFPCL's MDCC. <u>Note :</u> In case of damage to contents, check the contents to ascertain the nature & quantum of damage. Re-pack contents in original packing, keep them in dry condition & follow step B.03.	P	-	B	To be checked at the time of receipt	OEM's Instruction Manual, BOM, Packing List & BIFPCL's MDCC	SR	
B.03	Ensure that nonconforming / rejected components, discrepancy in supply are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	Work instructions for site Operations	MDR	
B.04	Ensure that busduct is not kept directly on ground and the exposed parts such as palms are covered/wrapped properly.	P	-	C	Once on receipt & every three months thereof	OEM's Instruction Manual	Logbook	
B.05	Ensure that BOIs, hardware, copper items and NGT, NGR, CT, PT etc. are stored in covered shed in original packing.	P	-	C	Once on receipt & every three months thereof	OEM's Instruction Manual	Logbook	

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Checked and Approved.

Date: 22-Mar-2018

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLN-E2060:20 FIELD QUALITY PLAN FOR **ISOLATED PHASE BUSDUCT** (STATEMENT OF CHECKS)	FQP NO.: **MAITREE-00-BBS-QA-300031-PSE** BHEL Doc. No. : QPE-MTE-660-EL-55 REV.NO.: 1 SHEET 03 / 06 SHEETS
SYSTEM: ELECTRICAL	SUB-SYSTEM: ISOLATED PHASE BUSDUCT	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
C	**PRE-ERECTION CHECKS**							
C.01	Before erection of the structure at site, check materials visually on random basis.	V	-	B	100%	Owner's Tech. Specifications, OEM's Instruction Manual & No scratch or peel off of zinc coating	Logbook	
C.02	Check disposition & level of foundation w.r.t. transformer axes & bench mark	M	Measuring tape, piano wire	B	100%	Layout drawing	Logbook	
C.03	Check the equipment for their physical condition & cleanliness	V	-	C	100%	- OEM's Instruction Manual - equipment shall be clean & no rusting	Logbook	
C.04	Check for marking of supporting structures.	V	-	C	100%	Drawing	SR	
C.05	Check IR value of each bus conductor before erection.	T	2.5KV / 5KV IR Tester	B	100%	BS 159 : 1992	Logbook	
D	**ERECTION CHECKS**							
D.01	Ensure availability of correct WPS & PQR at site	R	-	A	100%	Drawing & AWS D1.2	-	
D.02	Review of MTC of welding electrodes & other consumables	R	-	A	100%	Relevant AWS specifications as per applicable WPS	SR	The copy of MTCs to be reviewed & signed by BHEL and record to be maintained in Site Register. BIFPCL/OE will conduct spot checks of review conducted by BHEL.
D.03	Welders' performance qualification, preparation of Welder Qualification Record (WQR) and Identity card.	V & T	-	A	100%	WPS & AWS D1.2	WQR	
D.04	Daily in-Process monitoring of joint fit-ups before welding	V & M	Measuring tape	B	100%	Drawing & BHEL Instruction Manual	Logbook	
D.05	Welding of components Note : Ensure adoption of correct procedure, use of approved electrodes and methods.	V	-	B	100%	Drawing/ EWS, WPS, AWS D10.7 & BHEL recommended procedure	SR	
D.06	Visual Inspection of welds	V	-	A	100%	AWS D1.2	SR	
D.07	Review of qualification of NDT inspectors	R	-	A	Once before engagement of each inspector	Level-II or above of ASNT NDT Certification or equivalent	NDT Inspector Register	

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLN-E2060:20 FIELD QUALITY PLAN FOR **ISOLATED PHASE BUSDUCT** (STATEMENT OF CHECKS)	FQP NO.: **MAITREE-00-BBS-QA-300031-PSE** BHEL Doc. No. : QPE-MTE-660-EL-55 REV.NO.: 1 SHEET 04 / 06 SHEETS
SYSTEM: ELECTRICAL	SUB-SYSTEM: ISOLATED PHASE BUSDUCT	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
D.08	NDT of welds	T	As required	A	DPT - 100%, RT - 10% of weld length of busduct conductor	AWS D1.2	NDT Report	
E	**ERECTION CHECKS**							
E.01	Check alignment of supporting structure (including verticality)	M	Measuring tape, plumb	B	100%	Drawing	Logbook	
E.02	Check layout of busduct & correct phase sequence	P	-	B	100%	Drawing	Logbook	
E.03	Check tightness of bolts (between enclosure, insulator & conductors) as applicable	P	Torque wrench	B	100%	Drawing & OEM's Instruction Manual	Logbook	
E.04	Check fixing of wall frame assembly with SOB (if any)	P	-	C	100%	Drawing	Logbook	
E.05	Check for alignment of enclosure, conductor & SOB	M	Measuring tape, piano wire	B	100%	Drawing	Logbook	
E.06	Check for fixing of splice plate, flexibles & rubber bellow etc.	P	-	C	100%	Drawing & OEM's Instruction Manual	Logbook	
E.07	Check cleaning of conductor, insulators & enclosure splice plates, flexibles, SOB etc., as applicable	P	-	C	100%	Drawing & OEM's Instruction Manual	Logbook	
E.08	Ensure that eye-bolts are used for lifting of cubicles & generator adopters.	P	-	C	100%	OEM's Instruction Manual	SR	
E.09	Check dimensions & alignment for conductors, enclosures & cubicles etc.	M	Measuring tape, piano wire	B	100%	Drawing & OEM's Instruction Manual	Logbook	
E.10	Check insulators after fixing busbars in adopter box.	P	-	B	100%	Drawing & OEM's Instruction Manual	Logbook	
E.11	Check clearance between phase & enclosure	M	Measuring tape	B	100%	Drawing & Table - 2 of BS 159:1992	Logbook	
E.12	Welding of conductor & enclosure	As per checks in Sl. No. 'D'						
E.13	Resistance check (or mV drop test) of site joints	V & T	micro-ohm meter	A	100%	BS 159:1992 & shall not exceed the resistance of 1.25 m identical conductor without connections by more than 10%	Logbook	

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLN-E2060:20 FIELD QUALITY PLAN FOR **ISOLATED PHASE BUSDUCT** (STATEMENT OF CHECKS)	FQP NO.: **MAITREE-00-BBS-QA-300031-PSE** BHEL Doc. No. : QPE-MTE-660-EL-55 REV.NO.: 1 SHEET 05 / 06 SHEETS
SYSTEM: ELECTRICAL	SUB-SYSTEM: ISOLATED PHASE BUSDUCT	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
E.14	Check polarity and ratio of Phase & Neutral CTs and their placement	T	Multimeter	B	100%	IEC 60044-1	Logbook	
E.15	Check Phase & Neutral CT's secondaries are kept shorted until connected to respective instruments / relays.	V	-	B	100%	CT wiring diagram	Logbook	
E.16	Ensure proper crimping, ferrule numbering & check wiring inside CT terminal box.	P	-	C	100%	CT wiring diagram	SR	
E.17	Check positioning of rubber bellows & gaskets	V	-	C	100%	Drawing & OEM's Instruction Manual	SR	
E.18	Check earthing of busbucts, support structures, NG cubicles & shunt.	V	-	B	100%	Drawing & OEM's Instruction Manual	SR	
E.19	Check setting of thermostats	V	-	B	100%	OEM's Instruction Manual	Logbook	
E.20	Trail run & initial operation of Air pressuring equipment / Hot air blowing equipment	P	-	B	100%	OEM's Instruction Manual	Logbook	
E.21	Check Bus bar connections to NG Transformer & NGR	V		C		Drawing & OEM's Instruction Manual	SR	
E.22	Check the polarity, ratio & Mag. Curve of NG cubicle CTs	T & M	Multimeter	B	100%	IEC 60044-1	Logbook	
E.23	Check the polarity, ratio & Mag. Curve of NGR Transformer	T & M	Multimeter	B	100%	IEC 60044-1	Logbook	
E.24	Check Function of heaters	V		C	100%	Drawing & OEM's Instruction Manual	Logbook	
E.25	Check Free movement of panel doors	V	-	C	100%	- OEM's Instruction Manual - free movement	SR	
E.26	Check for earthing connections of Neutral Grounding Cubicles and Busduct / associated equipment	V	-	B	100%	Drawing & OEM's Instruction Manual	SR	
E.27	Check IR value of NGT (Insulation tester)	T & M	IR Tester	B	100%	Drawing & OEM's Instruction Manual	Logbook	

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Date: 22-Mar-2018

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLN-E2060:20 FIELD QUALITY PLAN FOR **ISOLATED PHASE BUSDUCT** (STATEMENT OF CHECKS)	FQP NO.: **MAITREE-00-BBS-QA-300031-PSE** BHEL Doc. No. : QPE-MTE-660-EL-55 REV.NO.: 1 SHEET 06 / 06 SHEETS
SYSTEM: ELECTRICAL	SUB-SYSTEM: ISOLATED PHASE BUSDUCT	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
E.28	Check Wiring and continuity check	V	-	C	100%	Drawing & OEM's Instruction Manual	SR	
E.29	Check Movement of trolleys	V	-	C	100%	- OEM's Instruction Manual - free movement	SR	
E.30	Check of proper shrouding and size of bolts	V	-	C	100%	Drawing & OEM's Instruction Manual	SR	
E.31	Check Limit switch operation	V	-	C	100%	Drawing & OEM's Instruction Manual	SR	
E.32	Check completeness of busduct assembly	V	-	B	100%	Drawing & OEM's Instruction Manual	SR	
E.33	Check IR of each completed bus duct section after erection	T & M	2.5KV / 5KV IR Tester	A	100%	BS 159 : 1992	Logbook	
E.34	HV testing of busduct conductor at specified voltage	T & M	HV Test kit	A	100%	Clause no. 7.2 of BS 159:1992	JOINT PROTOCOL	
E.35	Check for erection completion of all components & handing over for commissioning	R	-	A	100%	Drawing & Owner's Tech. Specifications	JOINT PROTOCOL	- Review all Inspection records, Log Sheets, protocols for completeness and disposition status of NCRs (if any)

NOTE: All commissioning tests are to be conducted as per BIFPCL Technical Specification

APPROVED
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Date: 22-Mar-2018

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PSER

RECORD OF QUALITY CHECKS

SHEET NO. OF FQP	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	INSPECTED BY SIGN. & DATE	CLEARED BY SIGN. & DATE	REMARKS

Note : Any protocol made is to be numbered & mentioned in "Format of Record" column.

		SYSTEM	SUB-SYSTEM	AREA	FQP NO.: QPE-MTE-660-EL-55
PROJECT					REV. NO. : 1
UNIT NO.					LOG SHEET NO. L-00
RATING	250MW				SHEET / SHEETS

APPROVED
Checked and Approved.

Date: 22-Mar-2018

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PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

			NAME	SIGNATURE & DATE	FQP NO.: QPE-MTE-660-EL-55
PROJECT		INSPECTED BY			REV. NO. : 1
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

APPROVED
Checked and Approved.

Date: 20-Apr-2018

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FIELD QUALITY PLAN
FOR
SEGREGATED PHASE BUSDUCT

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED

OWNER'S CONSULTANT

FICHTNER

Fichtner GmbH & Co. KG, Germany

BIFPCL DOC. NO. : MAITREE-00-BBS-QA-300032-PSE, REV. NO. : 1

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-EL-56
REV No.: 1

APPROVED
Checked and Approved.

Date: 20-Apr-2018

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FIELD QUALITY PLAN
FOR
SEGREGATED PHASE BUSDUCT

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-BBS-QA-300032-PSE, REV. NO. : 1

PREPARED BY	DE/QLY, BHEL- PSER	APPROVED BY	HEAD / QLY, BHEL-PSER

FQP NO.	**QPE-MTE-660-EL-56**
ORIGINAL DATE OF ISSUE	14/02/2018
REVISION NO. & DATE	1, Dt. 11/04/2018
COPY NO.	01
ISSUED TO	
DATE OF ISSUE	
PURPOSE :	
ISSUED BY (SIGNATURE & DESIGNATION)	DE/QLY, BHEL- PSER

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

APPROVED
Checked and Approved.

Date: 20-Apr-2018

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PSER	FIELD QUALITY PLAN FOR SEGREGATED PHASE BUSDUCT	FQP NO: MAITREE-00-BBS-QA-300032-PSE BHEL Doc. No. : QPE-MTE-660-EL-56
		Rev. No. : 1
		SHEET 1 / 1 SHEETS

CONTENTS

S. No.	Description	No. of Sheets
1.0	Contents	01
2.0	Status of Revisions	01
3.0	Authorization for checks and nonconformity disposition	01
4.0	Statement of Checks	05
5.0	Log Sheets	02

APPROVED
Checked and Approved.

Date: 20-Apr-2018

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PSER	FIELD QUALITY PLAN FOR SEGREGATED PHASE BUSDUCT	FQP NO: MAITREE-00-BBS-QA-300032-PSE BHEL Doc. No. : QPE-MTE-660-EL-56
		Rev. No. : 1
		SHEET 1 / 1 SHEETS

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 14.02.18	Document prepared as per the owner's specifications
02	All	1, Dtd.: 11.04.18	As per comments dated 21/02/2018 from BIFPCL / OE, the FQP is aligned with valid NTPC RFQP no 0000-999-QVE-T-032, Rev-0 for SPBD and the copy of the RFQP is attached. The codes/standards referred in this FQP are as per accepted codes/standards in FTS of BIFPCL.

APPROVED
Checked and Approved.

Date: 20-Apr-2018

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PSER

AUTHORISATION FOR DIFFERENT CATEGORY OF CONSTRUCTION/ ERECTION CHECKS & NONCONFORMITY DISPOSITION

Category of Check	Inspection Authority	Witness Authority	Nonconformity (if any) Disposition Authority	Accepting Authority
'A' (Customer Hold Point)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'B' (Formal intimation shall be forwarded by BHEL. Check shall commence at notified time whether parties show-up or not)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'C'	BHEL Engineer	BHEL Engineer	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BHEL HOS

Abbreviations used:

HOS – Head of Section

Note:

1. Nonconformity Disposition authority for all categories of checks shall be as under:

   Product nonconformities: BHEL Engineering Centre.

   Process/System nonconformities: Head (Quality): BHEL, PS ER.

2. Wherever log sheet is not called for, suitable record shall be maintained in protocol / Site register.

3. In case of nonconformity, accepting authority will consider the solution for the nonconformity as proposed by the Nonconformity Disposition Authority before acceptance, and such solution shall be reflected in the log sheets/protocols.

4. Owner's Engineer is authorized to carry out surveillance in any of B & C category of checks at his discretion.

5. Concerned agencies shall ensure that instruments having valid calibration are only used for measurements.

6. Quantum of check shall be 100% for all characteristics unless otherwise mentioned specifically in Field Quality Plan/ reference documents.

7. Only authorised persons with proper safety gears to enter construction area

APPROVED
Checked and Approved.

Date: 20-Apr-2018

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PSER	FIELD QUALITY PLAN FOR SEGREGATED PHASE BUSDUCT	FQP NO: MAITREE-00-BBS-QA-300032-PSE BHEL Doc. No. : QP-E-MTE-660-EL-56
		Rev. No. : 1
		SHEET 01 / 05 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	BUS DUCT
Sub-system :	SEGREGATED PHASE BUSDUCT
Area :	ERECTION

NOTES :

1. As an evidence of having carried out the work satisfactorily, a general purpose log sheet, L-00 shall be maintained for all the checks.
2. Abbreviations used:

   R – Record Verification

   V – Visual Check

   P – Physical Check

   M – Measurement

   T – Test

   MTC – Manufacturer's Test Certificate

   SR – Site Register

   MDR – Material Discrepancy Report
3. Latest revision of Standards & Specification shall apply
4. Materials shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
5. Welding shall be carried out by Qualified Welders, with traceable WPQ, in line with approved WPS and Qualified PQR, as per AWS D1.2
6. Only approved welding consumables shall be used, as per Approved Welding Consumable list.
7. Procedure shall be established and followed, for Procurement, Storage, Issue and Control of Welding Consumables.
8. NDT shall be carried out by Qualified Personnel with compliance to Approved NDT procedures and Acceptance Norms, as per AWS D1.2.
9. The Agency carrying out RT shall be approved by Local Authorities.
10. Field Radiography shall be carried out in compliance with Local Statutory requirements and safety precautions by Approved Agency.
11. Radiography Source handling and control procedure shall be established and complied
12. Cleaning, preservation and Painting of products shall be carried out as per Approved Painting Schedule

APPROVED
Checked and Approved.

Date: 20-Apr-2018

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLN-E2060:20 FIELD QUALITY PLAN FOR **SEGREGATED PHASE BUSDUCT** (STATEMENT OF CHECKS)	FQP NO.: **MAITREE-00-BBS-QA-300032-PSE** BHEL Doc. No. : QPE-MTE-660-EL-56 REV.NO.: 1 SHEET 02 / 05 SHEETS
SYSTEM: ELECTRICAL	SUB-SYSTEM: SEGREGATED PHASE BUSDUCT	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
A	**GENERAL REQUIREMENTS**							
A.01	Ensure availability of requisite equipment in good working condition well before commencement of concerned activity. All MMRs in the field shall be calibrated before commencement of tests and then at interval as per manufacturer's recommendations and as per direction of BIFPCL / OE.	P & R	-	A	Once prior to start of work and thereof monthly OR immediately after an Instrument damaging incident	- Technical Specifications & Drawing -The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	SR	-Functioning of MMRs in proper working condition to be verified on monthly basis. -calibration of MMRs shall be done by approved lab and the report shall be submitted to BIFPCL/ OE. - Wherever practical, a label shall be affixed on the Instrument, indicating the validity of Calibration
A.02	Ensure availability of BOM, approved Erection & Layout drawings and OEM's (BHEL-Rudrapur) Instruction Manual	R	-	A	100% for each equipment before start of activity	- List of Latest Revision of Approved Drawings and - Owner's Technical Specifications	SR	
B	**RECEIPT & STORAGE OF BUSDUCT MATERIAL**							
B.01	Ensure unloading of busduct components with use of strap belt / manila ropes near the support channel	V	-	C	100%	OEM's Instruction Manual	Logbook	
B.02	Check for - a) packing condition, transit damages (puncture, bend, scratch etc.) and b) completeness of supply of items viz. bus ducts, wall frames, support structures, bushings, rubber bellow, gaskets, splice plates, flexibles, LA, CT, VT etc. as per BOM, packing list & BIFPCL's MDCC. <u>Note :</u> In case of damage to contents, check the contents to ascertain the nature & quantum of damage. Re-pack contents in original packing, keep them in dry condition & follow step B.03.	P	-	B	To be checked at the time of receipt	OEM's Instruction Manual, BOM, Packing List & BIFPCL's MDCC	SR	
B.03	Ensure that nonconforming / rejected components, discrepancy in supply are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	Work instructions for site Operations	MDR	
B.04	Ensure that busduct is not kept directly on ground and the exposed parts such as palms are covered/wrapped properly.	P	-	C	Once on receipt & every three months thereof	OEM's Instruction Manual	Logbook	
B.05	Ensure that BOIs, hardware, copper items and NGT, NGR, CT, PT etc., as applicable, are stored in covered shed in original packing.	P	-	C	Once on receipt & every three months thereof	OEM's Instruction Manual	Logbook	

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Checked and Approved.

Date: 20-Apr-2018

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLN-E2060:20 FIELD QUALITY PLAN FOR SEGREGATED PHASE BUSDUCT (STATEMENT OF CHECKS)	FQP NO.: **MAITREE-00-BBS-QA-300032-PSE** BHEL Doc. No. : QPE-MTE-660-EL-56 REV.NO.: 1 SHEET 03 / 05 SHEETS
SYSTEM: ELECTRICAL	SUB-SYSTEM: SEGREGATED PHASE BUSDUCT	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
C	**PRE-ERECTION CHECKS**							
C.01	Before erection of the structure at site, check materials visually on random basis.	V	-	B	100%	Owner's Tech. Specifications, OEM's Instruction Manual & No scratch or peel off of zinc coating	Logbook	
C.02	Check disposition & level of foundation w.r.t. transformer axes & bench mark	M	Measuring tape, piano wire	B	100%	Layout drawing	Logbook	
C.03	Check the equipment for their physical condition & cleanliness	V	-	C	100%	- OEM's Instruction Manual - equipment shall be clean & no rusting	Logbook	
C.04	Check for marking of supporting structures.	V	-	C	100%	Drawing	SR	
C.05	Check IR value of each bus conductor before erection.	T	2.5KV / 5KV IR Tester	B	100%	BS 159 : 1992	Logbook	
D	**WELDING & NON DESTRCUTIVE EXAMINATIONS**							
D.01	Ensure availability of applicable WPS & PQR at site	R	-	A	100%	Drawing & AWS D1.2	-	
D.02	Review of MTC of welding electrodes & other consumables	R	-	A	100%	Relevant AWS specifications as per applicable WPS	SR	The copy of MTCs to be reviewed & signed by BHEL and record to be maintained in Site Register. BIFPCL/OE will conduct spot checks of review conducted by BHEL.
D.03	Welders' performance qualification, preparation of Welder Qualification Record (WQR) and Identity card.	V & T	-	A	100%	WPS & AWS D1.2	WQR	
D.04	Daily in-Process monitoring of joint fit-ups before welding	V & M	Measuring tape	B	100%	Drawing & BHEL Instruction Manual	Logbook	
D.05	Welding of components Note : Ensure adoption of correct procedure, use of approved electrodes and methods.	V	-	B	100%	Drawing/ EWS, WPS & BHEL recommended procedure	SR	
D.06	Visual Inspection of welds	V	-	A	100%	AWS D1.2	SR	
D.07	Review of qualification of NDT inspectors	R	-	A	Once before engagement of each inspector	Level-II or above of ASNT NDT Certification or equivalent	NDT Inspector Register	

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLN-E2060:20 FIELD QUALITY PLAN FOR SEGREGATED PHASE BUSDUCT (STATEMENT OF CHECKS)	FQP NO.: **MAITREE-00-BBS-QA-300032-PSE** BHEL Doc. No. : QPE-MTE-660-EL-56 REV.NO.: 1 SHEET 04 / 05 SHEETS
SYSTEM: ELECTRICAL	SUB-SYSTEM: SEGREGATED PHASE BUSDUCT	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
D.08	NDT of welds	T	As required	A	DPT - 100%, RT - 10% of weld length of busduct conductor	AWS D1.2	NDT Report	
E	**ERECTION CHECKS**							
E.01	Check alignment of supporting structure (including verticality)	M	Measuring tape, plumb	B	100%	Drawing	Logbook	
E.02	Check layout of busduct & correct phase sequence	P	-	B	100%	Drawing	Logbook	
E.03	Check tightness of bolts (between enclosure, insulator & conductors) as applicable	P	Torque wrench	B	100%	Drawing & OEM's Instruction Manual	Logbook	
E.04	Check installation of rain hoods at the joint of enclosure.	P	As required	C	100%	Drawing & OEM's Instruction Manual	Logbook	
E.05	Check fixing of wall frame assembly with SOB (if any)	P	-	C	100%	Drawing	Logbook	
E.06	Check for alignment of enclosure, conductor & SOB	M	Measuring tape, piano wire	B	100%	Drawing	Logbook	
E.07	Check for fixing of splice plate, flexibles, etc.	P	-	C	100%	Drawing & OEM's Instruction Manual	Logbook	
E.08	Check cleaning of conductor, insulators & enclosure splice plates, flexibles, SOB etc., as applicable	P	-	C	100%	Drawing & OEM's Instruction Manual	Logbook	
E.09	Check dimensions & alignment for conductors, enclosures & cubicles, rain hood etc.	M	Measuring tape, piano wire	B	100%	Drawing & OEM's Instruction Manual	Logbook	
E.10	Check clearance between phase & enclosure	M	Measuring tape	B	100%	Drawing & Table - 2 of BS 159:1992	Logbook	
E.11	Welding of conductor, enclosure & NDE, as applicable	As per checks in Sl. No. 'D'						
E.12	Resistance check (or mV drop test) of site joints	V & T	micro-ohm meter	A	100%	BS 159:1992 & shall not exceed the resistance of 1.25 m identical conductor without connections by more than 10 percent	Logbook	

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLN-E2060:20 FIELD QUALITY PLAN FOR SEGREGATED PHASE BUSDUCT (STATEMENT OF CHECKS)	FQP NO.: **MAITREE-00-BBS-QA-300032-PSE** BHEL Doc. No. : QPE-MTE-660-EL-56 REV.NO.: 1 SHEET 05 / 05 SHEETS
SYSTEM: ELECTRICAL	SUB-SYSTEM: SEGREGATED PHASE BUSDUCT	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
E.13	Check polarity and ratio of CTs and their placement, as applicable	T	Multimeter	B	100%	IEC 60044-1	Logbook	
E.14	Check CT's secondaries are kept shorted until connected to respective instruments / relays, as applicable	V	-	B	100%	CT wiring diagram	Logbook	
E.15	Ensure proper crimping, ferrule numbering & check wiring inside CT terminal box, as applicable.	P	-	C	100%	CT wiring diagram	SR	
E.16	Check positioning of rubber bellows & gaskets	V	-	C	100%	Drawing & OEM's Instruction Manual	SR	
E.17	Check earthing of busbucts, support structures, etc.	V	-	B	100%	Drawing & OEM's Instruction Manual	SR	
E.18	Check setting of thermostats	V	-	B	100%	OEM's Instruction Manual	Logbook	
E.19	Check drain plug assembly for effective drain out	V	-	C	100%	Drawing & OEM's Instruction Manual	SR	
E.20	Check silicagel breather assembly	V	-	C	100%	Drawing & OEM's Instruction Manual	SR	
E.21	Check Function of heaters	V		C	100%	Drawing & OEM's Instruction Manual	Logbook	
E.22	Check Wiring and continuity check	V	-	C	100%	Drawing & OEM's Instruction Manual	SR	
E.23	Check completeness of busduct assembly	V	-	B	100%	Drawing & OEM's Instruction Manual	SR	
E.24	Check IR of each completed bus duct section after erection	T & M	2.5KV / 5KV IR Tester	A	100%	BS 159 : 1992	Logbook	
E.25	HV testing of busduct conductor at specified voltage	T & M	HV Test kit	A	100%	Clause no. 7.2 of BS 159:1992	JOINT PROTOCOL	
E.26	Check for erection completion of all components & handing over for commissioning	R	-	A	100%	Drawing & Owner's Tech. Specifications	JOINT PROTOCOL	- Review all Inspection records, Log Sheets, protocols for completeness and disposition status of NCRs (if any)

NOTE: All commissioning tests are to be conducted as per BIFPCL Technical Specification

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RECORD OF QUALITY CHECKS

SHEET NO. OF FQP	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	INSPECTED BY SIGN. & DATE	CLEARED BY SIGN. & DATE	REMARKS

Note : Any protocol made is to be numbered & mentioned in "Format of Record" column.

		SYSTEM	SUB-SYSTEM	AREA	FQP NO.: QPE-MTE-660-EL-56
PROJECT					REV. NO. : 1
UNIT NO.					LOG SHEET NO. L-00
RATING	250MW				SHEET / SHEETS

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PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

			NAME	SIGNATURE & DATE	FQP NO.: QPE-MTE-660-EL-56
PROJECT		INSPECTED BY			REV. NO. 1
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

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Date: 23-Aug-2018

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FIELD QUALITY PLAN
FOR
MEDIUM VOLTAGE CABLING

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED

OWNER'S CONSULTANT

FICHTNER

Fichtner GmbH & Co. KG, Germany

BIFPCL DOC. NO. : MAITREE-00-BBS-QA-300037-PSE, REV. NO. : 0

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-EL-61A
REV No.: 0

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Checked and Approved.

Date: 23-Aug-2018

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FIELD QUALITY PLAN
FOR
MEDIUM VOLTAGE CABLING

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-BBS-QA-300037-PSE, REV. NO. : 0

PREPARED BY	ENGR./QLY, BHEL-PSER	APPROVED BY	HEAD / QLY, BHEL-PSER

FQP NO.	**QPE-MTE-660-EL-61A**
ORIGINAL DATE OF ISSUE	02/08/2018
REVISION NO. & DATE	0, Dt. 02/08/2018
COPY NO.	01
ISSUED TO	BIFPCL / FICHTNER
DATE OF ISSUE	12/06/2018
PURPOSE :	FOR REVIEW & COMMENTS / APPROVAL
ISSUED BY (SIGNATURE & DESIGNATION)	ENGR./QLY, BHEL-PSER

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

APPROVED
Checked and Approved.

Date: 23-Aug-2018

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PSER	FIELD QUALITY PLAN FOR MEDIUM VOLTAGE CABLING	FQP NO: MAITREE-00-BBS-QA-300037-PSE BHEL Doc. No. : QPE-MTE-660-EL-61A
		Rev. No. : 0
		SHEET 1 / 1 SHEET

CONTENTS

S. No.	Description	No. of Sheets
1.0	Contents	01
2.0	Status of Revisions	01
3.0	Authorization for checks and nonconformity disposition	01
4.0	Statement of Checks	04
5.0	Log Sheets	02

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PSER	FIELD QUALITY PLAN FOR MEDIUM VOLTAGE CABLING	FQP NO: MAITREE-00-BBS-QA-300037-PSE BHEL Doc. No. : QPE-MTE-660-EL-61A
		Rev. No. : 0
		SHEET 1 / 1 SHEET

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 02.08.18	The document is similar to NTPC-approved FQP No. 4410-001-215-QVE-G-066A, Rev-00 for NTPC-NKSTPP (3x660MW).

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AUTHORISATION FOR DIFFERENT CATEGORY OF CONSTRUCTION/ ERECTION CHECKS & NONCONFORMITY DISPOSITION

Category of Check	Inspection Authority	Witness Authority	Nonconformity (if any) Disposition Authority	Accepting Authority
'A' (Customer Hold Point)	BHEL Engineer	BIFPCL FQA / CONSULTANT FQA	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BIFPCL HEAD-FQA / CONSULTANT FQA
'B' (Formal intimation shall be forwarded by BHEL. Check shall commence at notified time whether parties show-up or not)	BHEL Engineer	BIFPCL Erection Engineer/ CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BIFPCL Erection Engineer/ CONSULTANT
'C'	BHEL Engineer	BHEL Engineer	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BHEL HOS

Abbreviations used:

HOS – Head of Section

Note:

1. Nonconformity Disposition authority for all categories of checks shall be as under:

   Product nonconformities: BHEL Engineering Centre.

   Process/System nonconformities: Head (Quality): BHEL, PS ER.

2. Wherever log sheet is not called for, suitable record shall be maintained in protocol / Site register.

3. In case of nonconformity, accepting authority will consider the solution for the nonconformity as proposed by the Nonconformity Disposition Authority before acceptance, and such solution shall be reflected in the log sheets/protocols.

4. Owner's Engineer is authorized to carry out surveillance in any of B & C category of checks at his discretion.

5. Quantum of check shall be 100% for all characteristics unless otherwise mentioned specifically in Field Quality Plan/ reference documents.

6. Only authorised persons with proper safety gears to enter construction area

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PSER	FIELD QUALITY PLAN FOR MEDIUM VOLTAGE CABLING	FQP NO: MAITREE-00-BBS-QA-300037-PSE BHEL Doc. No. : QP E-MTE-660-EL-61A
		Rev. No. : 0
		SHEET 01 / 04 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	POWER CABLING
Sub-system :	MEDIUM VOLTAGE CABLING
Area :	STORAGE, ERECTION & TESTING

NOTES :

1. As an evidence of having carried out the work satisfactorily, a general purpose log sheet, L-00 shall be maintained for all the checks.
2. Abbreviations used:
   - R – Record Verification
   - V – Visual Check
   - P – Physical Check
   - M – Measurement
   - T – Test
   - MTC – Manufacturers Test Certificate
   - SR – Site Register
   - MDR – material Discrepancy Report
3. Latest revision of Standards & Specification shall apply.
4. Materials shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
5. Welding shall be carried out by Qualified Welders, with traceable WPQR, in line with approved WPS and Qualified PQR, as per ASME Section IX
6. Only approved welding consumables shall be used, as per Approved Welding Consumable list.
7. Procedure shall be established and followed, for Procurement, Storage, Issue and Control of Welding Consumables.
8. NDT shall be carried out by Qualified Personnel with compliance to Approved NDT procedures and Acceptance Norms, as per ASME Section V.
9. The Agency carrying out RT shall be approved by Local Authorities.
10. Field Radiography shall be carried out in compliance with Local Statutory requirements and safety precautions by Approved Agency.
11. Radiography Source handling and control procedure shall be established as per Local Statutory requirements and complied.
12. Preheating and Post Weld Heat treatment shall be in compliance with Approved Procedures.
13. Gauges and measuring Instruments, with valid calibration only shall be used
14. Cleaning, preservation and Painting of products shall be carried out as per Approved Painting Schedule.
15. Format of record identified with “tick” (√) mark in column no. ‘D*’ shall be essentially included in QA documentation.

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Date: 23-Aug-2019

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BHARAT HEAVY ELECTRICALS LIMITED
PS:ER, KOLKATA

TENDER NO. PSER:SCTQ:ALF:20090 20
FIELD QUALITY PLAN
FOR
MEDIUM VOLTAGE CABLING
STATEMENT OF CHECKS

FQP NO.: **MAITREE-00-BBS-QA-300037-PSE**
BHEL Doc. No. : QPE-MTE-660-EL-61A
REV.NO.: 0
SHEET 02 OF 04

SYSTEM: POWER CABLING | SUB-SYSTEM: MEDIUM VOLTAGE CABLING | AREA: ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD		REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*D**	*10*
A	**GENERAL REQUIREMENTS**									
A.01	Ensure availability of requisite equipment in good working condition well before commencement of concerned activity. Note: All MMRs in the field shall be calibrated before commencement of tests and then annually or immediately after an MMR damaging incident	P & R	-	A	Once prior to start of work and thereof monthly	Owner's Technical Specifications & Equipment (MMR) manufacturer's literature / manual	The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	MMR List & Calibration Report	√	- Calibration of MMRs shall be done by approved lab/agency and the report shall be submitted to BIFPCL/ OE. - Wherever practical, a label shall be affixed on the Instrument, indicating the validity of Calibration
A.02	Ensure availability of layout drawing and approved cable schedule, as applicable.	R	-	A	100% for each system before start of activity	Latest Master Document List	Latest revision of documents & drawings should be available	SR		
B	**MATERIAL RECEIPT**									
B.01	Receiving inspection : (i) Completeness of documents (shipping list/ packing list/ loading advice/ delivery challan/Despatch clearance/ MDCC etc.) (ii) Cables are received as per MDCC (iii) Straight through joints & termination kit	R	Records	B	100%	Packing slip / Delivery challan	MDCC & Approved BBU	Stock Register		
B.02	Ensure visual examination for - (i) Damages to drums (ii) Theft / pilferage	V	-	C	100%	Drums should not be damaged	Drums should not be damaged	Stock Register		Damage / theft to be suitably reported
B.03	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	Work instructions for site Operations	Work instructions for site Operations	MDR		
B.04	Control of receipt and issue of all components	V	-	C	100%	Work instructions for site Operations	Work instructions for site Operations	Stock Register		
C	**MATERIAL HANDLING & STORAGE**									
C.01	Ensure proper storage	V	-	B		BS 8512	BS 8512	SR		
C.02	Ensure safe handling & transportation to erection site	V	-	B		BS 8512	BS 8512	SR		fork lift or crane of adequate capacity to be deployed

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Date: 23-Aug-2018

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCT:KLN:E20:0120 FIELD QUALITY PLAN FOR **MEDIUM VOLTAGE CABLING** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-BBS-QA-300037-PSE** BHEL Doc. No. : QPE-MTE-660-EL-61A REV.NO.: 0 SHEET 03 OF 04
SYSTEM: POWER CABLING	SUB-SYSTEM: MEDIUM VOLTAGE CABLING	AREA: ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	D*	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*		*10*
D	**ERECTION**									
D.01	Check size of cable & layout length	V	-	B	100%	Approved cable schedule	Approved cable schedule	SR		
D.02	Check marking identification on cable drums	V	-	C	100%	Packing list	Should match with packing list	SR		
D.03	Removal of wooden planks from cable drum	V	-	C	100%	Use proper tools	Cables are not damaged	SR		
D.04	Cable drums are kept elevated from the ground with the help of cable drum jacks	V	Cable drum jack	C	100%	BS 8512	BS 8512	SR		
D.05	Check & ensure proper cables pulling tension	V	-	C	100%	IEEE Std 1185:2010	Cable manufacturer's recommendation for maximum allowable pulling tension	SR		Consult the cable manufacturer for maximum allowable/recommended pulling tension
D.06	Ensure that cable is properly supported during pulling	V	-	C	100%	IEEE Std 1185:2010	IEEE Std 1185:2010	SR		
D.07	Ensure that adequate length is kept too enable straight through joints	V	-	C	100%	Clause 13 of IEEE Std 576-2000	Clause 13 of IEEE Std 576-2000	SR		
D.08	Ensure proper laying/ installation of cables	V	-	C	100%	Approved Cable schedule, Layout drawing & IEEE Std 1185:2010	Approved Cable schedule, Layout drawing, Clause no. B0.6.18.12 of Technical Specifications & IEEE Std 1185:2010	SR		Ensure that laying of control cables & power cables in different layers of tray
D.09	Ensure cables are properly secured	V	-	B	100%	Approved Cable schedule, Layout drawing & IEEE Std 1185:2010	Approved Cable schedule, Layout drawing & IEEE Std 1185:2010	SR		
D.10	Check that the cables are protected on road crossing	V	-	C	100%	Approved Cable schedule, Layout drawing & IEEE Std 1185:2010	Approved Cable schedule, Layout drawing & IEEE Std 1185:2010	SR		

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:SCTK:LE:2000:20 FIELD QUALITY PLAN FOR **MEDIUM VOLTAGE CABLING** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-BBS-QA-300037-PSE** BHEL Doc. No. : QPE-MTE-660-EL-61A REV.NO.: 0 SHEET 04 OF 04
SYSTEM: POWER CABLING	SUB-SYSTEM: MEDIUM VOLTAGE CABLING	AREA: ERECTION & TESTING

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD		REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*D**	*10*
D.11	Check insulation resistance of cables	T	IR Tester	B	100%	IEEE Std 1185:2010	IEEE Std 1185:2010 & IEC 60502-1 & 2	SR		
D.12	Ensure proper earthing & bonding NOTE: Metal sheathing, metal screening and armour should be erathed at both ends)	V	-	B	100%	Approved cable schedule & Clause no. B0.6.18.6, B0.6.18.12 & B7.3.9.2 of Technical Specifications	Approved cable schedule & Clause no. B0.6.18.6, B0.6.18.12 & B7.3.9.2 of Technical Specifications	SR		
D.13	Check cable identification tag	V	-	B	100%	Approved cable schedule & IEEE Std 1185:2010	Approved cable schedule & IEEE Std 1185:2010	SR		
D.14	Check Straight through joints & termination	V	-	B	100%	Clause 13 & 14 of IEEE Std 576-2000	Clause 13 & 14 of IEEE Std 576-2000	SR		
D.15	Ensure cleaning of trenches and covering the cable trenches	V	-	C	100%	Drawing & clause no. B0.6.18.12.1 of Technical Specifications	Drawing & clause no. B0.6.18.12.1 of Technical Specifications	SR		Cables shall not be laid in trenches with fuel pipe work.
D.16	Ensure laying of sand, bricks / slab for buried cables	V	-	C	100%	Drawing & clause no. B0.6.18.12.1 of Technical Specifications	Drawing & clause no. B0.6.18.12.1 of Technical Specifications	SR		
E	**FIELD ACCEPTANCE TESTING**									
E.01	Insulation Resistance before & after laying	M	IR Tester	A	100%	IEC 60502-1 & 2, IEEE Std 576-2000 & IEEE Std 1185:2010	IEC 60502-1 & 2 & Clause no. B0.6.18.12 of Technical Specifications	Protocol	√	
E.02	DC HV test on each core	R	HV Test kit	A	100%	IEC 60502-1 & 2, IEEE Std 576-2000 & IEEE Std 1185:2010	IEC 60502-1 & 2 & Clause no. B0.6.18.12 of Technical Specifications	Protocol	√	

FOR EARTHING - REFER SEPARATE FQP (MAITREE-00-BAU-QA-300041-PSE)

APPROVED
Checked and Approved.

Date: 23-Aug-2018

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PSER

RECORD OF QUALITY CHECKS

SHEET NO. OF FQP	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	INSPECTED BY SIGN. & DATE	CLEARED BY SIGN. & DATE	REMARKS

Note: Any protocol made is to be numbered & mentioned in "Format of Record" column.

		SYSTEM	SUB-SYSTEM	AREA	FQP NO.: QPE-MTE-660-EL-61A
PROJECT					REV. NO. : **0**
UNIT NO.					LOG SHEET NO. : **L- 00**
RATING					PAGE **1** OF **1**

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PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

			NAME	SIGNATURE & DATE	FQP NO.: QPE-MTE-660-EL-61A
PROJECT		INSPECTED BY			REV NO. 0
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

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Cat I

FIELD QUALITY PLAN

for

CABLING

(POWER & CONTROL CABLES)

A Maharatna Company

NTPC - NORTH KARANPURA (3 X 660 MW)

NTPC DOC. NO. : 4410-001-215-QVE-G-066A

Maharatna Company

Certification signature by kailash <kcbedwal@ntpc.co.in>
Validity Unknown
Date: 2017.12.07 16:37:17 IST
Reason: OK I
Location: NTPCEOC

BHARAT HEAVY ELEC[illegible]ITED
POWER SECTOR - EA[illegible]ION
KOLKATA – 700091

DOCUMENT NO. : QPE:NKP:660:EL:61
REV No.: 00

APPROVED
Checked and Approved.

Date: 23-Aug-2018

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TENDER NO. PSER:SCT:KLN-E2060:20

Field Quality Plan

for

Cabling

(Power & Control Cables)

DOC. NO. : QPE:NKP:660:EL:61	REV. NO. : 00	DATE : 25/01/2017
PREPARED BY : BHEL. PSER KOL-91 QUALITY DEPT. DY. ENGR. / QLY., BHEL, PS:ER	REVIEWED BY: HEAD / QLY., BHEL, PS:ER	APPROVED BY: NTPC
ISSUED TO :		
COPY NO. :	ISSUED BY :	
DATE OF ISSUE :	(NAME, DESIGNATION/DEPARTMENT) (SIGN.)	

BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR: EASTERN REGION

KOLKATA

Cat I

ENDORSEMENT SHEET FOR RFQP

REFERENCE FIELD QUALITY PLAN (RFQP)

TO BE FILLED IN BY SUPPLIER AT THE TIME OF SUBMISSION :		To be filled in by NTPC
PROJECT NAME	NTPC - NORTH KARANPURA	*REVIEW & ENDORSEMENT BY NTPC*
CONTRACT NO.:	4410-001	PROJECT SPECIFIC QP No. ALLOTMENT
MAIN SUPPLIER	BHEL	**4410-001-215-QVE-G-066A**
MANUFACTURER WORKS & ADDRESS	BHEL	Rev. No.: 00 Date:25.01.17
~~ITEM / EQUIPMENT /~~ SYSTEM / SUB-SYSTEM DETAILS ~~i.e. MODEL TYPE/SIZE/RATING etc.~~	**FQP FOR CABLING (POWER & CONTROL CABLES AND ACCESSORIES UPTO 33KV)**	
PROJECT SPECIFIC DOC. No. ALLOTMENT	QPE:NKP:660:EL:61, REV 00	(*TICK APPLICABLE)*
APPROVED DOC.No:~~RQP/SQP/ RFQP~~/ SFQP	0000-999-QOE-I-004, REV00	The QP is endorsed for this project without any change.
Confirmation by Main Supplier (TICK WHICHEVER APPLICABLE)		
√ *I. That the item/component is identical to that considered for QP approval. OR.*		√The QP is endorsed for this project with change as indicated
II. ~~That there are minor changes in the item/component with respect to that considered for QP approval,~~		
III. ~~That there are minor changes in the item component with respect to that considered for QP approval, however the same affect the QP slightly, as indicated below / in attached sheet.~~		*DISTRIBUTION OF ENDORSEMENT OF* *A) RQP/SQP:* *~~1. MAIN SUPPLIER(WITH A COPY OF QP)~~* *~~2. MANUFACTURER~~* *~~3. RIO~~* *~~4. CQA-SPL~~* *~~5.CQA-O/C~~* *B) RFQP/SFQP:* *1. MAIN SUPPLIER (WITH A COPY OF QP)* *2. MANUFACTURER* *3. CQA-O/C*
***CHANGES EFFECTED** : NIL*		

BHEL PSER KOL-91 QUALITY DEPT. Digitally signed by Arup Ratan Paul DN: cn=Arup Ratan Paul, o=BHEL, ou=PSER, email=arpaul@bhelpser.co.in, c=IN Location: BHEL, PSER Kolkata Date: 2017.01.25 11:39:35 +05'30'

SIGNATURE | *SIGN: (Manufacturer)* | *NTPC (Reviewed/Approved by/Date & Seal)*

APPROVED
Checked and Approved.
Date: 23-Aug-2018
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TENDER NO. PSER:SCT:KLN-E2060:20

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एनटीपीसी NTPC	SYSTEM EQUIPMENT: **POWER & CONTROL CABLES AND ACCESSARY UP TO 33KV** **SUB-SYSTEM :**	**STANDARD FIELD QUALITY PLAN** **CONFORMING TO CODE: IS1255-1983 AND NTPC TECHNICAL SPECIFICATION**	QP NO.: 0000-999-QO E - I-004 REV. NO.: 00 DATE : 26/03/08 PAGE 1 OF 6 VALID UPTO : 25/03/11	REVIEWED BY: L.J.SINGH VIKRAM TALWAR S.D.SINGH O.P.NIRANJAN	APPROVED BY U.R.KHOSLA

SL. NO	ACTIVITY AND OPERATION	CHARACTERISTICS / INSTRUMENTS	CLASS# OF CHECK	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	REMARKS		
1.	2.	3.	4.	5.	6.	7.	8.	9		10
1	**RECEIPT & STORAGE**									
1.1	RECEIVING INSPECTION A) COMPLETENESS OF DOCUMENTS B) CABLES ARE RECEIVED AS PER MDCC / CHP C) STRAIGHT THROUGTH JOINTS & TERMINATION KITS	---	C	V	100%	DELIVERY CHALLAN	MDCC/CHP PACKING LIST OF DRUMS	MAIN CONTRACTOR PERFORMA		
1.2	VISUAL EXAMINATION A) DAMAGE TO DRUMS B) THEFT	---	C	V	100%	DRUMS ARE NOT DAMAGED	DRUMS ARE NOT DAMAGED	--DO-		DAMAGE/ THEFT TO BE REPORTED TO NTPC
1.3	PROPER STORAGE	CHECK FOR PROPER STORAGE STORAGE LEVEL " B "	C	V	100%	IS 1255 CL.7.0	CABLES DRUMS ARE PLACED ON RAISED PLATFORM, HARD & WELL DRAINED SURFACE	--DO--		IN NO CASE DRUMS SHALL NOT BE STORED IN FLAT I.E. WITH FLANGE HORIZONTAL
1.4	TRANSPORATION TO ERECTION SITE	--	C	V	100%	MECHNISED SYSTEM	MECHNISED SYSTEM ENSURE SAFETY OF DRUMS & PERSONNELS			
2.0	**ERECTION**									
2.01	FOR H T CABLE:- SIZE OF CABLE/ ROUTE LENGTH	V	B	V	100%	APROVED CABLES SCHEDULE	APROVED CABLES SCHEDULE	--DO--		CABLE LENTGH IS TO BE PLANNED IN SUCH A WAY SO THAT MIMNMUM STRAIGHT THROUGH JOINTS ARE MADE

उपमहाप्रबंधक (गुणवत्ता आश्वासन)
Dy. General Manager (QA)
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A-8A, Sector-24, Noida-201 301 (U.P.)

TENDER NO. PSER:SCT:KLN-E2060:20

LEGEND: * RECORDS, INDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
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SL. NO	ACTIVITY AND OPERATION	CHARACTERISTICS / INSTRUMENTS	CLASS# OF CHECK	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.		10.
2.02	FOR L T CABLE:- SIZE OF CABLE/ ROUTE LENGTH	V	C	V	100%	--DO-	--DO--	--DO--		--DO--
2.03	MARKING IDENTIFICATION ON CABLE DRUMS	--	C	V	100%	IS1554-I, IS7098-I & 2	SHOULD MATCH WITH PACKING LIST	CHECK LIST		
2.04	REMOVAL OF WOODEN PLANK FROM CABLE DRUMS	--	C	MECH	100%	USE PROPER TOOL	CABLES ARE NOT DAMAGED	--DO-		
2.05	CABLE DRUMS ARE KEPT ELEVATED FROM GROUND WITH THE HELP OF CABLE DRUMS JACKS	CABLE DRUMS JACK	C	MECH	100%	IS1255 CL.8.0	CABLES DRUMS ARE NOT TOUCHED ON GROUND	--DO--		
2.06	CABLES LENGTH UNWOUNDING / PULLING TENSION	MECH	C	MECH	100%	IS1255 CL.5.0	IS1255 CL.5.0	--DO--		CABLES SHOULD NOT DAMAGE
2.07	1.GROUND ROLLERS SHALL BE USED AT EVERY 2 METER INTERVAL. 2. CABLES SHALL NOT BE PULLED FROM END WITHOUT HAVING INTERMEDIATE PUSHING ARRANGEMENT.	GROUND ROLLERS	C	MECH	100%	IS1255, CL 10.0 & NTPC TECH. SPECTS.	IS1255 /CABLES ARE NOT DRAGGED ON HARD GROUND	--DO--		
2.08	IN EACH CABLE RUN SOME EXTRA LENGTH SHALL BE KEPT TO ENABLE ONE LT/ TWO HT STRAIGHT THROUGH JOINTS TO BE MADE	--	C	V	100%	NTPC TECH. SPECTS.	NTPC TECH. SPECTS.	--DO--		
2.09	SINGLE CORE CABLE/ MULTI CORE CABLE	--	C	V	100%	NTPC APROVED LAY OUT DRGS./ CABLES SCHEDULE/ NTPC TECH. SPECTS. – REFER CABLE INSTALLATION	SINGLE CORE CABLE IN TREFOIL FORMATION SHALL BE LAID WITH A DISTANCE OF FOUR TIMES THE DIAMETER OF CABLE BETWEEN TREFOIL CENTRE LINES AND CLAMPED AT EVERY TWO METRE. ALL MULTI CORE CABLES SHALL BE LAID IN TOUCHING FORMATION	--DO--		

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1.	2.	3.	4.	5.	6.	7.	8.	9.		10.
2..10	SECURING OF CABLES	--	C	V	100%	NTPC APROVED LAY OUT DRGS./ CABLES SCHEDULE/ NTPC TECH. SPECTS REFER CABLE INSTALLATION	POWER& CONTROL CABLES SAHLL BE SECURED FIXED TO TRAYS/ SUPPORT WITH SELF LOCKING TYPE NYLON CABLE TRAYS TYPE STRAPS WITH DE-INTERLINKING FACILITIES. FOR HORIZONTAL TYAPS ARRANGEMENTS, MULTI POWER CABLES & CONTROL CABLES SHALL BE SECURED AT EVERY FIVE METER INTERVAL. FOR VERTICAL TRAYS ARRANGEMENT IN INDIVIDUAL MULICORE POWER CABLES AND CONTROL CABLESSAHLL BE SECURED AT EVERY ONE METER BY NYLON CABLE STRAP.	--DO--		
2.11	CONTROL CABLES SECURING IN VERTICAL TRAYS	--	C	V	100%	--DO--	CONTROL CABLES SHALL BE BINDED TO TRAYS / SUPPORTS BY ALUMINUM STRIPS AT EVERY FIVE METER INTERVAL & AT EVERY BEND	--DO--		

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Dy. General Manager (QA)
एनटीपीसी लिमिटेड/NTPC Limited
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1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
2.12	PROTECTION OF CABLES ON ROAD CROSSING	MECH	C	V	100%	NTPC APROVED LAY OUT DRGS./ CABLES SCHEDULE/IS1255	NTPC APROVED LAY OUT DRGS./ CABLES SCHEDULE/IS1255	--DO--	
2..13	LAYING OF CONTROL CABLES AND POWER CABLES IN DIFFERENT LAYERS OF TRAYS	--DO--	C	V	100%	NTPC APROVED LAY OUT DRGS./ CABLES SCHEDULE/IS1255/ NTPC TECHNICAL SPECIFICATION REFER CABLE INSTALLATION	HT CABLES SHALL BE LAID ON TOP MOST TIER & CABLES OF SUBSEQUENT LOWER VOLTAGE GRADES ON LOWER TIERS OF TRAYS	--DO--	
2.14	IR CHECK OF CABLES	MEGGER	C	V	100%	SHOULD NOT SHOW ZERO VALUE	SHOULD NOT SHOW ZERO VALUE	--DO--	
2..15	EARTHING AND BONDING (METAL SHEATHING , METAL SCREENING AND ARMOUR OF CABLE SHOULD BE EARTHED AT BOTH ENDS.)	MECH	B	V	100%	NTPC APROVED LAY OUT DRGS./ CABLES SCHEDULE/ NTPC TECHNICAL SPECIFICATION REFER EARTHING SYSTEM INSTALLATION	METALLIC SHEATH/SCREENS, AND ARMOUR OF MULTI-CORE CABLES SHALL BE EARTHED AT BOTH ENDS. METALLIC SHEATH AND ARMOUR OF SINGLE CORE CABLES SHALL BE EARTHED AT SWITCHGEAR END ONLY OR AS PER APPD. CABLE SCHEDULE.	--DO-	
2.16	CABLE IDENTIFICATION TAG	V	C	V	100%	NTPC APROVED LAY OUT DRGS./ CABLES SCHEDULE/IS1255/ NTPC TECHNICAL SPECIFICATION REFER CABLE INSTALLATION	NTPC APROVED LAY OUT DRGS /CABLES SCHEDULE/IS1255/ NTPC TECHNICAL SPECIFICATION REFER CABLE INSTALLATION	--DO--	

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1.	2.	3.	4.	5.	6.	7.	8.	9.		10.
2.17	STRAIGHT THROUGTH JOINTS & TERMINATION									
2..18	LT STRAIGHT THROUGTH JOINTS & TERMINATION	V	C	V	100%	NTPC APROVED LAY OUT DRGS./ CABLES SCHEDULE/IS1255/ NTPC TECHNICAL SPECIFICATION / TERMINATION MANUFACTURER RECCOMENDATIONS	--DO-	--DO-		1.CABLE JOINTER SHALL BE QUALIFIED TO CARRY OUT SATISFACTORY CABLE JOINTING / TERMINATION. 2.CONTRACTOR SHALL FURNISH FOR REVIEW DOCUMENTARY EVIDENCE / EXPERIENCE REPORTS OF THE JOINTERS TO BE DEPLOYED AT SITE.
2.19	HT STRAIGHT THROUGTH JOINTS & TERMINATION	V	B	V	100%	-DO--	-DO	--DO--		--DO--
2.20	G.I. CONDUITS EARTHING	MECH	C	V	100%	IS3043-1966/ NTPC SPECTS.	IS3043-1966 / NTPC SPECTS.	--DO--		
2.21	SEALING OF END OF CONDUITS AFTER CABLE LAYING	--DO—	C	V	100%	NTPC TECH.SPECTS.	ENDS OF CONDUITS /PIPES SHALL BE SEALED WITH GLASS WOOL/CEMENT MORTAR/ PUTTY	--DO-		
2.22	CLEANING OF CABLE TRENCH & COVER THE CABLE TRENCH WITH COVERS	--DO--	C	V	100%	NTPC TECH. SPECTS	REPLACE RCC/STEEL TRENCH COVERS AFTER INSTALLATION WORK	--DO--		

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1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	
2.23	LAYING OF SAND BRICKS/ SLABS FOR BURRIED CABLES	--DO--	C	V	100%	NTPC APROVED LAY OUT DRGS./ CABLES SCHEDULE/IS1255	NTPC APROVED LAY OUT DRGS./ CABLES SCHEDULE/IS1255	--DO--	P	1. POWER CBALE SHOULD NOT BE LAID ABOVE TELECOMMU NICATION CABLE. 2. CABLE PROTECTIVE COVER MAY BE MARKED BY " POWER CABLE"
3.1	**ERECTION TESTS**									
3.2	FOR LT CABLES									
3.3	IR TEST	MEGGER	B	MEAS	100%	IS1255	IS1255	-DO-		
3.4	DC HV TEST	HV TESTER	B	MEAS	100%	IS1255	IS1255	--DO--		
3.5	FOR HT CABLES									
3.6	IR BEFORE AND AFTER LAYING	MEGGER	A	MEAS	100%	IS1255	IS1255	-DO--		
3.7	DC HV TEST ON EACH CORE	MEGGER	A	MEAS	100%	IS1255	IS1255	--DO--		

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TENDER NO. PSER:SCT:KLN-E2060:20

LEGENDS USED FOR 'STORAGE LEVEL'	
STORAGE LEVEL "A"	OUTSIDE WITH NO PROTECTIVE COVER (OPEN SPACE /YARD ON RAISED SURFACE, PROPERLY STACKED AND FREE FROM WATER LOGGING AND LOADING / UNDUE WEIGHT)
STORAGE LEVEL "B"	OUTSIDE WITH PROTECTIVE COVER (OPEN SPACE /YARD ON RAISED SURFACE, PROPERLY STACKED AND FREE FROM WATER LOGGING AND LOADING / UNDUE WEIGHT, COVERED WITH PVC/TARPAULIN)
STORAGE LEVEL "C"	INDOOR SHELF ITEMS (STORED IN PUCCA SHED, IN STORE)
STORAGE LEVEL "D	INDOOR CLEAN CONDITIONS (STORED IN PUCCA SHED, IN STORE. THE STORAGE AREA SHALL BE DRY AND FREE FROM DUST AND THERE SHALL NOT BE ACID/ CHEMICALS IN VICINITY)
STORAGE LEVEL "E"	INDOOR TEMPERATURE AND HUMIDITY CONTROLLED – AIR CONDITIONED (STORED IN PUCCA SHED, IN STORE WITH CONTROLLED ATMOSPHERE)

LEGEND: * RECORDS, INDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
LEGEND TO BE USED: CLASS # : A = CRITICAL, B=MAJOR, C=MINOR; 'A' SHALL BE WITNESSED BY NTPC FQA, **'B'** SHALL BE WITNESSED BY NTPC ERECTION / CONSTRUCTION DEPTT. AND **'C'** SHALL BE WITNESSED BY MAIN SUPPLIER (A & B CHECK SHALL BE NTPC CHP STAGE)

APPROVED
Checked and Approved.

Date: 23-Apr-2018

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FIELD QUALITY PLAN
FOR
MEDIUM VOLTAGE OIL FILLED TRANSFORMER

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED

OWNER'S CONSULTANT

FICHTNER

Fichtner GmbH & Co. KG, Germany

BIFPCL DOC. NO. : MAITREE-00-BBT-QA-300029-PSE, REV. NO. : 1

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-EL-51A
REV No.: 1

APPROVED
Checked and Approved.

Date: 23-Apr-2018

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FIELD QUALITY PLAN
FOR
MEDIUM VOLTAGE OIL FILLED TRANSFORMER

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-BBT-QA-300029-PSE, REV. NO. : 1

PREPARED BY	DE/QLY, BHEL, PSER	APPROVED BY	HEAD / QLY, BHEL, PSER

FQP NO.	**QPE-MTE-660-EL-51A**
ORIGINAL DATE OF ISSUE	01/02/2018
REVISION NO. & DATE	1, Dt. 17/04/2018
COPY NO.	
ISSUED TO	
DATE OF ISSUE	:
PURPOSE :	
ISSUED BY (SIGNATURE & DESIGNATION)	DE/QLY, BHEL, PSER

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

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Date: 23-Apr-2018

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PSER	FIELD QUALITY PLAN FOR MEDIUM VOLTAGE OIL FILLED TRANSFORMER	FQP NO: MAITREE-00-BBT-QA-300029-PSE BHEL Doc. No. : QPE-MTE-660-EL-51A
		Rev. No. : 1
		SHEET 1 / 1 SHEETS

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Date: 23-Apr-2018

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PSER	FIELD QUALITY PLAN FOR MEDIUM VOLTAGE OIL FILLED TRANSFORMER	FQP NO: MAITREE-00-BBT-QA-300029-PSE BHEL Doc. No. : QP-E-MTE-660-EL-51A
		Rev. No. : 1
		SHEET 1 / 1 SHEETS

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 01.02.18	Document prepared as per the owner's specifications
02	All	1, Dtd.: 17.04.18	The document is revised as per the comments dated 21.02.18 from BIFPCL / OE & is similar to NTPC approved FQP No. 4410-001-215-QVE-G-067, Rev-1: FQP for Power Transformers for NTPC - North Karanpura STPP (3x660MW) with additional tests e.g. SFRA, etc., as per the requirement of FTS.

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PSER

AUTHORISATION FOR DIFFERENT CATEGORY OF CONSTRUCTION/ ERECTION CHECKS & NONCONFORMITY DISPOSITION

Category of Check	Inspection Authority	Witness Authority	Nonconformity (if any) Disposition Authority	Accepting Authority
'A' (Customer Hold Point)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'B' (Formal intimation shall be forwarded by BHEL. Check shall commence at notified time whether parties show-up or not)	BHEL Engineer	OWNER / CONSULTANT	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / CONSULTANT
'C'	BHEL Engineer	BHEL Engineer	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BHEL HOS

Abbreviations used:

HOS – Head of Section

Note:

1. Nonconformity Disposition authority for all categories of checks shall be as under:

   Product nonconformities: BHEL Engineering Centre.

   Process/System nonconformities: Head (Quality): BHEL, PS ER.

2. Wherever log sheet is not called for, suitable record shall be maintained in protocol / Site register.

3. In case of nonconformity, accepting authority will consider the solution for the nonconformity as proposed by the Nonconformity Disposition Authority before acceptance, and such solution shall be reflected in the log sheets/protocols.

4. Owner's Engineer is authorized to carry out surveillance in any of B & C category of checks at his discretion.

5. Concerned agencies shall ensure that instruments having valid calibration are only used for measurements.

6. Quantum of check shall be 100% for all characteristics unless otherwise mentioned specifically in Field Quality Plan/ reference documents.

7. Only authorised persons with proper safety gears to enter construction area

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PSER	FIELD QUALITY PLAN FOR MEDIUM VOLTAGE OIL FILLED TRANSFORMER	FQP NO: MAITREE-00-BBT-QA-300029-PSE BHEL Doc. No. : QPE-MTE-660-EL-51A
		Rev. No. : 1
		SHEET 01 / 09 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	POWER TRANSFORMER
Sub-system :	MEDIUM VOLTAGE OIL FILLED TRANSFORMER (UAT & OTHER AUX. TRANSFORMERS)
Area :	ERECTION & TESTING

NOTES :

1. As an evidence of having carried out the work satisfactorily, a general purpose log sheet, L-00 shall be maintained for all the checks.
2. For FQP of GT & ST, please refer document no. MAITREE-00-BAT-QA-300028-PSE
3. Abbreviations used:

   R – Record Verification

   V – Visual Check

   P – Physical Check

   M – Measurement

   T – Test

   MTC – Manufacturer's Test Certificate

   SR – Site Register

   MDR – Material Discrepancy Report
4. Latest revision of Standards & Specification shall apply

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Date: 23-Apr-2021
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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:QLT:ZOKP21 IRES:QLT:ZOKP21 FOR **MEDIUM VOLTAGE OIL FILLED TRANSFORMER** STATEMENT OF CHECKS	FQP NO: **MAITREE-00-BBT-QA-300029-PSE** BHEL Doc. No. : QPE-MTE-660-EL-51A REV.NO.: 1 SHEET 02 / 09 SHEETS
SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: MEDIUM VOLTAGE OIL FILLED TRANSFORMER (UAT & Other Aux. Transformers)	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
A	**GENERAL REQUIREMENTS**								
A.01	Ensure availability of requisite equipment in good working condition well before commencement of concerned activity. All MMRs in the field shall be calibrated before commencement of tests and then at interval as per manufacturer's recommendations and as per direction of BIFPCL / OE.	P & R	-	A	Once prior to start of work and thereof monthly OR immediately after an Instrument damaging incident	Technical Specifications & Drawing	The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	SR	- Functioning of MMRs in proper working condition to be verified on monthly basis. - calibration of MMRs shall be done by approved lab and the report shall be submitted to BIFPCL/ OE. - Wherever practical, a label shall be affixed on the Instrument, indicating the validity of Calibration
A.02	Ensure availability of approved drawings	R	-	A	100% for each transformer before start of activity	List of Latest Revision of Approved Drawings	Owner's Technical Specifications	SR	
B	**MATERIAL RECEIPT**								
B.01	Check availability of Bill of materials (BOM) / packing slip, dispatch documents.	V	-	C	100%	-	Compliance to requirement of Column No. 2	-	
B.02	Check materials for completeness, correctness, and shortages / excesses as per Bill of Materials / Dispatch documents / Packing slip.	V	-	C	100%	BOM / Dispatch documents / Packing slip	Compliance to requirement of Column No. 2	L-01	
B.03	Retrieve the impact recorders and send to BHEL-Jhansi (OEM) for analysis and review record of reading of shock recorder as per the manufacturer's recommendations.	P & R	As required	A	100%	OEM's Instruction Manual	- Direction of rail : 0.8g - Perpendicular to direction of rail : 0.8g - Vertical direction : 0.5g	Logbook	- Applicable only for UAT - Report submission by OEM for review. - In cas of deviation, OEM to be consulted.
B.04	Check components / boxes carefully for physical condition (In case of damage to contents, check the contents to ascertain the nature & quantum of damage. Re-pack contents in original packing & follow step B.05)	V	-	C	100%	OEM's Instruction Manual & Packing list	No physical damage	Logbook	
B.05	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	Work instructions for site Operations	Work instructions for site Operations	MDR	

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BHARAT HEAVY ELECTRICALS LIMITED
PS:ER, KOLKATA

TENDER NO. PSER:CT:QAP-2060.20

INSPECTION & TEST PLAN
FOR
MEDIUM VOLTAGE OIL FILLED TRANSFORMER
STATEMENT OF CHECKS

FQP NO: **MAITREE-00-BBT-QA-300029-PSE**
BHEL Doc. No. : QPE-MTE-660-EL-51A
REV.NO.: 1
SHEET 03 / 09 SHEETS

SYSTEM: POWER TRANSFORMER | SUB-SYSTEM: MEDIUM VOLTAGE OIL FILLED TRANSFORMER (UAT & Other Aux. Transformers) | AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
B.06	Unloading of transformer main tank	P	As required	C	100%	Approved Method statement	OEM's Instruction Manual	-	
B.07	Check Nitrogen pressure in tank for positive pressure. (in case of absence of positive pressure follow step B.08 with a communication to OEM)	M	Pressure gauge	A	Once on receipt	OEM's Instruction Manual	over pressure of minimum 0.17 kg/cm2 at RT	Logbook	- applicable only for transformer dispatched in N2 filled condition.
B.08	In case of absence of positive pressure, Communicate to OEM and arrange for nitrogen filling as per the instructions of OEM.	P & M	As required	A	Once on receipt	OEM's Instruction Manual	over pressure of minimum 0.17 kg/cm2 at RT	Logbook	- applicable only for transformer dispatched in N2 filled condition.
B.09	Check IR of core-end frame-tank at 500V	M	IR Tester	A	Once on receipt	IEC 60076-1	Acceptance value: Min. 500 MΩ	Logbook	
B.10	Control of receipt and issue of all components	V	-	C	100%	Work instructions for site Operations	Work instructions for site Operations	Register	
C	**STORAGE & PRESERVATION**								
C.01	Check Bushings for any damage (to be stored in the crate in which it is supplied. Oil to SF6 Bushings to be stored indoor.)	V	As required	C	Once in three months	OEM's Instruction Manual	No physical damage	SR	
C.02	Check oil drums for any leakage and tampering. (They should be stored in lying position with both the closed openings also in horizontal position , bung at approx. 45 deg. position).	V	As required	C	Once in three months	OGA Drawing, Shipping List	No physical damage	SR	Provide secondary containment.
C.03	Check Fragile items like marshalling boxes, fans, pumps, instruments & their fittings, Gas Relays, oil level indicators, breathers, drying agents, terminal boxes, Tap changer cabinets, gaskets, Copper/ earthing strips and turrets with built-in CTs, DGA kits. Online dryout system, testing kits for any damage (to be stored indoors).	V	As required	C	Once in three months	OGA Drawing, Shipping List	No physical damage	SR	Marshalling boxes are to be stored vertical in their respective cases.
C.04	Check Oil conservator, radiator and coolers with blanking plates for all openings and structure supporting conservator for any damage (they may be stored outdoors on raised platform, above ground & covered with tarpaulin).	V	As required	C	Once in three months	OGA Drawing, Shipping List	No physical damage	SR	
C.05	Record nitrogen gas pressure during storage.	M	Pressure gauge	A	Weekly	OEM's Instruction Manual	over pressure of minimum 0.17 kg/cm2 at RT	SR	- If the storage time without oil exceeds 18 months, OEM to be consulted for measures to be taken. - applicable only for transformer dispatched in N2 filled condition.

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SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
C.06	Check paint Condition & Touch up painting to be carried out, if required	V	-	B	Once on receipt	Owner's Technical Specifications	Approved painting schedule	SR	
D	**PRE-ERECTION CHECKS**								
D.01	Check availibility of shop protocols	R	-	C	Once before start of erection	OEM's Instrcution Manual	OEM's Instrcution Manual	-	
D.02	Check availability of proper tools and tackes including jacking pad for carrying out inspection	R	-	C	Before start of erection & During Erection	OEM's Instrcution Manual	OEM's Instrcution Manual	-	
D.03	Checking of foundation	M	Water level, tape & Piano wire	A	100%	OGA Drawing & Layout drawing	OGA Drawing & Layout drawing	Logbook	
D.04	Where rollers are applicable, check that rollers are greased properly before assembly of transformer.	V	As required	C	100%	OGA Drawing	Free movement of rollers	SR	
D.05	Ensure oil filtration plant, oil tankers of adequate capacity to process & fill the oil in transformer	V	-	B	100%	OEM's Instrcution Manual	Approved Method statement	-	
D.06	Check that all pipes are free from rust and dust. Ensure cleaning of Radiators/ coolers and pipes.	P	-	B	100%	OEM's Instrcution Manual	OEM's Instrcution Manual	SR	
D.07	Check all bushings are free from physical damage, oil leakage & have oil level up to mark.	V	-	B	100%	Drawing	Oil up to mark	SR	
D.08	Check condenser bushings for IR Value & Capacitance / Tan delta test. Capacitance & Tan delta (dissipation factor) measurement shall be made at 2 KV, 5kV and 10 KV. (as applicable)	M	2.5kV IR Tester & Tan delta kit	A	100%	IEC 60076-1	IR > 5000 MΩ tan-delta < 0.007	Logbook	Applicable only for UAT.
D.09	Check turret CT polarity, turn ratio, knee point voltage, winding resistance & IR before erection	M	As required	B	100%	IEC 60076 & Shop Test records	Comparable with shop test result	L-05	
D.10	Check IR of core-end frame-tank at 500V	M	IR Tester	A	100%	IEC 60076 & Shop Test records	Comparable with shop test result	Logbook	
D.11	Check tightness of core earthing after checking IR value between core and earth.	P	As required	B	100%	OEM's instruction Manual	IR > 1 MΩ	Logbook	

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:QA:ERECT:16:0120 INSPECTION & TEST PLAN FOR **MEDIUM VOLTAGE OIL FILLED TRANSFORMER** STATEMENT OF CHECKS	FQP NO: **MAITREE-00-BBT-QA-300029-PSE** BHEL Doc. No. : QPE-MTE-660-EL-51A REV.NO.: 1 SHEET 05 / 09 SHEETS
SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: MEDIUM VOLTAGE OIL FILLED TRANSFORMER (UAT & Other Aux. Transformers)	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
E	**ERECTION CHECKS**								
E.01	Ensure placement of transformer on the foundation as per Drawing.	P & V	As required	B	100%	OGA Drawing, OEM's Instrucion Manual	Approved Method statement	Logbook	
E.02	Ensure use of new gaskets during final erection of turrets, bushings and piping	V	-	B	100%	OGA Drawing	Compliance to requirement of Column No. 2	Logbook	
E.03	Ensure installation of tap changing system & it's oil filling	V	-	B	100%	Drawing	OEM's Instruction Manual	Logbook	
E.04	Where dispatched separately, ensure installation of Cooling banks/ radiators & other accessories as per drawing.	V	-	C	100%	Drawing	OEM's Instruction Manual	Logbook	
E.05	Internal inspection of transformer after removal of N2 gas - a) Ensure removal of metallic winding lead support. b) Detailed inspection as per checklist.	V	Dry air unit	B	100%	OGA Drawing & Checklist	No physical damage & loose items	Logbook	- applicable only for transformer dispatched in N2 filled condition.
E.06	Checks during HV bushing erection : - Check winding lead connections with bushing from inside - Check original hardware supplied by OEM with Bushings. - Ensure joint assembly as per drawing. - Check tightness with proper tool and required torque. - Check clearance of leads from tank body.	P & V	As required	C	100%	OEM's Instruction Manual & Drawing	Approved method statement	Logbook	- applicable only for transformer dispatched in N2 filled condition. - suitable crane and nylon slings to be used to avoid damage to the bushings
E.07	After inspection transformer man holes to be closed and Nitrogen gas pressure to be maintained. (applicable for nitrogen filled transformers only)	V	As required	C	100%	OEM's Instruction Manual	an over pressure of minimum 0.17 kg/cm2 at room temperature	SR	- applicable only for transformer dispatched in N2 filled condition. - Dew point of - 50 deg C or better to be ensured on Nitrogen cylinder
E.08	Ensure proper earthing of turret , earthing of bushing test tap, top tank & bottom tank and other earthing points.	V	-	B	100%	OEM's Instruction Manual	Drawing & IEC 60076	Logbook	
E.09	Leakage test of tank after erection & before oil filling by a) N2 pressure at 0.3 kg/cm2. and b) Vacuum at 1 Torr for 3 hours.	T	Pressure gauge & vacuum gauge	A	100%	OEM's Instruction Manual	Method statement & IEC 60076	Logbook	- applicable only for transformer dispatched in N2 filled condition.
E.10	Pressure test of conservator air cell	T	Pressure gauge	B	100%	OEM's Instruction Manual	Method statement & IEC 60076	Logbook	- applicable only for transformer dispatched in N2 filled condition.

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BHARAT HEAVY ELECTRICALS LIMITED
PS:ER, KOLKATA

TENDER NO. PSER:QA-ED060120
INSPECTION & TEST PLAN
FOR
MEDIUM VOLTAGE OIL FILLED TRANSFORMER
STATEMENT OF CHECKS

FQP NO: **MAITREE-00-BBT-QA-300029-PSE**
BHEL Doc. No. : QPE-MTE-660-EL-51A
REV.NO.: 1
SHEET 06 / 09 SHEETS

SYSTEM: POWER TRANSFORMER
SUB-SYSTEM: MEDIUM VOLTAGE OIL FILLED TRANSFORMER (UAT & Other Aux. Transformers)
AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
E.11	Pressure test of cooling banks	T	Pressure gauge	B	100%	OEM's Instruction Manual	Method statement & IEC 60076	Logbook	- applicable only for transformer dispatched in N2 filled condition.
E.12	Ensure proper tightness of valves and air release plugs	P	As required	B	100%	OEM's Instruction Manual	no leakage	Logbook	
E.13	Functioning of hand operated air release valve	P	As required	C	100%	OEM's Instruction Manual	Drawing & IEC 60076	SR	
E.14	Body earthing of Transformer as per drawing.	V	As required	B	100%	Drawing & IEEE 81	OEM's Instruction Manual	Logbook	
E.15	Check continuity and IR value of internal cables to marshalling	T	Continuity tester	B	100%	IEC 60076	OEM's Instruction Manual	L-02	
E.16	Hand operation of taps of tap changing system Verify tap position in Motor drive unit (if applicable)	P	As required	B	100%	Drawing & Schematics	OEM's Instruction Manual	Logbook	
E.17	Dry out by Vacuum treatment and Nitrogen purging of transformer before oil filling as applicable (Dew point of - 50 deg C or better to be ensured on N2 cylinder) : Ensure fitting of equalizing pipe between main tank diverter chamber of tap changer during vacuum treatment of transformer	M	Vacuum gauge, Dew point meter, filtration machine	A	100%	OEM's Instruction Manual	OEM's Instruction Manual	Logbook	- applicable only for transformer dispatched in N2 filled condition.
E.18	Oil shall be circulated in oil storage tank to achieve required BDV before starting filling in Transformer. Filter machine heater temperature to be adjusted to maintain oil temperature (55 -60 Deg C)	P & T	oil filtration plant, oil tankers	A	100%	OEM's Instruction Manual	IEC 60296	Logbook	- applicable only for transformer dispatched in N2 filled condition.
E.19	Ensure oil filling in transformer main tank under vacuum	V	oil filtration plant, oil tankers	B	100%	OEM's Instruction Manual	OEM's Instruction Manual	Logbook	- applicable only for transformer dispatched in N2 filled condition.
E.20	Hot oil circulation for dry out	P	Oil filtration plant, oil tankers & thermometer	B	100%	OEM's Instruction Manual	OEM's Instruction Manual	L-02 & L-04	

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SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
E.21	Ensure following tests on transformer oil sample in NABL accredited / BIFPCL approved lab after filling in transformer and hot oil circulation & review of records: a) Specific Gravity b) BDV c) Moisture content (ppm) d) DGA e) Resistivity f) Tan delta g) IFT	R	-	A	100%	OEM's Instruction Manual	IEC 60296	Logbook	
E.22	Ensure removal of equalizing pipe between main tank diverter chamber of tap changer after oil filling upto core level.	V	-	B	100%	Drawing & Schematics	OEM's Instruction Manual	Logbook	
E.23	Check Oil level in main tank and bushings	V	-	B	100%	Drawing	OEM's Instruction Manual	Logbook	
E.24	Check oil leakage from tank bottom surface and from different flange joints and valves	V	-	B	100%	Drawing	OEM's Instruction Manual	Logbook	
E.25	Ensure proper tightness of neutral grounding arrangement.	V	-	B	100%	Drawing	OEM's Instruction Manual	Logbook	
F	**ELECTRICAL TESTS AFTER OIL FILLING**								
F.01	CC-CL-tank isolation test @ 500V	M	500V IR Tester	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	Logbook	
F.02	Polarity of all CTs	M	Galvanometer	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	L-05	
F.03	Polarity and Vector group	M	Galvanometer & multimeter	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	L-05	
F.04	Magnetizing current	M	multimeter & clamp meter	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	Logbook	
F.05	Magnetic balance	M	multimeter & clamp meter	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	Logbook	

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:QLN-ET-20-0120 INSPECTION & TEST PLAN FOR **MEDIUM VOLTAGE OIL FILLED TRANSFORMER** STATEMENT OF CHECKS	FQP NO: **MAITREE-00-BBT-QA-300029-PSE** BHEL Doc. No. : QPE-MTE-660-EL-51A REV.NO.: 1 SHEET 08 / 09 SHEETS
SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: MEDIUM VOLTAGE OIL FILLED TRANSFORMER (UAT & Other Aux. Transformers)	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
F.06	TTR at all taps (NA for Reactors)	M	TTR Kit	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	Logbook	
F.07	Winding resistance in all taps.	M	WRM Kit	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	L-06	
F.08	IR test of windings @ 5kV	M	5KV IR Tester	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	L-03	
F.09	Sweep Frequency Response Analysis - Applicable for UAT only	M	SFRA kit	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	Joint Protocol	
F.10	Short circuit impedance (at low voltage)	M	multimeter & clamp meter	B	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	Logbook	
F.11	Phase sequence of power supply at Marshalling kiosk. Check control supply.	M	Phase sequence meter	A	100%	Shop Test Reports & IEC 60076-1	Comparable with shop test result	Logbook	
F.12	Direction of rotation of motors & fans.	V	-	B	100%	OEM's Instruction Manual	OEM's Instruction Manual	SR	
F.13	Functioning of tap changer manually and electrically in case of OLTC, as applicable	V	-	A	100%	Schematics	OEM's Instruction Manual	SR	
F.14	Functioning of oil pump from manual, local and remote controls as per approved schematics, as applicable	V	-	A	100%	Schematics	OEM's Instruction Manual	SR	
F.15	Functional checks on oil flow indicator, as applicable.	V	-	B	100%	OEM's Instruction Manual	OEM's Instruction Manual	SR	
F.16	Sequential operation of cooling system as per approved schematics, as applicable.	V	-	A	100%	OEM's Instruction Manual	OEM's Instruction Manual	SR	
F.17	Functioning of fire alarm system and fire protection system, as applicable.	V	-	A	100%	OEM's Instruction Manual	OEM's Instruction Manual	SR	

APPROVED
Checked and Approved.
Date: 23-Apr-2021
*Approval does not absolve the EPC contractor of its responsibility as specified in the Contract.

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	TENDER NO. PSER:QLA:ITP:20 ITP-QUALITY PLAN FOR **MEDIUM VOLTAGE OIL FILLED TRANSFORMER** STATEMENT OF CHECKS	FQP NO: **MAITREE-00-BBT-QA-300029-PSE** BHEL Doc. No. : QPE-MTE-660-EL-51A REV.NO.: 1 SHEET 09 / 09 SHEETS
SYSTEM: POWER TRANSFORMER	SUB-SYSTEM: MEDIUM VOLTAGE OIL FILLED TRANSFORMER (UAT & Other Aux. Transformers)	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF RECORD	REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
F.18	Record of tap changer- motor current and control voltage.	M	Multimeter & Stopwatch	B	100%	OEM's Instruction Manual	OEM's Instruction Manual	Logbook	
F.19	Check operation of Bucholz relay and PRV	V	-	A	100%	OEM's Instruction Manual	OEM's Instruction Manual	SR	
F.20	Check operation of all protective devices and interlocks	V	-	A	100%	OEM's Instruction Manual	OEM's Instruction Manual	SR	
F.21	Verification of temperature indicators	V	-	B	100%	OEM's Instruction Manual	OEM's Instruction Manual	SR	
F.22	Stability test for electrical protection check	M	multimeter & clamp meter	B	100%	OEM's Instruction Manual & IEC 60076-1	OEM's Instruction Manual	Logbook	
F.23	Measurement of Earth pit Resistance	M	Earth Test meter	B	100%	Datasheet & IEEE 81	Acceptable value is < 1 Ω	Logbook	
F.24	Erection completion check & Handing over for commissioning.	V & R	-	A	100%	Drawing & Protocols / Log sheets	OEM's Instruction Manual	Joint Protocol	Review of all Log Sheets, protocols and disposition status of NCRs (if any)

Commissioing Checks shall be as per Approved Procedure & FTS of BIFPCL

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PSER

RECORD OF QUALITY CHECKS

SHEET NO. OF FQP	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	INSPECTED BY SIGN. & DATE	CLEARED BY SIGN. & DATE	REMARKS

Note : Any protocol made is to be numbered & mentioned in "Format of Record" column.

		SYSTEM	SUB-SYSTEM	AREA	FQP NO.: QPE-MTE-660-EL-51A
PROJECT					REV. NO. 1
UNIT NO.					LOG SHEET NO. L-00
RATING					SHEET / SHEETS

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	INSTRUMENT REG. NO./TAG. NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

CHECKLIST FOR INSPECTION ON RECEIPT OF MATERIAL

Sl. No.	Name of Transformer Accessory	OK / NOT OK

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-51A
PROJECT		CHECKED BY			REV.NO. 1
UNIT NO.		ACCEPTED BY			LOG SHEET NO. **L-01**
RATING		CUSTOMER			PAGE **1** OF **1**

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	INSTRUMENT REG. NO./TAG NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

OIL DIELECTRIC STRENGTH:

GAP SETTING: mm

		Time & condition				
Sl. No.	Oil Sample from	Date	Time	Breakdown Voltage	ppm obtained	Remarks
a.	Top of main transformer tank					
b.	Bottom of main transformer tank					
c.	Cooling System Radiators					
d.	Tap changer chamber (if On Load Tap Changer is provided)					

INSULATION RESISTANCE TEST **Date:**

Sl. No.	Description	Megger rating	IR Value Obtained (MΩ)	Remarks
1.	Control wiring	500 V		
2.	Cooling system:	-do-		
a)	Motor fan	-do-		
b)	Motor pump	-do-		
c)	Control wiring	-do-		

Note: IR Value shall be recorded in each fan and pump motor wherever applicable.

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-51A
PROJECT		CHECKED BY			REV.NO. 1
UNIT NO.		ACCEPTED BY			LOG SHEET NO. **L-02**
RATING		CUSTOMER			PAGE **1** OF **1**

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PSER	INSTRUMENT REG. NO./TAG NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

Transformer Sl. No. :

INSULATION RESISTANCE TEST

Sl. No.	Description	Megger rating	IR Value Obtained (Mega ohms)	Remarks
3.	Main winding : Between	2500 V or 5000 V		
a)	HV & E + LV			
b)	LV & E + HV			
c)	HV & LV			

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-51A
PROJECT		INSPECTED BY			REV.NO. 1
UNIT NO.		CLEARED BY			LOG SHEET NO. L-03
RATING		CUSTOMER			SHEET 1 / 1 SHEETS

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PSER	INSTRUMENT REG. NO./TAG. NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

TRANSFORMER DRY-OUT

Transformer Sl. No. :

Date	Time	Winding Temperature	IR Values			BDV of various samples (once in 24 hrs)
			HV to E	LV to E	HV to LV	

NOTE : Minimum 1 KV Megger is to be used.

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-51A
PROJECT		INSPECTED BY			REV.NO. 1
UNIT NO.		CLEARED BY			LOG SHEET NO. L-04
RATING		CUSTOMER			SHEET 1 / 1 SHEET

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PSER	INSTRUMENT REG. NO./TAG. NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

Transformer Sl. No. :

BUSHING TURRET CTs

Sl. No.	Description	Status / value achieved	Remarks
1.	Polarity		
2.	Ratio		
3.	IR with 500 V Megger		
4.	Magnetising Current		

RATIO CHECK OF TRANSFORMER

Tap Position No.	Voltage applied			Voltage Measured			Ratio Obtained			Remarks
							a	b	c	

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-51A
PROJECT		INSPECTED BY			REV.NO. 1
UNIT NO.		CLEARED BY			LOG SHEET NO. L-05
RATING		CUSTOMER			SHEET 1 / 2 SHEETS

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	INSTRUMENT REG. NO./TAG. NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

VECTOR GROUP CHECK

Vector Group	Diagram of connections as required	Diagram of connections as connected for test

VOLTAGE SUPPLIED (as applicable)

Phase A				Phase B				Phase C				Remarks
A-a	B-b	C-c	A-n	A-a	B-b	C-c	A-n	A-a	B-b	C-c	A-n	

Conditions to be proved:

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PSER	INSTRUMENT REG. NO./TAG. NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

Transformer Sl. No. :

WINDING RESISTANCE

WINDING	TAP NO	VALUE	TEMPERATURE	REMARKS
HV Winding	Tap No. - 1 Highest Tap			
LV Winding				

			NAME	SIG./DATE	FQP NO.: QPE-MTE-660-EL-51A
PROJECT		INSPECTED BY			REV.NO. 1
UNIT NO.		CLEARED BY			LOG SHEET NO. L-06
RATING		CUSTOMER			SHEET 1 / 1 SHEETS

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PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

Transformer Sl. No. :

			NAME	SIGNATURE & DATE	FQP NO.: QPE-MTE-660-EL-51A
PROJECT		INSPECTED BY			REV. NO. 1
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

TENDER NO: PSER:SCT:KLN-E2060:20

VOLUME -III

PRICE SCHEDULE-REV-00

FOR

Erection, Testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears, HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1, FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP, Rampal, Bangladesh.

BHARAT HEAVY ELECTRICALS LIMITED

(A GOVT. OF INDIA UNDERTAKING)
POWER SECTOR – EASTERN REGION
PLOT NO. – 9 / 1, DJ – BLOCK,
SECTOR – II, KARUNAMOYEE,
SALT LAKE CITY,
KOLKATA – 700091.

VOLUME-III-R00 PRICE SCHEDULE	
Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.	
TENDER NO. PSER:SCT:KLN-E2060:20	
PREAMBLE	
1	This preamble forms part of tender document and schedule of items. The tenderer should read this preamble carefully before filling in rates for various items. Clauses under this preamble shall be read in conjunction with Volume-IB, ID, IE , Volume – IF and other tender sections as applicable and shall have precedence over any contrary statement mentioned any where in this document.
2	The work shall be carried out strictly as per specifications, description of the items in these schedule and / or engineer's instructions. Drawings encloaesd with the tender are only preliminary and for tender purposes and giving some idea of the work involved. The work is to be executed as per drawings & documents, which shall be furnished during execution.
3	Items of work provided in this schedule but not covered in this specification shall be executed strictly as per instruction of the engineer.
4	Unless specifically mentioned otherwise in the tender document, the tenderer shall quote for the finished items and shall provide for the complete cost towards power, fuel, tools, tackles, equipment, constructional plants, temporary works, labour, dismantling of all temporary piping, structures, valves, pumps, tanks & other misc. equipment, strengthening of roads/culverts/bridges etc. including arranging all clearances etc. required for carrying out different activities & tests, materials, levies, taxes(except service tax), transport, layout, repairs, rectification, maintenance till handing over, supervisions, colonies, shops, establishments, overheads, profits and all incidental items not specifically mentioned but reasonably implied and necessary to complete the work according to the complete tender document and this schedule.
5	The quantities of the various items mentioned in this schedule of items are approximate, based on very preliminary information and may vary to any extent or be deleted altogether. The quoted rates of each item will remain firm throughout the period of execution including extension, for reasons whatsoever, as long as variation in the total value of work executed under any part of this contract including extra items, if any but excluding any price variation remains, within plus minus fifteen percent (± 15%) of the awarded price as per LOI .
6	Prior written approval of BHEL shall be sought by the contractor in case quantity variation of any item crosses +50% (plus fifty percent) limit during execution and approval to be obtained before execution of further quantity for this item.
7	In case Sealed /Paper Price Bids are opened for finalisation of the tender, for any Item Rate/BOQ based contract, possibility of variation of quantity/ addition/deletion of items can not be ruled out. Under such circumstances, after execution of work, if it is observed that standing as L-1 is changed based on actual quantity executed, the bidder shall give suitable rebate to maintain your standing as L-1. Since this aspect can be assessed at the end of execution, necessary adjustment will be effected at the end of execution in final bill.This condition shall not be applicable where the tender is finalised through Reverse Auction.
8	BHEL reserve the right to rationalize the rates, quoted by L-1 bidder against unit rate items and/ or other optional items with respect to item-wise lowest rates (amongst the participating bidders), before placement of order.
9	The rates quoted shall be inclusive of cleaning of site of any vegetation, dressing , clearing of old structures and leveling etc. including fixing of grid pillars, benchmarks etc. required for commencement of site activities. No separate payment will be made towards the same.However, if separate rate for such item is avalable in the rate schedule, the same shall be considered.
10	Rates shall be quoted in figures and in words in clear legible writing. No overwriting is allowed. All scoring and cancellations should be countersigned and in case of illegibility the interpretation of engineer shall be final. All entries shall be in English language.
11	All works item wise shall be measured upon completion and paid for at the rates quoted and accepted as per BHEL approved payment schedule/billing break-up.
12	The tenderer shall be deemed to have visited site and made himself aware of all the site conditions, studied the specifications and details of work to the done within the time schedule attached and to have acquainted himself of the conditions prevailing at site.
13	No splitting of the job is envisaged. Decision of BHEL in this regard shall be final and binding to the bidders.
14	Bidders are not allowed to alter the Price Schedule format including item description,quantity etc. and the offer is liable for rejection if the bidders submit their prices in Price Schedules modified by them.BHEL reserves the right to reject the offers of bidders who submit offers in Price Formats which are modiified/altered by them. Also putting any comments instead of rates/price in the designated column of the rate schedule shall make the offer liable for rejection.
15	Bidders to note that for Civil &/Structural packages, against a particular item against a ST No. appearing in more than one schedule of the BOQ, same rate must be quoted in all schedules for that particular items with same descriptions. If by error, different rates are quoted in different schedules for same ST No.(i.e. item with same description), then the higher of the rates shall be considered for evaluation but awarding shall be done with the lower rate ,if the bidder becomes L-1."
16	For Lumpsum Service Contract : The items/components indicated in the tender is indicative and may vary to any extent. No compensation shall be payable in case of any variation in the items/components listed in the bill of quantities if the executed weight remains within the variation limit. However, in case of deletion of any item or addition of new items over and above the items listed or variation of existing quantity beyond variation limit specified, adjustment (i.e. Payment or recovery as the case may be) shall be done on pro-rata basis based on the Rate per MT worked out from the quoted lump-sum Price and the total weight of components listed /indicated in price schedule plus 15% weight variation limit.
17	Engineer's decision shall be final and binding on the contractor regarding clarification of items in the schedule with respect to the other sections/volumes of the contract.
18	In case of tender for Civil and/or Structural works, the Non-schedule items are not quoted by the bidder, it will be treated at par with rate of corresponding item of CPWD/PWD/ BPWD schedule as prescribed in the tender/BOQ cum Rate Schedule.
19	No interest, whatsoever, shall be payable by BHEL on the security deposit, any bank guarantee submitted or any amount due to successful bidder/contractor.

VOLUME-III-R00 PRICE SCHEDULE	
Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.	
TENDER NO. PSER:SCT:KLN-E2060:20	
PREAMBLE	
20	Size and weights of various items are mentioned in the attached BOQ cum rate/price schedule for reference purpose only & these shall not be taken into consideration for quoting/calculating amount in the rate schedule. These shall be utilised as per relevant sections of tender. Bidders shall quote for each item in the rate column, taking unit as mentioned in the quantity column. Rates shall be filled in both figures and words. Amount shall be calculated based upon these rates multiplied by the mentioned quantity for the respective items.
21	Bidder's Total price shall be considered for evaluation unless stated otherwise.
22	In case of BOP packages, if Bidder does not quote/indicate the price for freight chagses against indicated rate schedule, the same shall be considered as 2% of basic price and adjusted with the total quoated price against each item keeping the total quoted price unaltered.

VOLUME-III-R-00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO. PSER:SCT:KLN-E2060:20

SCHEDULE - 1 : TOTAL PRICE

SL NO	DESCRIPTION	PRICE SCHEDULE REF	TOTAL PRICE (IN USD)
1.0	TOTAL PRICE FOR ERECTION, TESTING & COMMISSIONING OF CABLE TRAYS, CABLING, LIGHTING AND EARTHING PROTECTION, HT/LT TRANSFORMER, HT/LT BUS DUCT, HT/LT SWITCHGEARS,HT/LT MOTOR,VARIOUS PANELS, DG SET, OTHER MISC ELECTRICAL EQUIPMENT FOR MAIN PLANT AREA-U#1,FGD-U#1 AND BOP AREA-COMMON FOR U#1&2 OF 2X660 MW MAITREE STPP,RAMPAL,BANGLADESH	SCH 2 - PRICE BREAK UP	*IN FIGURES:-* *IN WORDS:-*

NOTE

1.0	Bidder shall quote total price for SCH-2- Part only at Sl No. 1 above. All other amounts / rates of each item of works in respective schedules / parts will be derived based on allocated percentages. As such, any uncalled figure/ amount noted at any other place / schedule of Volume-III will not be recknoed & will stand null & void.
2.0	Bidder to note that total price at Sl No. 1 above shall be considered for evaluation & awarding. As such grand total price should be complete in all respect for the full scope defined and considering all terms and conditions.
3.0	Bidder's quoted total price of SCH-2 at Sl. No 1 above, shall be apportioned into amount of various items of works based on allocated percentages against respective item, in respective schedules / parts. As such, bidder shall not indicate / quote any amount / rate in these schedules / parts and any amount / rate quoted against any item shall not be taken into cognizance / account and offer may be liable for rejection.
4.0	Based on the itemwise percentage allocations, the amount for the individual items of the Bill of Quantity shall be arrived at. The rates of individual items shall be derived from the amount against each items and its quantity after rounding off to upto 2 decimal places. However, RA bill payment shall be done after rounding off the gross amount to two decimal points. Any adjustment, if required, due to such methodology, will be effected / adjusted in final bill.
5.0	Any item as per scope of work, if not included in the price quoted above and shown separately will not be taken cognizance of and the offer shall be liable for rejection.
6.0	Price format shall not be changed by bidder in any case and it may lead to cancellation of their offer.

VOLUME-III-R00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO - PSER:SCT:KLN-E2060:20

SCHEDULE - 2 : BREAK UP OF TOTAL PRICE

SL NO	DESCRIPTION	PRICE SCHEDULE REF	WEIGHTAGE
1.0	TOTAL PRICE FOR ERECTION, TESTING & COMMISSIONING OF CABLE TRAYS, CABLING, LIGHTING AND EARTHING PROTECTION, HT/LT TRANSFORMER, HT/LT BUS DUCT, HT/LT SWITCHGEARS,HT/LT MOTORS,VARIOUS PANELS, DG SET, OTHER MISC ELECTRICAL EQUIPMENT FOR MAIN PLANT AREA-U#1,FGD-U#1 AND BOP AREA-COMMON FOR U#1&2 OF 2X660 MW MAITREE STPP,RAMPAL,BANGLADESH		
a	SERVICE (PART-I)	SCH-3	0.98386733
b	SUPPLY (PART-II)	SCH-4	0.01613267
2.0	**GRAND TOTAL(SL. NO.1.0a+SL. NO.1.0b)**		1.00000000

VOLUME-III-R00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
A	**CABLE TRAYS (complete with Coupler plate, Fastners, clamp, and fixing hardware etc. complete, including site modifications required as described & classified in the technical specification to suit site layout).**			
A.1	**GALVANISED MS LADDER TYPE CABLE TRAY**			
1.0	600mm wide	Metres	19920	0.01963795
2.0	450mm wide	Metres	1860	0.00134467
3.0	300mm wide	Metres	2100	0.00117314
4.0	150mm wide	Metres	1560	0.00076895
5.0	100mm wide	Metres	120	0.00005521
A.2	**GALVANISED MS PERFORATED TYPE CABLE TRAY**			
1.0	600mm wide	Metres	8400	0.00883306
2.0	450mm wide	Metres	600	0.00047320
3.0	300mm wide	Metres	960	0.00053629
4.0	150mm wide	Metres	960	0.00047320
5.0	100mm wide	Metres	1200	0.00055207
6.0	50mm wide (ladder/ perforated/solid bottom)	Metres	720	0.00028392
A.3	**LADDER TYPE FRP CABLE TRAY (complete with Coupler plate, Fastners, clamp, and fixing hardware etc. complete, including site modifications required as described & classified in the technical specification to suit site layout).**			
1.0	600mm wide	Metres	37800	0.03726445
2.0	450mm wide	Metres	6020	0.00435212
3.0	300mm wide	Metres	12600	0.00703884
4.0	150mm wide	Metres	16800	0.00828099
5.0	100mm wide	Metres	840	0.00038645
A.4	**PERFORATED TYPE FRP CABLE TRAY (complete with Coupler plate, Fastners, clamp, and fixing hardware etc. complete, including site modifications required as described & classified in the technical specification to suit site layout).**			
1.0	600mm wide	Metres	10500	0.01104132
2.0	450mm wide	Metres	2240	0.00176661
3.0	300mm wide	Metres	4200	0.00234628
4.0	150mm wide	Metres	8400	0.00414049
5.0	100mm wide	Metres	2100	0.00096612
6.0	50mm wide (ladder/perforated/solid bottom)	Metres	1400	0.00055207

VOLUME-III-R00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
B	**CABLE TRAY ACCESSORIES**			
B.1	**(LADDER TYPE)**			
B.1.1	**HORIZONTAL 90 DEG. BEND 600 MM RADIUS**			
1.0	600mm wide	Nos.	420	0.00087414
2.0	450mm wide	Nos.	36	0.00006752
3.0	300mm wide	Nos.	60	0.00009972
4.0	150mm wide	Nos.	24	0.00003495
B.1.2	**VERTICAL 90 DEG. BEND 600 MM RADIUS (INSIDE)**			
1.0	600mm wide	Nos.	60	0.00012488
2.0	450mm wide	Nos.	6	0.00001125
3.0	300mm wide	Nos.	6	0.00000997
B.1.3	**VERTICAL 90 DEG. BEND 600 MM RADIUS (OUTSIDE)**			
1.0	600mm wide	Nos.	60	0.00012488
2.0	450mm wide	Nos.	6	0.00001125
3.0	300mm wide	Nos.	6	0.00000997
B.1.4	**TEES 600 MM RADIUS**			
1.0	600mm wide	Nos.	324	0.00067434
2.0	450mm wide	Nos.	6	0.00001163
3.0	300mm wide	Nos.	24	0.00004133
4.0	150mm wide	Nos.	1	0.00000151
B.1.5	**CROSSES 600 MM RADIUS**			
1.0	600mm wide	Nos.	5	0.00001041
2.0	450mm wide	Nos.	1	0.00000194
3.0	300mm wide	Nos.	1	0.00000162
B.1.6	**REDUCERS LHS /RHS**			
1.0	600mm wide - 450mm wide	Nos.	18	0.00003880
2.0	600mm wide - 300mm wide	Nos.	12	0.00002327
3.0	450mm wide - 300mm wide	Nos.	5	0.00000781

VOLUME-III-R00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
B.2	**(PERFORATED TYPE)**			
B.2.1	**HORIZONTAL 90 DEG. BEND 600 MM RADIUS**			
1.0	600mm wide	Nos.	144	0.00031042
2.0	450mm wide	Nos.	12	0.00002327
3.0	300mm wide	Nos.	30	0.00005205
4.0	150mm wide	Nos.	5	0.00000831
B.2.2	**VERTICAL 90 DEG. BEND 600 MM RADIUS (INSIDE)**			
1.0	600mm wide	Nos.	23	0.00004958
2.0	450mm wide	Nos.	3	0.00000582
3.0	300mm wide	Nos.	3	0.00000517
B.2.3	**VERTICAL 90 DEG. BEND 600 MM RADIUS (OUTSIDE)**			
1.0	600mm wide	Nos.	10	0.00002156
2.0	450mm wide	Nos.	1	0.00000194
3.0	300mm wide	Nos.	1	0.00000172
B.2.4	**TEES 600 MM RADIUS**			
1.0	600mm wide	Nos.	132	0.00028455
2.0	450mm wide	Nos.	4	0.00000776
3.0	300mm wide	Nos.	18	0.00003099
4.0	150mm wide	Nos.	1	0.00000151
B.2.5	**CROSSES 600 MM RADIUS**			
1.0	600mm wide	Nos.	4	0.00000862
2.0	450mm wide	Nos.	1	0.00000194
3.0	300mm wide	Nos.	1	0.00000172

VOLUME-III-R00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
B.2.6	**REDUCERS LHS /RHS**			
1.0	600mm wide - 450mm wide	Nos.	2	0.00000375
2.0	600mm wide - 300mm wide	Nos.	12	0.00001994
3.0	450mm wide - 300mm wide	Nos.	4	0.00000582
B.3	**FRP CABLE TRAY ACCESSORIES**			
B.3.1	**(FRP LADDER TYPE)**			
B.3.1.1	**HORIZONTAL 90 DEG. BEND 600 MM RADIUS**			
1.0	600mm wide	Nos.	273	0.00056819
2.0	450mm wide	Nos.	7	0.00001313
3.0	300mm wide	Nos.	98	0.00016287
4.0	150mm wide	Nos.	140	0.00020386
B.3.1.2	**VERTICAL 90 DEG. BEND 600 MM RADIUS (INSIDE)**			
1.0	600mm wide	Nos.	189	0.00039336
2.0	450mm wide	Nos.	6	0.00001125
3.0	300mm wide	Nos.	140	0.00023268
4.0	150mm wide	Nos.	378	0.00057139
B.3.1.3	**VERTICAL 90 DEG. BEND 600 MM RADIUS (OUTSIDE)**			
1.0	600mm wide	Nos.	224	0.00046621

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
2.0	450mm wide	Nos.	19	0.00003563
3.0	300mm wide	Nos.	84	0.00013961
4.0	150mm wide	Nos.	126	0.00019046
B.3.1.4	**TEES 600 MM RADIUS**			
1.0	600mm wide	Nos.	28	0.00005828
2.0	450mm wide	Nos.	14	0.00002714
3.0	300mm wide	Nos.	10	0.00001722
4.0	150mm wide	Nos.	19	0.00002872
B.3.1.5	**CROSSES 600 MM RADIUS**			
1.0	600mm wide	Nos.	11	0.00002289
2.0	450mm wide	Nos.	7	0.00001357
3.0	300mm wide	Nos.	7	0.00001205
B.3.1.6	**REDUCERS LHS /RHS**			
1.0	600mm wide - 450mm wide	Nos.	14	0.00003018
2.0	600mm wide - 300mm wide	Nos.	14	0.00002714
3.0	450mm wide - 300mm wide	Nos.	7	0.00001094
B.3.2	**(FRP PERFORATED TYPE)**			
B.3.2.1	**HORIZONTAL 90 DEG. BEND 600 MM RADIUS**			
1.0	600mm wide	Nos.	155	0.00033413
2.0	450mm wide	Nos.	7	0.00001357
3.0	300mm wide	Nos.	95	0.00016358
4.0	150mm wide	Nos.	224	0.00033860
B.3.2.2	**VERTICAL 90 DEG. BEND 600 MM RADIUS (INSIDE)**			
1.0	600mm wide	Nos.	100	0.00021557
2.0	450mm wide	Nos.	6	0.00001163
3.0	300mm wide	Nos.	44	0.00007576
4.0	150mm wide	Nos.	196	0.00029628

VOLUME-III-R00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
B.3.2.3	**VERTICAL 90 DEG. BEND 600 MM RADIUS (OUTSIDE)**			
1.0	600mm wide	Nos.	114	0.00024575
2.0	450mm wide	Nos.	12	0.00002327
3.0	300mm wide	Nos.	100	0.00017219
4.0	150mm wide	Nos.	100	0.00015116
B.3.2.4	**TEES 600 MM RADIUS**			
1.0	600mm wide	Nos.	20	0.00004311
2.0	450mm wide	Nos.	9	0.00001745
3.0	300mm wide	Nos.	16	0.00002755
4.0	150mm wide	Nos.	7	0.00001058
B.3.2.5	**CROSSES 600 MM RADIUS**			
1.0	600mm wide	Nos.	11	0.00002371
2.0	450mm wide	Nos.	11	0.00002133
3.0	300mm wide	Nos.	7	0.00001205
B.3.2.6	**REDUCERS LHS /RHS**			
1.0	600mm wide - 450mm wide	Nos.	12	0.00002327
2.0	600mm wide - 300mm wide	Nos.	12	0.00002066
3.0	450mm wide - 300mm wide	Nos.	7	0.00001094
C	**CABLE TRAY COVER COMPLETE WITH ACCESSORIES**			
C.1	**GALVANISED CABLE TRAY COVER COMPLETE WITH ACCESSORIES**			
1.0	600mm wide	Metres	140	0.00011634
2.0	450mm wide	Metres	70	0.00005123
3.0	300mm wide	Metres	140	0.00009499
C.2	**FRP CABLE TRAY COVER FLAT/PEAK COMPLETE WITH ACCESSORIES**			
1.0	600mm wide	Metres	7000	0.00581694
2.0	450mm wide	Metres	1120	0.00081971
3.0	300mm wide	Metres	420	0.00028498
4.0	150mm wide	Metres	35	0.00002346

VOLUME-III-R00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
D.1	**SUPPORT STRUCTURAL (Galvanized Iron) MATERIAL (FABRICATION/ASSEMBLY OF SUPPORT STRUCTURAL ITEMS OF SWITCHGEARS, PANELS, LPBS, STARTERS, MISC. CABLE TRAY STRUCTURES ETC.)**	MT	120	0.02602597
D.2	**CABLE TRAY SUPPORT MATERIAL** Including fabrication/assembly of loose items like Channels, Angles, Clamps, Plates etc. (Welded/Bolted type)			
D.2.1	**CHANNELS**			
1.0	SINGLE CHANNEL SC1	Metres	10725	0.01043659
2.0	DOUBLE CHANNEL DC1	Metres	10725	0.01217418
D.2.2	**CANTILEVER ARM FITTING WITH HEX BOLT & WASHER, SPRING NUT, PAN HEAD SCREW, CLAMPS ETC. COMPLETE**			
1.0	CANTILEVER ARM FOR **600MM** WIDE CABLE TRAY	Nos.	27300	0.01291834
2.0	CANTILEVER ARM FOR **450MM** WIDE CABLE TRAY	Nos.	1820	0.00075357
3.0	CANTILEVER ARM FOR **300MM** WIDE CABLE TRAY	Nos.	11700	0.00361406
4.0	CANTILEVER ARM FOR **150MM** WIDE CABLE TRAY	Nos.	6500	0.00128158
5.0	CANTILEVER ARM FOR **100MM** WIDE CABLE TRAY	Nos.	910	0.00016148
6.0	CANTILEVER ARM FOR **50MM** WIDE CABLE TRAY	Nos.	1040	0.00016404
AE.1	**FABRICATION OF IRREGULAR BEND (Supply of cable tray material is by BHEL, consumables etc. to be provided by vendor, Applicable for BEND TYPE 'E', 'F' & G) - LTCT**			
1.0	600 MM WIDE	NOS	120	0.00046840
2.0	450 MM WIDE	NOS	30	0.00011710
3.0	300 MM WIDE	NOS	120	0.00043730
4.0	150 MM WIDE	NOS	96	0.00033740
AE.2	**FABRICATION OF IRREGULAR BEND (Supply of cable tray material is by BHEL, consumables etc. to be provided by vendor, Applicable for BEND TYPE 'E', 'F' & G) - PTCT**			
1.0	600 MM WIDE	NOS	120	0.00046840
2.0	450 MM WIDE	NOS	30	0.00011710
3.0	300 MM WIDE	NOS	120	0.00043730
4.0	150 MM WIDE	NOS	96	0.00033740
E	**Installation of GALVANISED MS CONDUITS / PIPES**			
E.1	**GALVANISED MS RIGID CONDUITS**			
1.0	Upto 50 mm diameter	Metres	150	0.00007776
2.0	Above 50 mm upto 100 mm dia	Metres	90	0.00008371
E.2	**FLEXIBLE CONDUITS MADE OF COLD ROLLED ANNEALED ELECTRO GALVANISED MS STRIP**			

VOLUME-III-R00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
1.0	Upto 50 mm diameter	Metres	180	0.00002745
2.0	Above 50 mm upto 100 mm dia	Metres	30	0.00000778
F	**CABLE LAYING** (Including supply and installation of required clamps , Al. Strips, saddles ets for cable dressing and clamping etc.) (Trefoil clamps will be supplied by BHEL)			
F.1	**11 KV HT. XLPE POWER CABLE (COPPER)**			
1.0	1C-150 SQ. MM	KM	95	0.03146776
2.0	1C-185 SQ. MM	KM	5	0.00173506
3.0	3C-120 SQ. MM	KM	50	0.01971664
F.2	**3.3 KV HT.XLPE POWER CABLE (COPPER)**			
1.0	1C-95 SQ. MM	KM	1.8	0.00042588
2.0	3C-95 SQ. MM	KM	25	0.00867532
F.3.1	**1.1 KV LT COPPER XLPE POWER CABLE(UNARMOURED)**			
1.0	1CX6 SQ. MM	KM	1	0.00008675
2.0	1Cx10 SQ. MM	KM	1	0.00008675
3.0	1Cx16 SQ. MM	KM	20	0.00177765
4.0	1CX25 SQ. MM	KM	2	0.00020374
5.0	1CX35 SQ. MM	KM	3	0.00032532
6.0	1CX50 SQ. MM	KM	1	0.00011501
7.0	1CX70 SQ. MM	KM	11	0.00144589
8.0	1CX95 SQ. MM	KM	2	0.00028918
9.0	1CX150 SQ. MM	KM	1	0.00015379
10.0	1CX240 SQ. MM	KM	2	0.00032335
11.0	1CX300 SQ. MM	KM	24	0.00406951
12.0	1CX500 SQ. MM	KM	50	0.00887249
13.0	1CX630 SQ. MM	KM	2	0.00039433
14.0	2CX2.5 SQ. MM	KM	170	0.01050240
15.0	2CX6 SQ. MM	KM	18	0.00153790
16.0	2CX10 SQ. MM	KM	0.5	0.00004436
17.0	2CX16 SQ. MM	KM	12	0.00107889
18.0	2CX25 SQ. MM	KM	0.5	0.00004601
19.0	2CX35 SQ. MM	KM	1	0.00010253

VOLUME-III-R00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
20.0	2CX70 SQ. MM	KM	37	0.00510661
21.0	2CX120 SQ. MM	KM	5	0.00078867
22.0	3CX2.5 SQ. MM	KM	470	0.02965383
23.0	03CX6 SQ. MM	KM	40	0.00262889
24.0	03CX10 SQ. MM	KM	2	0.00019059
25.0	03CX16 SQ. MM	KM	16	0.00152475
26.0	03CX25 SQ. MM	KM	2	0.00020374
27.0	03CX35 SQ. MM	KM	8	0.00086753
28.0	03CX50 SQ. MM	KM	1	0.00012159
29.0	03CX70 SQ. MM	KM	8	0.00110413
30.0	03CX120 SQ. MM	KM	1	0.00016431
31.0	03CX150 SQ. MM	KM	32	0.00609901
32.0	03CX185 SQ. MM	KM	1	0.00019717
33.0	03CX240 SQ. MM	KM	1	0.00021031
34.0	3.5CX25 SQ. MM	KM	1	0.00011501
35.0	3.5CX35 SQ. MM	KM	26	0.00328085
36.0	3.5CX70 SQ. MM	KM	4	0.00056784
37.0	3.5CX120 SQ. MM	KM	2	0.00034833
38.0	3.5CX150 SQ. MM	KM	8	0.00155104
39.0	3.5CX185 SQ. MM	KM	1	0.00020374
40.0	3.5CX240 SQ. MM	KM	3	0.00066248
41.0	04CX2.5 SQ. MM	KM	16	0.00113568
42.0	04CX6 SQ. MM	KM	13	0.00112779
43.0	04CX10 SQ. MM	KM	4	0.00041536
44.0	04CX16 SQ. MM	KM	11	0.00119286
45.0	04CX35 SQ. MM	KM	0.5	0.00006309
F.3.2	**1.1 KV LT COPPER XLPE POWER CABLE(ARMOURED)**			
1.0	3CX2.5 SQ. MM	KM	1	0.00006309
2.0	3.5CX35 SQ. MM	KM	4	0.00050475
3.0	3.5CX70 SQ. MM	KM	3	0.00042588
4.0	4CX16 SQ. MM	KM	12	0.00130130

VOLUME-III-R00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
F.4	**LT COPPER EPR INSULATED FIRE SURVIVAL CABLE (UNARMOURED)**			
1.0	1C-150 SQ. MM	KM	1	0.00020045
2.0	1C-400 SQ. MM	KM	3	0.00072952
3.0	1C-630 SQ. MM	KM	1	0.00026815
4.0	2C-150 SQ. MM	KM	2	0.00050475
5.0	3C-2.5 SQ. MM	KM	1	0.00006309
6.0	3C-10 SQ. MM	KM	1	0.00009858
7.0	3C-25 SQ. MM	KM	1	0.00010647
8.0	3C-35 SQ. MM	KM	1	0.00011041
9.0	3C-95 SQ. MM	KM	1	0.00015773
10.0	3C-185 SQ. MM	KM	1	0.00020979
11.0	3C-150SQ. MM	KM	1	0.00019559
12.0	4C-16 SQ. MM	KM	1	0.00011830
13.0	5C-2.5 SQ. MM	KM	1	0.00007229
F.5	**1.1 KV LT. COPPER PVC FRLS CONTROL CABLE (UNARMOURED)**			
1.0	2C X 1.5 SQ MM	KM	80	0.00473199
2.0	2CX2.5 SQ. MM	KM	1	0.00006178
3.0	3C X 1.5 SQ MM	KM	10	0.00061779
4.0	3C X 2.5 SQ. MM	KM	5	0.00031547
5.0	4C X 1.5 SQ. MM	KM	4	0.00025237
6.0	5C X 1.5 SQ MM	KM	36	0.00236600
7.0	5C X 2.5 SQ MM	KM	20	0.00138016
8.0	5C X 4 SQ MM	KM	13	0.00093983
9.0	7C X 1.5 SQ MM	KM	9	0.00062107
10.0	7C X 2.5 SQ. MM	KM	11	0.00078078
11.0	10C X 2.5 SQ. MM	KM	5	0.00042062
12.0	12C X 1.5 SQ MM	KM	32	0.00332291
13.0	12C X 2.5 SQ MM	KM	24	0.00258682
14.0	16C X 2.5 SQ. MM	KM	7	0.00077289
15.0	19CX1.5 SQ. MM	KM	0.5	0.00005915
F.6	**1.1 KV SCREENED CONTROL CABLE**			

VOLUME-III-R00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
1.0	2P - 0.5 SQ. MM (G)	KM	36	0.00217672
2.0	4P - 0.5 SQ. MM (G)	KM	18	0.00113568
3.0	8P - 0.5 SQ. MM (G)	KM	4	0.00027603
4.0	12P - 0.5 SQ. MM (G)	KM	45	0.00443624
5.0	1P - 0.5 SQ. MM (F)	KM	4	0.00023873
6.0	2P - 0.5 SQ. MM (F)	KM	9	0.00054418
7.0	4P - 0.5 SQ. MM (F)	KM	36	0.00227136
8.0	8P - 0.5 SQ. MM (F)	KM	3	0.00020702
9.0	12P - 0.5 SQ. MM (F)	KM	3	0.00029575
10.0	20P - 0.5 SQ. MM (F)	KM	3	0.00035490
11.0	3P - 1.5 SQ. MM (G)	KM	7	0.00048306
12.0	8P - 1.5 SQ. MM (G)	KM	65	0.00576712
13.0	12P - 1.5 SQ. MM (G)	KM	7	0.00075909
14.0	4C - 1.5 SQ. MM	KM	20	0.00126187
F.7	**OTHER CABLES (including termination)**			
1.0	CAT - 5e COMMUNICATION CABLE WITHOUT CONDUIT	KM	7	0.00042325
2.0	CAT - 5e COMMUNICATION CABLE WITH CONDUIT	KM	3	0.00026617
3.0	PTFE signal cable, earthing cable alongwith flexible GI conduit for Hopper Ash level indicator system.	KM	3	0.00030561
F.7.1	**OTHER CABLES (excluding termination)**			
1.0	OPTICAL FIBRE CABLE WITHOUT CONDUIT	KM	8	0.00047320
2.0	OPTICAL FIBRE CABLE WITH CONDUIT	KM	3	0.00019717
F.7.2	**Fiber optic cable termination.**			
F.7.2.1	Single mode	Nos	6	0.00003786
F.7.2.2	Multi mode	Nos	18	0.00014196
G	**CABLE TERMINATION** (Supply of heavy duty copper lugs upto 2.5 Sq.mm. is under Vendor scope)			
G.1	**11 KV HT. XLPE POWER CABLE (END TERMINATION)**			
1.0	1C-150 sq mm	Nos.	140	0.00165620
2.0	1C-185 sq mm	Nos.	60	0.00070980
3.0	3C-120 sq mm	Nos.	120	0.00236600
G.2	**3.3 KV HT.XLPE POWER CABLE (END TERMINATION)**			
1.0	1C-95 sq mm	Nos.	60	0.00070980

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
2.0	3C-95 sq mm	Nos.	140	0.00276033
G.3	**1.1 KV LT COPPER XLPE POWER CABLE(UNARMOURED)**			
1.0	1CX6 SQ. MM	Nos.	13	0.00001526
2.0	1Cx10 SQ. MM	Nos.	13	0.00001675
3.0	1Cx16 SQ. MM	Nos.	286	0.00037969
4.0	1CX25 SQ. MM	Nos.	20	0.00002577
5.0	1CX35 SQ. MM	Nos.	32	0.00004318
6.0	1CX50 SQ. MM	Nos.	13	0.00001754
7.0	1CX70 SQ. MM	Nos.	117	0.00016412
8.0	1CX95 SQ. MM	Nos.	20	0.00003050
9.0	1CX150 SQ. MM	Nos.	13	0.00002136
10.0	1CX240 SQ. MM	Nos.	20	0.00003286
11.0	1CX300 SQ. MM	Nos.	247	0.00042207
12.0	1CX500 SQ. MM	Nos.	494	0.00095777
13.0	1CX630 SQ. MM	Nos.	20	0.00003751
14.0	2CX2.5 SQ. MM	Nos.	3640	0.00319131
15.0	2CX6 SQ. MM	Nos.	290	0.00026302
16.0	2CX10 SQ. MM	Nos.	7	0.00000614
17.0	2CX16 SQ. MM	Nos.	117	0.00010688
18.0	2CX25 SQ. MM	Nos.	7	0.00000614
19.0	2CX35 SQ. MM	Nos.	13	0.00001282
20.0	2CX70 SQ. MM	Nos.	377	0.00042121
21.0	2CX120 SQ. MM	Nos.	52	0.00007294
22.0	3CX2.5 SQ. MM	Nos.	5980	0.00629144
23.0	03CX6 SQ. MM	Nos.	663	0.00073797
24.0	03CX10 SQ. MM	Nos.	20	0.00002577
25.0	03CX16 SQ. MM	Nos.	169	0.00021774
26.0	03CX25 SQ. MM	Nos.	20	0.00002577
27.0	03CX35 SQ. MM	Nos.	78	0.00010525
28.0	03CX50 SQ. MM	Nos.	13	0.00001824
29.0	03CX70 SQ. MM	Nos.	78	0.00010942

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
30.0	03CX120 SQ. MM	Nos.	13	0.00002131
31.0	03CX150 SQ. MM	Nos.	325	0.00060952
32.0	03CX185 SQ. MM	Nos.	13	0.00002563
33.0	03CX240 SQ. MM	Nos.	13	0.00002587
34.0	3.5CX25 SQ. MM	Nos.	13	0.00001526
35.0	3.5CX35 SQ. MM	Nos.	260	0.00037593
36.0	3.5CX70 SQ. MM	Nos.	39	0.00005895
37.0	3.5CX120 SQ. MM	Nos.	20	0.00003278
38.0	3.5CX150 SQ. MM	Nos.	78	0.00014628
39.0	3.5CX185 SQ. MM	Nos.	13	0.00002587
40.0	3.5CX240 SQ. MM	Nos.	26	0.00005536
41.0	04CX25 SQ. MM	Nos.	200	0.00027603
42.0	04CX6 SQ. MM	Nos.	175	0.00020702
43.0	04CX10 SQ. MM	Nos.	39	0.00005025
44.0	04CX16 SQ. MM	Nos.	110	0.00015431
45.0	04CX35 SQ. MM	Nos.	7	0.00001058
G.4	**LT COPPER EPR INSULATED FIRE SURVIVAL CABLE**			
1.0	1C-150 SQ. MM	Nos.	12	0.00001972
2.0	1C-400 SQ. MM	Nos.	36	0.00006388
3.0	1C-630 SQ. MM	Nos.	12	0.00002251
4.0	2C-150 SQ. MM	Nos.	24	0.00004101
5.0	3C-2.5 SQ. MM	Nos.	12	0.00001262
6.0	3C-10 SQ. MM	Nos.	12	0.00001546
7.0	3C-25 SQ. MM	Nos.	12	0.00001546
8.0	3C-35 SQ. MM	Nos.	12	0.00001619
9.0	3C-95 SQ. MM	Nos.	12	0.00001774
10.0	3C-185 SQ. MM	Nos.	12	0.00002405
11.0	3C-150SQ. MM	Nos.	12	0.00002251
12.0	4C-16 SQ. MM	Nos.	12	0.00001683
13.0	5C-2.5 SQ. MM	Nos.	12	0.00001189
G.5	**1.1 KV LT. COPPER PVC FRLS CONTROL CABLE**			

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
1.0	2C X 1.5 SQ MM	Nos.	1430	0.00109020
2.0	2CX2.5 SQ. MM	Nos.	16	0.00001305
3.0	3C X 1.5 SQ MM	Nos.	208	0.00016967
4.0	3C X 2.5 SQ. MM	Nos.	62	0.00005460
5.0	4C X 1.5 SQ. MM	Nos.	52	0.00004580
6.0	5C X 1.5 SQ MM	Nos.	430	0.00040322
7.0	5C X 2.5 SQ MM	Nos.	234	0.00023192
8.0	5C X 4 SQ MM	Nos.	156	0.00016412
9.0	7C X 1.5 SQ MM	Nos.	104	0.00012210
10.0	7C X 2.5 SQ. MM	Nos.	125	0.00016105
11.0	10C X 2.5 SQ. MM	Nos.	65	0.00009118
12.0	12C X 1.5 SQ MM	Nos.	390	0.00054708
13.0	12C X 2.5 SQ MM	Nos.	300	0.00043913
14.0	16C X 2.5 SQ. MM	Nos.	85	0.00013407
15.0	19CX1.5 SQ. MM	Nos.	7	0.00001067
G.6	**1.1 KV SCREENED CABLE**			
1.0	2P - 0.5 SQ. MM (G)	Nos.	1170	0.00205156
2.0	4P - 0.5 SQ. MM (G)	Nos.	2340	0.00410311
3.0	8P - 0.5 SQ. MM (G)	Nos.	1040	0.00182361
4.0	12P - 0.5 SQ. MM (G)	Nos.	936	0.00219071
5.0	1P - 0.5 SQ. MM (F)	Nos.	45	0.00007098
6.0	2P - 0.5 SQ. MM (F)	Nos.	110	0.00019288
7.0	4P - 0.5 SQ. MM (F)	Nos.	1820	0.00319131
8.0	8P - 0.5 SQ. MM (F)	Nos.	430	0.00075399
9.0	12P - 0.5 SQ. MM (F)	Nos.	715	0.00167346
10.0	20P - 0.5 SQ. MM (F)	Nos.	39	0.00009128
11.0	3P - 1.5 SQ. MM (G)	Nos.	85	0.00015418
12.0	8P - 1.5 SQ. MM (G)	Nos.	780	0.00147638
13.0	12P - 1.5 SQ. MM (G)	Nos.	78	0.00019685
14.0	4C - 1.5 SQ. MM	Nos.	234	0.00027473
G.7	**CABLE JOINTS (using Straight thru jointing kit)**			

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PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
G.7.1	**11 KV HT. XLPE POWER CABLE**			
1.0	1C-150 sq mm	Nos.	70	0.00121455
2.0	1C-185 sq mm	Nos.	8	0.00013881
3.0	3C-120 sq mm	Nos.	32	0.00080759
G.7.2	**3.3 KV HT.XLPE POWER CABLE**			
1.0	1C-95 sq mm	Nos.	4	0.00006625
2.0	3C-95 sq mm	Nos.	8	0.00018928
G.7.3	**1.1 KV LT COPPER .XLPE POWER CABLE**			
1.0	1CX6 SQ. MM	Nos.	10	0.00001174
2.0	1Cx10 SQ. MM	Nos.	10	0.00001288
3.0	1Cx16 SQ. MM	Nos.	10	0.00001328
4.0	1CX25 SQ. MM	Nos.	10	0.00001288
5.0	1CX35 SQ. MM	Nos.	10	0.00001349
6.0	1CX50 SQ. MM	Nos.	10	0.00001349
7.0	1CX70 SQ. MM	Nos.	10	0.00001403
8.0	1CX95 SQ. MM	Nos.	10	0.00001525
9.0	1CX150 SQ. MM	Nos.	10	0.00001643
10.0	1CX240 SQ. MM	Nos.	10	0.00001643
11.0	1CX300 SQ. MM	Nos.	10	0.00001709
12.0	1CX500 SQ. MM	Nos.	10	0.00001939
13.0	1CX630 SQ. MM	Nos.	10	0.00001972
14.0	2CX2.5 SQ. MM	Nos.	10	0.00000701
15.0	2CX6 SQ. MM	Nos.	10	0.00000789
16.0	2CX10 SQ. MM	Nos.	10	0.00000762
17.0	2CX16 SQ. MM	Nos.	10	0.00000848
18.0	2CX25 SQ. MM	Nos.	10	0.00000816
19.0	2CX35 SQ. MM	Nos.	10	0.00001314
20.0	2CX70 SQ. MM	Nos.	10	0.00001314
21.0	2CX120 SQ. MM	Nos.	10	0.00001403
22.0	3CX2.5 SQ. MM	Nos.	10	0.00001052
23.0	03CX6 SQ. MM	Nos.	10	0.00001113

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
24.0	03CX10 SQ. MM	Nos.	10	0.00001288
25.0	03CX16 SQ. MM	Nos.	10	0.00001288
26.0	03CX25 SQ. MM	Nos.	10	0.00001288
27.0	03CX35 SQ. MM	Nos.	10	0.00001349
28.0	03CX50 SQ. MM	Nos.	10	0.00001403
29.0	03CX70 SQ. MM	Nos.	10	0.00001403
30.0	03CX120 SQ. MM	Nos.	10	0.00001639
31.0	03CX150 SQ. MM	Nos.	10	0.00001875
32.0	03CX185 SQ. MM	Nos.	10	0.00002037
33.0	03CX240 SQ. MM	Nos.	10	0.00002300
34.0	3.5CX25 SQ. MM	Nos.	10	0.00001174
35.0	3.5CX35 SQ. MM	Nos.	10	0.00001446
36.0	3.5CX70 SQ. MM	Nos.	10	0.00001512
37.0	3.5CX120 SQ. MM	Nos.	10	0.00001639
38.0	3.5CX150 SQ. MM	Nos.	10	0.00001875
39.0	3.5CX185 SQ. MM	Nos.	10	0.00001875
40.0	3.5CX240 SQ. MM	Nos.	10	0.00002300
41.0	04CX2.5 SQ. MM	Nos.	10	0.00001052
42.0	04CX6 SQ. MM	Nos.	10	0.00001249
43.0	04CX10 SQ. MM	Nos.	10	0.00001288
44.0	04CX16 SQ. MM	Nos.	10	0.00001403
45.0	04CX35 SQ. MM	Nos.	10	0.00001512
G.7.4	**LT. COPPER FIRE SURVIVAL CABLE**			
1.0	1C-150 SQ. MM	Nos.	5	0.00000877
2.0	1C-400 SQ. MM	Nos.	5	0.00001170
3.0	1C-630 SQ. MM	Nos.	5	0.00000938
4.0	2C-150 SQ. MM	Nos.	5	0.00000986
5.0	3C-2.5 SQ. MM	Nos.	5	0.00000629
6.0	3C-10 SQ. MM	Nos.	5	0.00000657
7.0	3C-25 SQ. MM	Nos.	5	0.00000657
8.0	3C-35 SQ. MM	Nos.	5	0.00000710

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
9.0	3C-95 SQ. MM	Nos.	5	0.00000907
10.0	3C-185 SQ. MM	Nos.	5	0.00001134
11.0	3C-150SQ. MM	Nos.	5	0.00001038
12.0	4C-16 SQ. MM	Nos.	5	0.00000690
13.0	5C-2.5 SQ. MM	Nos.	5	0.00000675
G.7.5	**1.1 KV LT. COPPER PVC FRLS CONTROL CABLE**			
1.0	2C X 1.5 SQ MM	Nos.	10	0.00000762
2.0	2CX2.5 SQ. MM	Nos.	10	0.00000816
3.0	3C X 1.5 SQ MM	Nos.	10	0.00000816
4.0	3C X 2.5 SQ. MM	Nos.	10	0.00001052
5.0	4C X 1.5 SQ. MM	Nos.	10	0.00000946
6.0	5C X 1.5 SQ MM	Nos.	10	0.00000938
7.0	5C X 2.5 SQ MM	Nos.	10	0.00000991
8.0	5C X 4 SQ MM	Nos.	10	0.00001052
9.0	7C X 1.5 SQ MM	Nos.	10	0.00001174
10.0	7C X 2.5 SQ. MM	Nos.	10	0.00001288
11.0	10C X 2.5 SQ. MM	Nos.	10	0.00001403
12.0	12C X 1.5 SQ MM	Nos.	10	0.00001403
13.0	12C X 2.5 SQ MM	Nos.	10	0.00001464
14.0	16C X 2.5 SQ. MM	Nos.	10	0.00001577
15.0	19CX1.5 SQ. MM	Nos.	10	0.00001525
H	**ABOVE GROUND EARTHING AND LIGHTNING PROTECTION MATERIAL (INCLUDING CLAMPING, BRAZING, LUGGING, FITTING OF LOOSE ITEMS ETC.)**			
H.1	**20MM DIA 1 MTR LONG STAINLESS STEEL ROD**	Nos.	469	0.00243852
H.2	**TINNED BARE CU CONDUCTOR FOR EARTHING SYSTEM**			
1.0	TINNED BARE CONDUCTOR 240SQ. MM CU	MTR	31500	0.04140495
2.0	TINNED BARE CONDUCTOR 50SQ. MM CU	MTR	700	0.00049686
3.0	TINNED BARE CONDUCTOR 95SQ. MM CU	MTR	840	0.00059623
4.0	TINNED BARE CONDUCTOR 35SQ. MM CU	MTR	1750	0.00124215
5.0	TINNED BARE CONDUCTOR 16SQ. MM CU	MTR	28000	0.01656198
6.0	STRANDED TINNED COPPER CONDUCTOR 16 SQ MM	MTR	700	0.00041405

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Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
7.0	STRANDED TINNED COPPER CONDUCTOR 35 SQ MM	MTR	210	0.00014906
8.0	STRANDED TINNED COPPER CONDUCTOR 50 SQ MM	MTR	70	0.00004969
9.0	STRANDED TINNED COPPER CONDUCTOR 95 SQ MM	MTR	210	0.00014906
10.0	STRANDED TINNED COPPER CONDUCTOR 240 SQ MM	MTR	700	0.00092011
11.0	14 SWG tinned Stranded Copper wire	MTR	4200	0.00049686
H.3	TEST LINK 150x25x3 mm SS FLAT WITH BOX	NOS.	350	0.00151818
H.4	150MMX150MMX6MM STAINLESS STEEL PLATE	NOS.	350	0.00151818
H.5	25 MMX3 MM STAINLESS STEEL(SS) CLAMP	NOS.	7000	0.01058126
H.6	25 MM X 3MM STAINLESS STEEL (SS) FLAT	MT	10	0.00197166
H.7	Ground Electrode (3 METRE LONG)	NOS	160	0.00082021
H.8	Vertical rods	NOS	125	0.00064079

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PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
H.9	30 X 8 MM TINNED COPPER BUS BAR FLAT/BAR	MT	7	0.00138016
I	**MINOR CIVIL WORK**			
1.0	Chipping of concrete (upto 50 mm depth)	SQ. M	14	0.00005981
2.0	Breaking of concrete wall/ floors including finishing	CU. M	7	0.00058887
3.0	Breaking of brick walls/floors including finishing	CU. M	28	0.00023555
4.0	Earth excavation & back filling	CU. M	28	0.00002208
J	**HT Switchgear**			
1.0	11KV, 4000A, UNIT-1 SWITCH BOARD - 1BA (01BBA)	NO.OF BOARDS	1	0.00151161
2.0	11KV, 4000A, UNIT-1 SWITCH BOARD - 1BB (01BBB)	NO.OF BOARDS	1	0.00151161
3.0	11KV, 4000A, STATION SWITCH BOARD - 0BA (00BBA)	NO.OF BOARDS	1	0.00118300
4.0	3.3KV, 3150A, UNIT-1 AUX. SWITCH BOARD (01BCA)	NO.OF BOARDS	1	0.00185520
5.0	3.3 KV, 1600A, STATION SWITCH BOARD (00BCA)	NO.OF BOARDS	1	0.00184022
6.0	3.3 KV, 1000A, RAW WATER SWITCH BOARD (00BCG)	NO.OF BOARDS	1	0.00157733
7.0	3.3 KV, 2500A, CHP-1 AUX. SWITCH BOARD (00BCB)	NO.OF BOARDS	1	0.00184022
8.0	3.3 KV, 2500A, CHP-2 AUX. SWITCH BOARD (00BCC)	NO.OF BOARDS	1	0.00184022
9.0	3.3 KV, 2000A, CHP-3 AUX. SWITCH BOARD (00BCD)	NO.OF BOARDS	1	0.00184022
10.0	3.3 KV, 1000A, JETTY AUX. SWITCH BOARD (00BCF)	NO.OF BOARDS	1	0.00157733
11.0	3.3 KV, 1000A, AHP AUX. SWITCH BOARD (00BCE)	NO.OF BOARDS	1	0.00157733
12.0	3.3 KV, 1250A, UNIT-1 FGD SWITCH BOARD (01BCB)	NO.OF BOARDS	1	0.00157733
13.0	11 KV EARTHING TRUCKS	SET	9	0.00008872
14.0	3.3 KV EARTHING TRUCKS	SET	20	0.00047320
15.0	11 KV BUS TRANSFER PANEL	NO.	2	0.00039433
16.0	HT DATA CONCENTRATOR PANEL WITH ACCESSORIES (INCLUDING INSTALLATION OF LOOSE ITEMS, MINOR WIRING IN THE ASSOCIATED PANELS.)	NO.	7	0.00138016
17.0	MOUNTING OF ETHERNET SWITCHES AT DIFFERENT HT SWGR PANELS INCLUDING LMU AND INTERNAL WIRING ETC. FOR HT DATA CONCENTRATOR SYSTEM	Nos.	40	0.00047320
K	**LT SWBD AND DC DB**			
1.0	415V, 3000A, UNIT-1 EMERGENCY MCC (01BMA)	NO.OF BOARDS	1	0.00164305

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Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
2.0	220V, 1000A, UNIT-1 MAIN DCDB (01BUA)	NO.OF BOARDS	1	0.00118300
3.0	415V, 3200A, UNIT-1 TURBINE SERVICE PMCC (01BFA)	NO.OF BOARDS	1	0.00131444
4.0	415V, 250A, UNIT-1 TURBINE VALVE DB (01BJA)	NO.OF BOARDS	1	0.00131444
5.0	415V, 630A UNIT-1 SERVICE ACDB (01BJB)	NO.OF BOARDS	1	0.00131444
6.0	415V, 4000A, UNIT-1 BOILER SERVICE PMCC (01BFB)	NO.OF BOARDS	1	0.00131444
7.0	415V, 250A, UNIT-1 BOILER VALVE & DAMPER ACDB(01BJC)	NO.OF BOARDS	1	0.00131444
8.0	415V, 400A, UNIT-1 BOILER ACDB (01BJD)	NO.OF BOARDS	1	0.00131444
9.0	415V, 400A, UNIT-1 ESP & ID FAN AREA MCC (01BJE)	NO.OF BOARDS	1	0.00131444
10.0	415V, 400A, UNIT-1 ESP AC & VENTILLATION MCC (01BJF)	NO.OF BOARDS	1	0.00131444
11.0	415V, 4000A, STATION SEVICES PMCC, UNIT-1 (00BFA)	NO.OF BOARDS	1	0.00131444
12.0	415V, 630A UNIT-1 AIR WASHER MCC (01BJG)	NO.OF BOARDS	1	0.00131444
13.0	415V, 1600A, CCR AIR CONDITIONING MCC (00BJS)	NO.OF BOARDS	1	0.00131444
14.0	415V, 1000A, UNIT-1 VENTILATION MCC (01BJH)	NO.OF BOARDS	1	0.00131444
15.0	415V, 630A, UNIT-1 MISC SERVICE MCC (00BJQ)	NO.OF BOARDS	1	0.00131444
16.0	415V, 3200A, ADMIN BUILDING PMCC (00BFF)	NO.OF BOARDS	1	0.00131444
17.0	415V, 400A, AUDITORIUM ACDB (00BJK)	NO.OF BOARDS	1	0.00131444
18.0	415V, 400A, CANTEEN ACDB (00BJL)	NO.OF BOARDS	1	0.00131444
19.0	415V, 1000A, SERVICE BUILDING MCC (00BJM)	NO.OF BOARDS	1	0.00131444
20.0	415V, 400A, GAS CHLORINATION MCC (00BJN)	NO.OF BOARDS	1	0.00131444
21.0	415V, 3200A, FUEL OIL PMCC (00BFC)	NO. OF BOARDS	1	0.00131444
22.0	415V, 400A, PERMANENT STORE ACDB (00BJA)	NO. OF BOARDS	1	0.00131444
23.0	415V, 630A, WORKSHOP MCC (00BJB)	NO. OF BOARDS	1	0.00131444
24.0	415V, 630A, H2 MCC (00BJC)	NO. OF BOARDS	1	0.00131444
25.0	415V, 4000A, RODM PMCC (00BFE)	NO. OF BOARDS	1	0.00131444
26.0	415V, 2500A, DESALINATION PMCC (00BFJ)	NO. OF BOARDS	1	0.00131444
27.0	415V, 1600A, PTP MCC (00BJH)	NO. OF BOARDS	1	0.00131444
28.0	415V, 630A, FIRE WATER MCC (00BJF)	NO. OF BOARDS	1	0.00131444
29.0	415V, 630A, CPU MCC (00BJD)	NO. OF BOARDS	1	0.00131444

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Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

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Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
30.0	415V, 630A, ETP MCC (00BJE)	NO. OF BOARDS	1	0.00131444
31.0	415V, 3200A, AUX.BOILER PMCC (00BFD)	NO. OF BOARDS	1	0.00131444
32.0	415V, 3200A, COOLING TOWER PMCC - 1 (01BFJ)	NO. OF BOARDS	1	0.00131444
33.0	415V, 800A, CWT & CHLORINATION MCC (00BJP)	NO. OF BOARDS	1	0.00131444
34.0	415V, 3200A, UNIT-1 FGD SERVICE SWITCH BOARD (01BFH)	NO. OF BOARDS	1	0.00131444
35.0	415V, 2500A, FGD COMMON SERVICE SWITCH BOARD (00BFH)	NO. OF BOARDS	1	0.00131444
36.0	415V, 630A, FGD AC & VENT. MCC (00BJT)	NO. OF BOARDS	1	0.00131444
37.0	415V, FGD EMERGENCY MCC (00BMA)	NO. OF BOARDS	1	0.00131444
38.0	415V, 2500A, UNIT-1 ESP LTMSB-A (01BFC)	NO. OF BOARDS	1	0.00131444
39.0	415V, 2500A, UNIT-1 ESP LTMSB-B (01BFD)	NO. OF BOARDS	1	0.00131444
40.0	415V, 2500A, UNIT-1 ESP LTMSB-C (01BFE)	NO. OF BOARDS	1	0.00131444
41.0	415V, 2500A, UNIT-1 ESP LTMSB-D (01BFF)	NO. OF BOARDS	1	0.00131444
42.0	415V, 63A, UNIT-1 SOOT BLOWER MCC (01BJI)	NO. OF BOARDS	1	0.00131444
43.0	220V, 50A, FGD/FOPH DCDB	NO. OF BOARDS	1	0.00131444
44.0	220V, 50A, RWPH DCDB	NO. OF BOARDS	1	0.00131444
45.0	415V, WALL MOUNTED ACDB	NO. OF BOARDS	8	0.00078867
46.0	220V, WALL MOUNTED DCDB	NO. OF BOARDS	6	0.00059150
47.0	LT DATA CONCENTRATOR PANEL WITH ACCESSORIES (INCLUDING INSTALLATION OF LOOSE ITEMS, MINOR WIRING IN THE ASSOCIATED PANELS.)	SET	2	0.00019717
48.0	MOUNTING OF ETHERNET SWITCHES AT DIFFERENT LT SWGR PANELS INCLUDING LMU AND INTERNAL WIRING ETC. FOR LT DATA CONCENTRATOR SYSTEM	Nos.	40	0.00047320
L	**GENERATOR RELAY PANELS, VARIOUS CONTROL PANELS, DAVR AND OTHER MISC. PANELS** (INCLUDING FITTING OF LOOSE ITEMS, INTERNAL WIRING IF ANY COMPLETE)			
1.0	Generator Relay Panel (GEN/GT/UT PROT. PANELS)	SET	1	0.00052578
2.0	STATION TRANSFORMER RELAY PANEL	SET	1	0.00032861
3.0	Electrical Control Panel in CCR	SET	1	0.00039433
4.0	Electrical Control Panel for other area	SET	8	0.00210311
5.0	MASTER CLOCK SYSTEM PANEL including associated items complete	SET	1	0.00007887
6.0	R.T.C.C. PANEL FOR POWER TRANSFORMERS	Nos.	3	0.00039433

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Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
7.0	DIGITAL AUOTOMATIC VOLTAGE REGULATOR BOARD (COMPRISING OF TRANSFORMER, REGULATION, THYRISTOR & FIELD SUPPRESSION CUBICLES - INCLUDING FITTINGS OF LOOSE ITEMS LIKE PC MONITOR AND OTHER ITEMS, INTERNAL WIRING IF ANY ETC. COMPLETE)	Set	1	0.00078867
8.0	**ENERGY MANAGEMENT SYSTEM PANELS**			
8.1	CONTROL PANEL OF EMS WITH ACCESSORIES	SET	1	0.00009858
8.2	LOCAL PANELS OF EMS WITH ACCESSORIES	SET	10	0.00098583
9.0	ELECTRICAL INTERFACE SYSTEM (EIS) PANELS	NO.	3	0.00029575
10.0	SAS / SWITCHYARD COMMUNIACTION CONTROL PANEL	No.	1	0.00015773
11.0	COMMISSIONING OF LOCAL CONTROL PANEL OF CENTRAL OIL PURIFICATION UNIT (Commisssioning only - erection by other vendor)	No.	1	0.00007887
12.0	COMMISSIONING OF LOCAL CONTROL PANEL FOR MISC SYSTEM LIKE DOSING, LP/HP BYPASS SYSTEM ETC.	No.	5	0.00039433
13.0	Misc. Electrical Relay/Transducer Panel (Commisssioning only - erection by other vendor, COMMISSIONING RATE INCL. MOUNTING OF LOOSE COMPONENTS, INTERNAL WIRING ETC.)	No.	5	0.00039433
M	**MISCELLANEOUS ITEMS OF ESP** **(Including fitting of loose items, internal wirings if any etc. complete)**			
1.0	Electronic Control Panel (with ARECA-II CONTROLLER)	No. Of Panel	56	0.00552066
2.0	DATA LOGGER PC WITH COLOR MONITOR	Set	1	0.00001301
3.0	IOS PC WITH COLOUR MONITOR (21")	Set	1	0.00002600
4.0	COLOR PRINTER (INKJET)	Nos	2	0.00002601
5.0	INTERLOCKS	Set	4	0.00020807
6.0	63A SWITCH FUSE UNIT	Set	4	0.00004732
7.0	LOCAL CONTROL UNIT	Nos	4	0.00004732
8.0	REMOTE CONTROL UNIT	Nos	8	0.00009464
9.0	REMOTE CONTROL UNIT PANEL	Nos	1	0.00004732
10.0	LOCAL CONTROL BOX (JUNCTION BOX) FOR PANEL TYPE HOPPER HEATER	Nos	56	0.00088331
11.0	POWER SUPPLY DISTRIBUTION SOCKET	Nos	1	0.00000789
12.0	ALI CONTROL PANEL (HIGH LEVEL)	Nos	1	0.00009464
(FROM SL. NO. 13.0 TO 24.0 : ONLY COMMISSIONING, ERECTION BY OTHER VENDOR)				
13.0	HEATING ELEMENTS FOR HOPPER HEATER (PANEL TYPE)	SET	56	0.00011409
14.0	HEATING ELEMENTS FOR SUPPORT INSULATOR HEATER	Nos	224	0.00043718
15.0	HEATING ELEMENTS FOR SHAFT INSULATOR HEATERS	Nos	56	0.00010929
16.0	THERMOSTAT FOR HOPPER HEATERS	Nos	112	0.00021859
17.0	THERMOSTAT FOR SUPPORT INSULATOR HEATERS	Nos	8	0.00001250

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

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Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
18.0	ASH LEVEL INDICATOR INCLUDING CONTROL UNIT(LOW & HIGH)	Set	224	0.00035008
19.0	OPACITY MONITOR	Nos	4	0.00001040
20.0	DISCONNECTING SWITCH	Nos	56	0.00010929
21.0	ELECTRICALLY OPERATED HOIST (3T)	Nos	4	0.00015604
22.0	GEARED MOTOR FOR GD SCREEN RAPPING (GDRM)	Nos.	8	0.00007801
23.0	GEARED MOTOR FOR COLLECTING ELECTRODE RAPPING MECHANISM (CERM)	Nos	56	0.00054604
24.0	GEARED MOTOR FOR EMITTING ELECTRODE RAPPING MECHANISM (EERM)	Nos	56	0.00054604
N	**DC Starter Panel/ Starter Cabinet** (Including fitting of loose items, internal wirng if any)			
1.0	STARTER CABINET FOR DC JACKING OIL MOTOR WITH RESISTANCE BOX	SET	1	0.00009858
2.0	STARTER CABINET FOR DC EMERGENCY LUB .OIL MOTOR WITH RESISTANCE BOX	SET	1	0.00009858
3.0	STARTER CABINET FOR DC SEAL OIL MOTOR WITH RESISTANCE BOX	SET	1	0.00006572
4.0	STARTER CABINET FOR DC SCANNER AIR MOTOR WITH RESISTANCE BOX	Nos	1	0.00009858
5.0	DC STARTER CONTROL PANEL OF TDBFP WITH RESISTANCE BOX	Nos	2	0.00013144
6.0	LOCAL MOTOR STARTER FOR VENTILATION FANS ETC.	Nos	300	0.00315466
O	**JUNCTION BOX, PUSH BUTTON ETC.**			
O.1	**JUNCTION BOX**			
1.0	JUNCTION BOX -6 WAY	Nos.	2	0.00000715
2.0	JUNCTION BOX -12 WAY	Nos.	2	0.00000781
3.0	JUNCTION BOX -24 WAY	Nos.	2	0.00000781
4.0	JUNCTION BOX -36 WAY	Nos.	2	0.00000910
	(JUNCTION BOX FOR ESP)			
5.0	FRP POWER JB VAR-01	Nos.	9	0.00003513
6.0	FRP POWER JB VAR-03	Nos.	17	0.00006636
7.0	FRP JUNCTION BOX -CONTROL FOR ESP	Nos.	110	0.00042937
8.0	JUNCTION BOX FOR HOPPER HEATERS (LCB)	Nos	56	0.00021859
9.0	JUNCTION BOX FOR SUPPORT INSULATOR HEATERS	Nos	16	0.00006245
10.0	JUNCTION BOX FOR SHAFT INSULATOR HEATERS	Nos	8	0.00003123
11.0	JUNCTION BOX FOR START STOP PUSH BUTTON	Nos	16	0.00006245
12.0	JUNCTION BOX FOR HOPPER HEATER FEEDBACK	Nos	16	0.00006245
13.0	JUNCTION BOX FOR ALI – LOW & HIGH (CONTROL)	Nos	32	0.00012491
14.0	JUNCTION BOX FOR OPACITY MONITOR	Nos	4	0.00001561

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SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
15.0	LOCAL JUNCTION BOX FOR ALI – LOW & HIGH (CONTROL)	Nos	32	0.00012491
O.2	**PUSH BUTTONS**			
1.0	LOCAL START STOP PUSH BUTTON FOR RAPPING MOTOR	Nos	120	0.00059150
2.0	Local Push Button Stations (Non flame proof)	Nos.	1200	0.00591499
3.0	Local Push Button Stations (Flame proof)	Nos.	200	0.00111728
P	**DC System (Including fitting of battery stand/rack, fitting of loose items like connectors, thyristors, transformer etc. with necessary internal wirings etc. complete and handling & filling of electrolyte)**			
P.1	**220V, Battery Bank**			
1.1	2X170 KBH 725P Main Plant Battery Bank (Composite bank of 2 x 170 Nos. Cells, Dimension of each cell 0.6X0.25X0.5 Meter)	Set	2	0.00324966
1.2	1X170 KBH 30P Other area Battery Bank (1 x 170 Nos. Cells, Dimension of each cell 0.2X0.25X0.4 Meter)	Set	2	0.00295328
1.3	1X170 KBH 24P Other area Battery Bank (1 x 170 Nos. Cells, Dimension of each cell 0.2X0.25X0.4 Meter)	Set	2	0.00305511
P.2	**Battery Charger**			
2.1	Float cum Boost Battery Charger, 455A	Set	2	0.00048115
2.2	Float cum Boost Battery Charger, 50A	Set	2	0.00031210
2.3	Float cum Boost Battery Charger, 50A	Set	2	0.00031210
P.3	**DC Isolation Box**			
3.1	220V DC ISOLATION BOX	Nos	6	0.00011706

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SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
X	**MISCELLANEOUS**			
X.1	**MOTORS, ACTUATORS, SOOT BLOWERS ETC. (EXCLUDING ERECTION - TO BE ERECTED BY OTHER VENDORS)**			
1.0	DRYING OUT, TESTING ETC. OF HT MOTORS	No.	100	0.00260047
2.0	MOUNTING OF CTs, CONNECTORS, INTERNAL WIRING ETC. OF HT MOTORS	No.	14	0.00055207
3.0	DRYING OUT, TESTING ETC. OF LT MOTORS	No.	480	0.00749081
4.0	Actuators (Limit switches setting, position feedback calibration, commissioning for motor operated valves,dampers, gates etc.)	No.	550	0.00500653
5.0	COMMISSIONING OF SOOT BLOWERS, WALL BLOWERS, APH HOT BLOWERS ETC. (EXCLUDING ERECTION - TO BE ERECTED BY OTHER VENDORS)	No.	90	0.00087757
6.0	Checking of Earth Resistance value of Electrical/Electronic Earth Pit.	No.	50	0.00082153
X.2	COMMISSIONING OF ELECTRICAL OPERATED HOIST (EXCLUDING ERECTION - TO BE ERECTED BY OTHER VENDORS)	No.	20	0.00078022
X.3	UPS (UPTO 10 KVA) WITH BATTERY & ACCESSORIES (FOR DATA CONCENTRATOR/SAS & MISC. SYSTEM)	SET	4	0.00031547
X.4	ASSEMBLY & INSTALLATION OF CONTROL DESK/STATION (A SET OF ONE NO. TABLE, TWO NO. CHAIRS, COMPUTERS, PRINTERS,SCANNERS & ASSOCIATE ACCESSORIES)	SET	8	0.00012619
X.5	**FABRICATION AND ERECTION (SUPPLY OF STRUCTURAL MATERIAL BY BHEL & SUPPLY OF COSUMABLES & PAINTS ETC. BY VENDOR**)			
1.0	Fabrication & erection of foundation/ base frames, support structures for Switchgears ,Control Panel,LCC/LPBS, Starters ,Fuse Boards and Misc. panels etc. by MS Structural items (like MS Angles, Channels, Plates, Flats etc.) including supply of all required consumables, paints etc.	MT	40	0.00806259
X.6	**CHEQUERED PLATES**			
1.0	Fabrication & erection of Chequered Plates (Material supply by BHEL) for covering up leftover floor cutout / trench around switchgear / panels (inclusive supply of all consumables , paints etc.).	MT	2	0.00040313
X.7	**INSERT PLATES /ANCHOR FASTENERS** (including supply of consumables, paints etc.)			
1.0	Fabrication of INSERT PLATES by MS plates (upto 12 mm thick), angle /flats etc.(Material supply by BHEL) and its installation on wall /floor/ceiling.	MT	0.8	0.00016125
2.0	Supply & Installation of heavy duty galvanised friction ANCHOR FASTENERS (reputed make), at least 100 mm length in concrete, of following sizes:			
2.1	Dia 8 mm	Set	3000	0.01892798
2.2	Dia 10 mm	Set	3000	0.01892798
2.3	Dia 12 mm	Set	1500	0.00946399
2.4	Dia 16 mm	Set	350	0.00220826
3.0	Supply and installation of Fasteners like nut, bolts, washer of all varriants	KG	35	0.00013662
X.8	**CANOPIES** (Including supply of all consumables, paints etc.)			
1.0	Fabrication and installation of canopies of 2 mm thick GI sheet (Material supply by BHEL) for protection of outdoor LPBs / starters etc.	Sq. Meter	35	0.00027297
X.9	**RUBBER MAT**			
1.0	Installation of Insulating rubber mat of appropriate voltage class Size for laying infront of switchgears upto 11KV. (as required under IE Rule).	Sq. Meter	2000	0.00181446

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Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
X.10	**DISPLAY BOARD**			
1.0	Installation of Electric Shock Treatment Display board as per IE Rules, Laminated on fibre material (size : 2.5 ft x 3.5 ft) and mounted on wooden frame) for switchgear rooms / substations	Pieces	70	0.00006351
2.0	11KV/3.3 KV/415V DANGER PLATE (size : 0.8 ft x 1ft)	Pieces	130	0.00011794
X.11	**Installation of MS HOT DIP GALVANISED THREADED & HEXAGONAL HEAD CABLE GLAND ADAPTORS/GLAND HOLE PLUGS AS PER REQUIRED SIZE AND SHAPES as per sample provided by BHEL**	KG.	180	0.00023466
X.12	**Application of Moisture Sealing compounds for wall, floor, panel openings for all variants**	Sq. Mtr.	35	0.00027297
X.13	**VFD PANELS AND ACCESSORIES**			
1.0	3.3 KV VFD panels FOR Ist pass RO HP motor	SET	3	0.00023660
2.0	415 V 1st pass RO booster pump VFD	SET	3	0.00018928
3.0	415 V UF permeate pump VFD	SET	6	0.00037856
4.0	415 V 2nd pass RO HP pump VFD	SET	3	0.00018928
5.0	415 V UF backpulse pump VFD	SET	2	0.00012619
6.0	415 V UF air blower VFD	SET	2	0.00012619
Y	**GENERATOR CIRCUIT BREAKER**			
Y.1	**21 KV Generator Circuit Breaker** (Including anchoring of base frames, fitting of loose items, connection of flexibles, filling of SF6 Gas, mouning of cooling fan arrangements etc. complete set)	Set	1	0.00164305
Z	**TRANSFORMERS**			
Z.1	**OIL FILLED TRANSFORMERS (SCOPE OF WORK:** **a) SHIFTING OF TRANSFORMER (IF REQUIRED) FOR ERECTION PURPOSE (Job involving Loading from storage location inside the plant premises, Transportation through multi axle low bed trailer and unloading for erection purpose)** **b) Erection, Testing and commissioning of Transformer and associated Equipments / accessories.** **Note- FOR GT,Additional scope is unloading and/or shifting(if required) and placement of GT on foundation.**			
1.0	Generator Transformer (3x1 phase 270MVA, {(420/√3)/21KV)} alongwith all accessories complete (01BAT01,01BAT02,01BAT03)			
1.0 (a)	UNLOADING AND/OR SHIFTING(if required) & PROPER PLACEMENT ON FOUNDATION OF TRANSFORMER FOR ERECTION PURPOSE	Set	1	0.00508775
1.0 (b)	Erection, Testing and commissioning of Transformer and associated Equipments / accessories.)	Set	1	0.02090220
2.0	Spare GT 1X1 Phase 270MVA, {(420/√3)/21KV}) alongwith all accessories complete			
2.0 (a)	UNLOADING AND/OR SHIFTING(if required) & PROPER PLACEMENT ON FOUNDATION OF TRANSFORMER FOR ERECTION PURPOSE	Set	1	0.00169589
2.0 (b)	Erection, Testing and commissioning of Transformer and associated Equipments / accessories.)	Set	1	0.00696740
3.0	Station Transformer (125/62.5/62.5 MVA, 230/11.5/11.5 KV) with NGR and all accessories complete (00BAT01)	Set	1	0.00828099
4.0	65 MVA, 21/11.5 KV Unit Transformer with NGR and accessories complete (01BBT01, 01BBT02)			
4.0 (a)	SHIFTING OF TRANSFORMER MATERIAL FOR ERECTION PURPOSE & PROPER PLACEMENT OF TANK ON FOUNDATION	Set	2	0.00197166

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Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
4.0 (b)	Erection, Testing and commissioning of Transformer and associated Equipments / accessories.)	Set	2	0.00920110
5.0	16 MVA, 11/3.45 KV Unit Aux. Transformer - 1A & 1B with NGR and accessories complete (01BBT03, 01BBT04)			
5.0 (a)	SHIFTING OF TRANSFORMER MATERIAL FOR ERECTION PURPOSE & PLACEMENT OF TANK ON FOUNDATION	Set	2	0.00092011
5.0 (b)	Erection, Testing and commissioning of Transformer and associated Equipments / accessories.)	Set	2	0.00591499
6.0	8 MVA, 11/3.45 KV Station Aux. Transformer with NGR and accessories complete (00BBT01)			
6.0 (a)	SHIFTING OF TRANSFORMER MATERIAL FOR ERECTION PURPOSE & PROPER PLACEMENT OF TANK ON FOUNDATION	Set	1	0.00032861
6.0 (b)	Erection, Testing and commissioning of Transformer and associated Equipments / accessories.)	Set	1	0.00256316
7.0	6.3 MVA, 11/3.45 KV FGD Aux. Transformer - 1A & 1B with NGR and accessories complete (01BBT05, 01BBT06)			
7.0 (a)	SHIFTING OF TRANSFORMER MATERIAL FOR ERECTION PURPOSE & PROPER PLACEMENT OF TANK ON FOUNDATION	Set	2	0.00065722
7.0 (b)	Erection, Testing and commissioning of Transformer and associated Equipments / accessories.)	Set	2	0.00460055
8.0	12.5 MVA, 11/3.45 KV CHP Aux. Transformer - 1A&1B with NGR and accessories complete (00BBT03, 00BBT04)			
8.0 (a)	SHIFTING OF TRANSFORMER MATERIAL FOR ERECTION PURPOSE & PLACEMENT OF TANK ON FOUNDATION	Set	2	0.00078867
8.0 (b)	Erection, Testing and commissioning of Transformer and associated Equipments / accessories.)	Set	2	0.00558638
9.0	12.5 MVA, 11/3.45 KV CHP Aux. Transformer - 2A&2B with NGR and accessories complete (00BBT05, 00BBT06)			
9.0 (a)	SHIFTING OF TRANSFORMER MATERIAL FOR ERECTION PURPOSE & PROPER PLACEMENT OF TANK ON FOUNDATION	Set	2	0.00078867
9.0 (b)	Erection, Testing and commissioning of Transformer and associated Equipments / accessories.)	Set	2	0.00558638
10.0	10 MVA, 11/3.45 KV CHP Aux. Transformer - 3A&3B with NGR and accessories complete (00BBT07, 00BBT08)			
10.0 (a)	SHIFTING OF TRANSFORMER MATERIAL FOR ERECTION PURPOSE & PROPER PLACEMENT OF TANK ON FOUNDATION	Set	2	0.00065722
10.0 (b)	Erection, Testing and commissioning of Transformer and associated Equipments / accessories.)	Set	2	0.00525777
11.0	3.5 MVA, 11/3.45 KV AHP Aux. Transformer - A&B with NGR and accessories complete (00BBT09, 00BBT10)			
11.0 (a)	SHIFTING OF TRANSFORMER MATERIAL FOR ERECTION PURPOSE & PROPER PLACEMENT OF TANK ON FOUNDATION	Set	2	0.00039433
11.0 (b)	Erection, Testing and commissioning of Transformer and associated Equipments / accessories.)	Set	2	0.00420622
12.0	3.5 MVA, 11/3.45 KV AHP Silo Jetty Transformer - A&B with NGR and accessories complete (00BBT11, 00BBT12)			
12.0 (a)	SHIFTING OF TRANSFORMER MATERIAL FOR ERECTION PURPOSE & PROPER PLACEMENT OF TANK ON FOUNDATION	Set	2	0.00039433
12.0 (b)	Erection, Testing and commissioning of Transformer and associated Equipments / accessories.)	Set	2	0.00420622
13.0	3.5 MVA, 11/3.45 KV Raw Water Transformer - A&B with NGR and accessories complete (00BBT13, 00BBT14)			
13.0 (a)	SHIFTING OF TRANSFORMER MATERIAL FOR ERECTION PURPOSE & PROPER PLACEMENT OF TANK ON FOUNDATION	Set	2	0.00039433
13.0 (b)	Erection, Testing and commissioning of Transformer and associated Equipments / accessories.)	Set	2	0.00420622

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SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
14.0	95 KV, 1000mA HVR TRANSFORMER (ERECTION IS EXCLUDED - OIL FILTRATION & COMMISSIOINING ONLY)	No.	56	0.00920110
Z.2	**OIL FILLLED SERVICE TRANSFORMERS**			
1.0	2.5 MVA, 11 /0.433KV, RODM Plant Service Transformer with all accessories complete (00BFT09, 00BFT10)	Set	2	0.00091866
2.0	2 MVA, 11 /0.433KV, CT Service Transformer with all accessories complete (01BFT15, 01BFT16, 01BFT15)	Set	3	0.00137800
3.0	2 MVA, 11 /0.433KV, Fuel Oil Service Transformer with all accessories complete (00BFT05,00BFT05)	Set	2	0.00091866
4.0	2 MVA, 11 /0.433KV, Aux. Boiler Service Transformer with all accessories complete (00BFT07, 00BFT08)	Set	2	0.00091866
5.0	2 MVA, 11 /0.433KV, Admin Service Transformer with all accessories complete (00BFT11, 00BFT12)	Set	2	0.00091866
6.0	2 MVA, 11 /0.433KV, Desalination Service Transformer with all accessories complete (00BFT13, 00BFT14)	Set	2	0.00091866
7.0	1.6 MVA, 11 /0.433KV, ESP Service Transformer with all accessories complete (01BFT05, 01BFT06, 01BFT07, 01BFT08, 01BFT09, 01BFT10, 01BFT11, 01BFT12)	Set	8	0.00189911
Z.3	**DRY TYPE TRANSFORMERS**			
1.0	2500 KVA, 11 KV/433V, WITH ALL ACCESSORIES COMPLETE	No.	6	0.00195060
2.0	2000 KVA, 11 KV/433V, WITH ALL ACCESSORIES COMPLETE	No.	4	0.00135650
3.0	1600 KVA, 11 KV/433V, WITH ALL ACCESSORIES COMPLETE	No.	2	0.00045514
4.0	8500 KVA, 21 KV/765V EXCITATION TRANSFORMER & RECTIFIER UNIT WITH ALL ACCESSORIES COMPLETE	No.	1	0.00045933
ZA	**BUSDUCTS** (Including erection of loose items like seal of bushings, wall frames, bellows, CTs and its wiring etc. as per drawing)			
ZA.1	**IP BUSDUCT(24KV)**			
a.	Main Bus Duct, 1700MM DIA (Unit-1)	MTR	225	0.01552686
b.	Tap Off Bus Duct, 780MM DIA (Unit-1)	MTR	150	0.00828099
c.	Delta Busduct, 1200MM DIA (Unit-1)	MTR	140	0.00828099
d.	Top Chambers (Neutral & Phase side) - Unit-1	No.	2	0.00131444
e.	NG cubicle with NGR, NGT including assembly of loose components alongwith internal wiring, mounting of neutral CT etc.(Unit-1)	SET	1	0.00049292
f.	LAVT Cubicle including assembly of loose components alongwith internal wiring, mounting of LAs & VTs etc. (Unit-1)	SET	1	0.00052578
g.	SPVT Cubicle including assembly of loose components alongwith internal wiring, mounting of VT etc. (Unit-1)	SET	1	0.00052578
h.	Air pressurisation equipment comprising of load unit, compresser, receiver, drier, pressurising panel & control panel etc. (Unit-1)	SET	1	0.00098583
ZA.2	**SP BUSDUCT(11KV & 3.3 KV)**			
1.0	4000A SP Busduct (11 KV) - Canopy/Plain type	MTR	175	0.00632576
2.0	3500A SP Busduct (11KV) - Canopy/Plain type	MTR	590	0.02055131
3.0	3150A SP Busduct (3.3 KV) - Canopy/Plain type	MTR	147	0.00483058
4.0	2500A SP Busduct (3.3 KV) - Canopy/Plain type	MTR	72	0.00217672
5.0	2000A SP Busduct (3.3 KV) - Canopy/Plain type	MTR	24	0.00067825
6.0	1600A SP Busduct (3.3 KV) - Canopy/Plain type	MTR	20	0.00052578

VOLUME-III-R00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO-PSER:SCT:KLN-E2060:20

SCH-3: SERVICE (PART-I)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
7.0	1250A SP Busduct (3.3 KV) - Canopy/Plain type	MTR	98	0.00244749
8.0	1000A SP Busduct (3.3 KV) - Canopy/Plain type	MTR	65	0.00149518
ZA.3	**LT BUSDUCTS** (each set complete comprising tentatively of following : Straight Run, 90 degree bend, Flexible Copper at Transformer end, Flexible at Switchgear end , Adapter, Expansion joint, Phase cross over, hardware at Transformer & SWBD end, silica gel breather etc.)			
1.0	4000A	SET	6	0.00165620
2.0	3200A	SET	15	0.00354900
3.0	3000A	SET	10	0.00223455
4.0	2500A	SET	1	0.00020505
ZB)	**DG SETS**			
ZB.1	2000 KVA, 415V, 2780A, DG SETs (FOR MAIN PLANT) along with Accoustic enclosure, Fuel tank(day tank, bulk oil tank), fuel oil piping, exhaust piping, DG set stack Installation, Generator terminal adaptor/box, Current transformer, instruments, Power JB, Control JB, cleaning of radiator tubes (cleaning agent to be supplied by BHEL), replacement of engine oil and its filter, lub. oil filter, radiator coolant (Diesel for commissioning, engine oil & its filter, lub oil, lub. oil filter, coolant to be supplied by BHEL) Cabling, earthing, etc. complete.	SETS	2	0.01064699
ZB.2	750 KVA, 415V, 1043A, DG SETs (FOR FGD) along with Accoustic enclosure, Fuel tank(day tank, bulk oil tank), fuel oil piping, exhaust piping,DG set stack Installation, Generator terminal adaptor/box, Current transformer, instruments, Power JB, Control JB, cleaning of radiator tubes (cleaning agent to be supplied by BHEL), replacement of engine oil and its filter, lub. oil filter, radiator coolant (Diesel for commissioning, engine oil & its filter, lub oil, lub. oil filter, coolant to be supplied by BHEL) Cabling, earthing, etc. complete.	SETS	1	0.00378560
ZB.3	**PANELS, BATTERY, DG Bus Duct ETC.** (Including fitting of loose items, internal wiring if any etc.)			
1.0	AMF PANEL & DG AUX. PANEL/DB	Set	3	0.00019717
2.0	24V DC, Lead Acid Type automotive Battery with accessories and stand (360AH)	Set	2	0.00012619
3.0	24V DC, Lead Acid Type automotive Battery with accessories and stand (180AH)	Set	1	0.00004732
4.0	Float cum Boost Battery Charger with stand	Nos.	3	0.00011830
5.0	NGR Panel	Nos.	3	0.00018731
6.0	Fuel transfer pump (3.7 KW) with accessories (Flow meters, valves, gauges etc.) for 2000kVA DG Sets	Set	2	0.00013802
7.0	Fuel transfer pump control panel	Set	1	0.00006729
8.0	Insulation & cladding	MT	3	0.00051263
9.0	Fabrication & erection of piping (upto 3"dia) between Fuel transfer Pumps for DG located in FOPH and buffer tank of DG set	MT	2	0.00031547
10.0	415V Bus Duct of DG Set (from DG to SWGR panel) (Including erection of loose items like seal of bushings, wall frames, bellows etc. as per drawing)	Meter	500	0.00985832
ZC	SUPPORT STRUCTURE (FOR ALL TYPE OF BUS DUCTS, DG SET ETC.) INCLUDING FABRICATION OF DG STRUCTURE (supply of materials is by BHEL)	MT	100	0.01577331
	TOTAL			**0.98386733**

VOLUME-III-R00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO- PSER:SCT:KLN-E2060:20

SCH-4: SUPPLY (PART-II)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
A	**RUBBER MAT**			
1.0	Supply of Rubber mat of appropriate voltage class Size for laying infront of switchgears upto 3.3 KV. (as per International Standard).	Pieces	210	0.00283696
2.0	Supply of Rubber mat of appropriate voltage class Size for laying infront of switchgears above 3.3 KV and upto 11 KV Switchgear. (as per International Standard).	Pieces	140	0.00257866
B	**DISPLAY BOARD**			
1.0	Supply of Electric Shock Treatment Display board as per IE Rules, Laminated on hardboard material (size : 2.5 ft x 3.5 ft) and mounted on wooden frame) for switchgear rooms / substations	Pieces	80	0.00058977
2.0	Supply of 11KV/6.6 KV/3.3 KV/415V DANGER PLATE	Pieces	50	0.00024587
C	**Supply of GALVANISED MS CONDUITS / PIPES**			
C.1	**GALVANISED MS RIGID CONDUITS**			
1.0	50 mm diameter	Metres	100	0.00016010
2.0	100-125 mm diameter	Metres	50	0.00036861
C.2	**FLEXIBLE CONDUITS MADE OF COLD ROLLED ANNEALED ELECTRO GALVANISED MS STRIP**			
1.0	20-25 mm diameter	Metres	1000	0.00099109
				0.00000000
D	**Supply of MS HOT DIP GALVANISED THREADED & HEXAGONAL HEAD CABLE GLAND ADAPTORS/GLAND HOLE PLUGS AS PER REQUIRED SIZE AND SHAPES**	KG.	50	0.00030762
E	**Supply of Moisture Sealing compounds for wall, floor, panel openings for all variants**	Sq. Mtr.	30	0.00092080
EA	**Supply of Grey shade (RAL 7032) paint (For use in Transformer, Bus Duct, HT/LT SWBDs etc. as touch-up paint)**	Ltr.	50	0.00019717
F	**CABLE GLANDS & LUGS**			
F.1	**Supply of DOUBLE COMPRESSION HEAVY DUTY CABLE GLANDS (Use upto 11KV level)**			
	ABOVE (MM) UP TO (MM)			
1.0	Upto 15	Nos.	12	0.00002004
2.0	15 18	Nos.	12	0.00002461
3.0	18 21	Nos.	12	0.00003092
4.0	21 24	Nos.	12	0.00004108
5.0	24 27	Nos.	12	0.00004849
6.0	27 30	Nos.	12	0.00005077
7.0	30 33	Nos.	12	0.00007383
8.0	33 36	Nos.	12	0.00008188
9.0	36 39	Nos.	12	0.00010320
10.0	39 42	Nos.	4	0.00004065
11.0	42 46	Nos.	4	0.00004065
12.0	46 50	Nos.	4	0.00005096
13.0	54 58	Nos.	4	0.00006578
14.0	58 62	Nos.	4	0.00007639
15.0	62 70	Nos.	4	0.00007639
16.0	70 78	Nos.	4	0.00009716

VOLUME-III-R00
PRICE SCHEDULE

Erection, testing & Commissioning of cable trays, cabling, lighting and earthing protection, HT/LT Transformer, HT/LT Bus duct, HT/LT Switchgears,HT/LT Motors, various Panels, DG Set, other misc electrical equipment for Main Plant Area-U#1,FGD U#1 and BOP Area-Common for U#1&2 of 2x660 MW Maitree STPP,Rampal,Bangladesh.

TENDER NO- PSER:SCT:KLN-E2060:20

SCH-4: SUPPLY (PART-II)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
F.2	**Supply of Cu/Al. LUGS (HEAVY DUTY TYPE) - SOLDERLESS CRIMPING TYPE (Use upto 11KV level)**			
1.0	4 sq mm	Nos.	200	0.00001220
2.0	6 sq mm	Nos.	50	0.00000419
3.0	10 sq mm	Nos.	50	0.00000457
4.0	16 sq mm	Nos.	50	0.00000610
5.0	25 sq mm	Nos.	20	0.00000366
6.0	35 sq mm	Nos.	20	0.00000488
7.0	50 sq mm	Nos.	20	0.00000762
8.0	70 sq mm	Nos.	20	0.00001235
9.0	95 sq mm	Nos.	20	0.00001769
10.0	120 sq mm	Nos.	10	0.00001212
11.0	150 sq mm	Nos.	10	0.00001570
12.0	185 sq mm	Nos.	10	0.00002066
13.0	240 sq mm	Nos.	10	0.00003155
14.0	300 sq mm	Nos.	10	0.00004606
15.0	400 sq mm	Nos.	10	0.00007240
16.0	630 sq mm	Nos.	10	0.00014827
G	**Supply of CABLE straight thru jointing kit**			
G.1	**1.1 KV LT COPPER XLPE POWER CABLE(UN-ARM)**			
1.0	1CX6 SQ. MM	Nos.	6	0.00004732
2.0	1Cx10 SQ. MM	Nos.	6	0.00004732
3.0	1Cx16 SQ. MM	Nos.	6	0.00004732
4.0	1CX25 SQ. MM	Nos.	6	0.00004732
5.0	1CX35 SQ. MM	Nos.	6	0.00004732
6.0	1CX50 SQ. MM	Nos.	6	0.00004732
7.0	1CX70 SQ. MM	Nos.	6	0.00004732
8.0	1CX95 SQ. MM	Nos.	6	0.00004732
9.0	1CX150 SQ. MM	Nos.	6	0.00004732
10.0	1CX240 SQ. MM	Nos.	6	0.00004732
11.0	1CX300 SQ. MM	Nos.	6	0.00004732
12.0	1CX500 SQ. MM	Nos.	6	0.00004732
13.0	1CX630 SQ. MM	Nos.	6	0.00004732
14.0	2CX2.5 SQ. MM	Nos.	6	0.00007098
15.0	2CX6 SQ. MM	Nos.	6	0.00007098
16.0	2CX10 SQ. MM	Nos.	6	0.00007098
17.0	2CX16 SQ. MM	Nos.	6	0.00007098
18.0	2CX25 SQ. MM	Nos.	6	0.00007098
19.0	2CX35 SQ. MM	Nos.	6	0.00007098
20.0	2CX70 SQ. MM	Nos.	6	0.00007098
21.0	2CX120 SQ. MM	Nos.	6	0.00007098
22.0	3CX2.5 SQ. MM	Nos.	6	0.00009464
23.0	03CX6 SQ. MM	Nos.	6	0.00009464
24.0	03CX10 SQ. MM	Nos.	6	0.00009464
25.0	03CX16 SQ. MM	Nos.	6	0.00009464
26.0	03CX25 SQ. MM	Nos.	6	0.00009464
27.0	03CX35 SQ. MM	Nos.	6	0.00009464
28.0	03CX50 SQ. MM	Nos.	6	0.00009464
29.0	03CX70 SQ. MM	Nos.	6	0.00009464
30.0	03CX120 SQ. MM	Nos.	6	0.00009464
31.0	03CX150 SQ. MM	Nos.	6	0.00009464

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PRICE SCHEDULE

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TENDER NO- PSER:SCT:KLN-E2060:20

SCH-4: SUPPLY (PART-II)

Sl No	ITEM DESCRIPTION	Unit	Quantity	Weightage
32.0	03CX185 SQ. MM	Nos.	6	0.00009464
33.0	03CX240 SQ. MM	Nos.	6	0.00009464
34.0	3.5CX25 SQ. MM	Nos.	6	0.00009464
35.0	3.5CX35 SQ. MM	Nos.	6	0.00009464
36.0	3.5CX70 SQ. MM	Nos.	6	0.00009464
37.0	3.5CX120 SQ. MM	Nos.	6	0.00009464
38.0	3.5CX150 SQ. MM	Nos.	6	0.00009464
39.0	3.5CX185 SQ. MM	Nos.	6	0.00009464
40.0	3.5CX240 SQ. MM	Nos.	6	0.00009464
41.0	04CX25 SQ. MM	Nos.	6	0.00009464
42.0	04CX6 SQ. MM	Nos.	6	0.00009464
43.0	04CX10 SQ. MM	Nos.	6	0.00009464
44.0	04CX16 SQ. MM	Nos.	6	0.00009464
45.0	04CX35 SQ. MM	Nos.	6	0.00009464
G.2	**LT. COPPER FIRE SURVIVAL CABLE**			
1.0	1C-150 SQ. MM	Nos.	6	0.00009464
2.0	1C-400 SQ. MM	Nos.	6	0.00009464
3.0	1C-630 SQ. MM	Nos.	6	0.00009464
4.0	2C-150 SQ. MM	Nos.	6	0.00009464
5.0	3C-2.5 SQ. MM	Nos.	6	0.00009464
6.0	3C-10 SQ. MM	Nos.	6	0.00009464
7.0	3C-25 SQ. MM	Nos.	6	0.00009464
8.0	3C-35 SQ. MM	Nos.	6	0.00009464
9.0	3C-95 SQ. MM	Nos.	6	0.00009464
10.0	3C-185 SQ. MM	Nos.	6	0.00009464
11.0	3C-150SQ. MM	Nos.	6	0.00009464
12.0	4C-16 SQ. MM	Nos.	6	0.00009464
13.0	5C-2.5 SQ. MM	Nos.	6	0.00009464
G.3	**1.1 KV LT. COPPER PVC FRLS CONTROL CABLE**			
1.0	2C X 1.5 SQ MM	Nos.	6	0.00005678
2.0	2CX2.5 SQ. MM	Nos.	6	0.00005678
3.0	3C X 1.5 SQ MM	Nos.	6	0.00005678
4.0	3C X 2.5 SQ. MM	Nos.	6	0.00005678
5.0	4C X 1.5 SQ. MM	Nos.	6	0.00005678
6.0	5C X 1.5 SQ MM	Nos.	6	0.00005678
7.0	5C X 2.5 SQ MM	Nos.	6	0.00005678
8.0	5C X 4 SQ MM	Nos.	6	0.00005678
9.0	7C X 1.5 SQ MM	Nos.	6	0.00005678
10.0	7C X 2.5 SQ. MM	Nos.	6	0.00006625
11.0	10C X 2.5 SQ. MM	Nos.	6	0.00006625
12.0	12C X 1.5 SQ MM	Nos.	6	0.00006625
13.0	12C X 2.5 SQ MM	Nos.	6	0.00006625
14.0	16C X 2.5 SQ. MM	Nos.	6	0.00006625
15.0	19CX1.5 SQ. MM	Nos.	6	0.00006625
	TOTAL			**0.01613267**