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

Ref: PSER:SCT:KLN-T1966:7559 Date: 16-05-2019

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 CUSTOMER APPROVAL & 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-T1966:19.	
ii	Broad Scope of job	Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 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: 16-05-2019* *Close: 27-05-2019* *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: 27-05-2019, 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 bidders are requested to go through the details mentioned in www.bhel.com (tender section) available in this link*	*Applicable.*

		http://www.bhel.com/pdf/DSC_checklist_web.pdf	
vi	OPENING OF TENDER	*Date: 27-05-2019* *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 41,35,772/- (or equivalent amount in USD/BDT/Other Foreign Currency as per currency matrix).*	*Applicable.*
viii	COST OF TENDER	*INR 10,000/- (or equivalent amount in USD/BDT/Other Foreign Currency as per currency matrix).*	*Applicable.*
ix	LAST DATE FOR SEEKING CLARIFICATION	*Date: 20-05-2019* *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 and not in the newspapers. 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 ($S_{1\text{-}1}$, $S_{1\text{-}2}$, $S_{1\text{-}3}$, $S_{1\text{-}4}$, $S_{1\text{-}5}$…. $S_{1\text{-}T1}$) 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 reserves the right to go for Reverse Auction (RA) (Guidelines as available on www.bhel.com) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. Bidders to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.

However, if reverse auction process is not adopted or is unsuccessful for whatsoever reason, absolute value price bid (Volume-III) uploaded in E-Procurement Site https://bhel.abcprocure.com /hard bid will be opened for deciding the successful bidder. BHEL's decision in this regard will be final & binding on bidder.

Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'Process compliance form' (to the designated service provider) as well as 'Online sealed bid' in the Reverse Auction. Non-submission of 'Process compliance form' or 'Online sealed bid' by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer. The envelope sealed price bid of successful L 1 bidder in RA, if conducted, shall also be opened after RA and the order will be placed on lower of the two bids (RA closing price & envelope sealed price) thus obtained. The bidder having submitted this offer specifically agrees to this condition and undertakes to execute the contract on thus awarded rates.

If it is found that L 1 bidder has quoted higher in online seal bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

As a reminder to the bidders, system will flash following message (in Red Color) during the course of 'online sealed bid':
"Bidders to submit online sealed bid less than or equal to their envelope sealed bid already submitted to BHEL"

In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

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).

I) 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	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	Address	Phone & Email
1.	Shri D.R.S Chaudhary, IAS (Retd.)	E-1/164, Arera Colony, Bhopal 462016 (M.P.)	dilip.chaudhary@icloud.com

2.	Mrs. Pravin Tripathi, IA & AS (Retd.)	D-243, Anupam Gardens, Lane IB, Neb Sarai, New Delhi - 110068	pravin.tripathi@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	ANISH 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 8235	033-2339 8226
Email	k.anish@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 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.

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

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	033-2335 8000
	FAX no	033-2321 1960
	E-mail	k.anish@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. Currency Matrix (Separate)
13. Other Tender documents as per this NIT.

ANNEXURE - 1

PRE QUALIFICATION CRITERIA

JOB	Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 2x660 MW Maitree STPP, Rampal, Bangladesh.
TENDER NO	PSER:SCT:KLN-T1966:19.

SL NO	CRITERIA
1 (a)	BIDDER SHOULD HAVE AVERAGE MINIMUM ANNUAL FINANCIAL TURNOVER OF USD 1330.03 THOUSAND OR EQUIVALENT AMOUNT DURING THE LAST 3 (THREE) YEARS, ENDING ON 31-03-2018 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 31-03-2018 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 31-03-2018 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 FOLLOWING WORK DURING LAST 7 YEARS, ENDING ON LATEST DUE DATE OF OFFER SUBMISSION. RELEVANT SUPPORTING DOCUMENT SHALL BE SUBMITTED.
2.1	ONE STG JOB OF ≥ 400 MW.
3.0	CONSORTIUM/JV BIDDING IS NOT ALLOWED.

NOTE

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

A	THE TERM 'EXECUTED' ABOVE MEANS ACHIEVING SYNCHRONISATION. BIDDER SHOULD HAVE ACHIEVED THE SPECIFIED CRITERIA EVEN IF THE CONTRACT HAS NOT BEEN COMPLETED OR CLOSED.
B	AFTER SATISFACTORY FULFILLMENT OF ALL THE ABOVE CRITERIA, OFFER SHALL BE CONSIDERED FOR FURTHER EVALUATION AS PER NIT AND ALL OTHER TERMS OF THE TENDER.
C	CONSIDERATION OF OFFER WILL BE SUBJECT TO CUSTOMER'S APPROVAL OF BIDDER.
D	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.
E	TWO TENDERS ARE FLOATED SEPARATELY FOR UNIT#1 & UNIT#2 OF TG & AUX INCL. FGD, FPS & LPP PACKAGES AT 2X660MW MAITREE STPP, BANGLADESH. THIS TENDER IS FOR UNIT#1

	COMPRISING OF (TG & AUX, FGD AND LPP PKGS) AND TENDER FOR UNIT#2 COMPRISING OF (TG & AUX, FGD AND FPS PKGS) SHALL BE FLOATED SUBSEQUENTLY. THESE WORKS SHALL BE AWARDED TO TWO DIFFERENT BIDDERS. BIDDERS MAY QUOTE AGAINST ANY OR BOTH THE PACKAGES. UNIT#1 PKG SHALL BE FINALISED FIRST AND THE SUCCESSFUL BIDDER OF UNIT#1 SHALL NOT BE CONSIDERED FOR UNIT#2 PKG.
F	* EQUIVALENT AMOUNT MEANS THAT IT IS CONVERTED AT RATES AS ON THE DATE OF TENDER FLOATING (SBI CARD RATES) AS BELOW: 1) CURRENCY OF SUBMITTED FINANCIAL STATEMENT TO INR – AT TT BUYING RATE; THEN 2) INR TO USD – AT TT SELLING RATE.

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. NETWORTH : Shall be calculated based on the latest Audited Accounts as furnished. Net worth = Paid up share capital + Reserves. (Net worth is required to be evaluated in case of companies)
4. PROFIT : shall be NET profit (PAT + Non cash expenditure viz depreciation) earned during any one of the 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. 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.
7. '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
8. Unless otherwise specified, for the purpose of 'Technical' criteria of PQR, the word 'EXECUTED' means achievement of milestones as defined below:
    a. "ACHIEVEMENT OF PHYSICAL QUANTITIES" as per respective PQRs.
    b. "READINESS FOR COAL FILLING" in respect of Mill Bunker.
    c. "CHARGING" in respect of Power Transformers / Bus Ducts / "HT/LT Switchgears" / "HT / LT Cabling".
    d. For C&I works: "SYNCHRONISATION" in case of power project and "WORK COMPLETION of the value as defined in PQR" in case of industry.
    e. "BOILER LIGHT UP" in respect of Boiler / CFBC / ESP.
    f. "GAS IN" in respect of HRSG.
    g. "STEAM BLOWING COMPLETION" in respect of Power Cycle Piping.
    h. "HYDRAULIC TEST" of the system in respect of Pressure parts / LP Piping / CW Piping.
    i. "FULL LOAD OPERATION OF THE UNIT" in respect of Insulation work.
    j. "SYNCHRONISATION" in respect of STG / GTG.
    k. "SPINNING" in respect of HTG.
    l. "COMPLETION AND HANDING OVER FOR MECHANICAL ERECTION" in respect of STG Deck and Machine/Equipment foundation.
9. Boiler means HRSG or WHRB or any other types of Steam Generator
10. Power Cycle piping means Main Steam, Hot Reheat, Cold Reheat, HP Bypass
11. For the purpose of evaluation of the PQR, one MW shall be considered equivalent to 3.5TPH where ever rating of HRSG/BOILER is mentioned in MW. Similarly, where ever rating of Gas Turbine is mentioned in terms of Frame size, ISO rating in terms of MW shall be considered for evaluation.
12. In case the experience/PO/WO certificate enclosed by bidders do not have separate break up prices for the E&C portion of Electrical and CI Works, (i.e. the certificates enclosed are for composite order for supply and erection of Electrical & CI and other works if any), then value of Erection and Commissioning for the Electrical & CI portion shall be considered as 15% of the supply & erection of Electrical & CI, unless otherwise specifically indicated in the PQR.
13. Scope for capital overhaul of STG shall cover Bearing Inspection work and overhauling of all cylinders of the Turbine.

14. In case the tendered scope is not a Pulverised Fuel Boiler, experience of Oil/Gas Fired Boilers also can be considered.
15. 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

16. PROFIT shall be PBT earned during any one year of last three financial years as mentioned in PQR.
17. For evaluation of PQR, the credentials of the Bidder alone, and not that of the Group Company shall be considered.
18. "Executed" means the bidder should have achieved the criteria specified in the PQR even if the Contract has not been completed or closed.
19. 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.

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, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 2x660 MW Maitree STPP, Rampal, Bangladesh.	
Ref	1.0	Tender no PSER:SCT:KLN-T1966:19.
	2.0	BHEL's NIT, vide reference no PSER:SCT:KLN-T1966:7559 Date: 16-05-2019.
	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, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 2x660 MW Maitree STPP, Rampal, Bangladesh.
TENDER NO	PSER:SCT:KLN-T1966:19.

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	Undertaking regarding Bankruptcy Code Proceedings (IBC) by NCLT or under Liquidation / BIFR	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 execution of work, the work experience shall be assigned to the Prime Bidder and the consortium partner or partners for their respective scope of work. After successful execution of two similar works with the same consortium partner or partners under direct orders of BHEL, the Prime Bidder shall be eligible for becoming a 'stand alone' bidder for similar works, subject to certification from BHEL about the active involvement of the Prime Bidder for satisfactory execution of the works.

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 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 may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit "online sealed bid" in the Reverse Auction. Non-submission of "online sealed bid" by the bidder for any of the eligible items for which techno- commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.
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 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. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL"s standard practice.
12. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the "Business Rules of Reverse Auction", which will be communicated before the Reverse Auction.
13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action *as per extant BHEL guidelines*, shall be initiated by BHEL and the results of the RA scrapped/ aborted.
14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
15. In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) will not be allowed to participate in further RA process provided minimum three bidders are left after removal of H1 bidder. In case of tie for H1 bid (identical online sealed bids), 15 minutes' additional time shall be provided and all the participating bidders shall be informed by mail/message on bidding screen to enable bidders submit revised online sealed bids so as to break the tie.

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

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

Currency Matrix for Erection contract being executed in Bangladesh - in USD (Rev. 00 (11-04-2018)

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/ Bangladesh	Tender floating	Bangladesh Bank	INR/BDT [Bangladesh Bank -- 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 - 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]
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/ Bangladesh	Tender floating	Bangladesh Bank	INR/BDT [Bangladesh Bank -- 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]
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 Card Rate --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)**				

Sl no	Nature	Mode	Currency	Place of Deposit/ Return	Exchange Rate On	Rate Published by	Payable
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
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 - 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	United States Dollars(USD)	Bangladesh			In USD
			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]
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)	Bangladesh for Recovery from RA Bill /India in case of BG			In USD
14	Performance Bank Guarantee (where applicable)	Bank Guarantee from Scheduled Bank in India. 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			In USD

TENDER NO: PSER:SCT:KLN-T1966:19

VOLUME -IB

GENERAL CONDITIONS OF CONTRACT

(SERVICE)

FOR

Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 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 of a period of two weeks by BHEL, 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-T1966:19

VOLUME -ID

SPECIAL CONDITIONS OF CONTRACT

FOR

Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 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.

SPECIAL CONDITIONS OF CONTRACT (SCC)
Chapter - III : General Technical Requirements (Codes and Standards)

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.

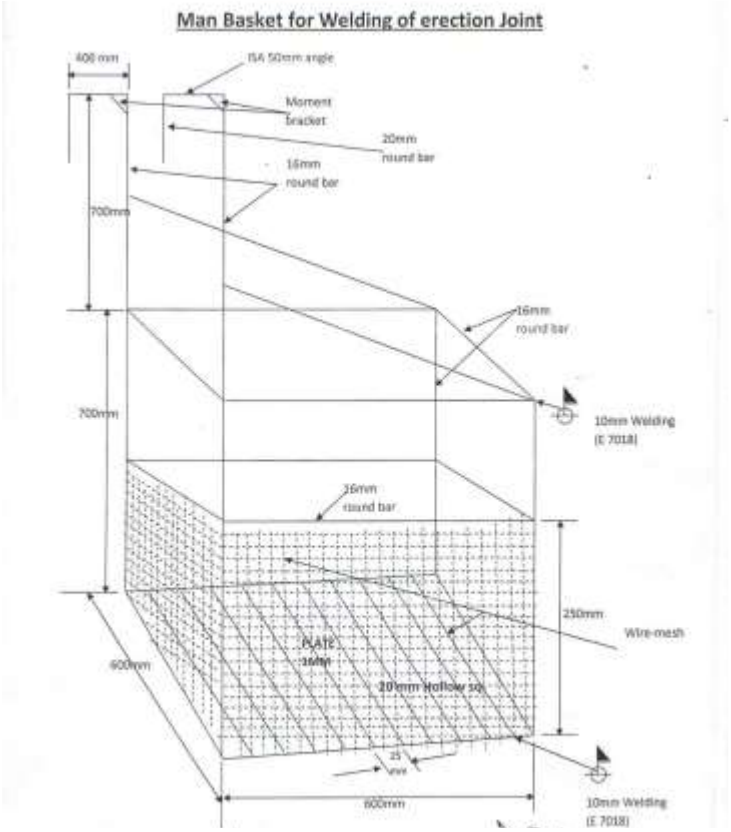
11.0 Lifting Operations:

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:

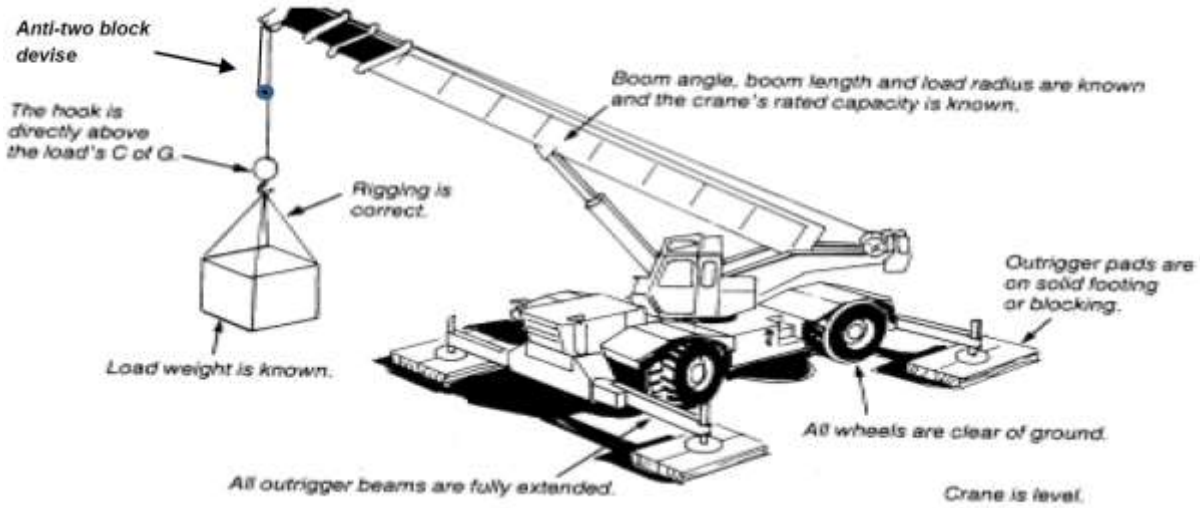
This procedure provides the guidelines to ensure proper rigging and lifting activities are accomplished safely and in accordance with applicable specifications, codes, and regulations.

- 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

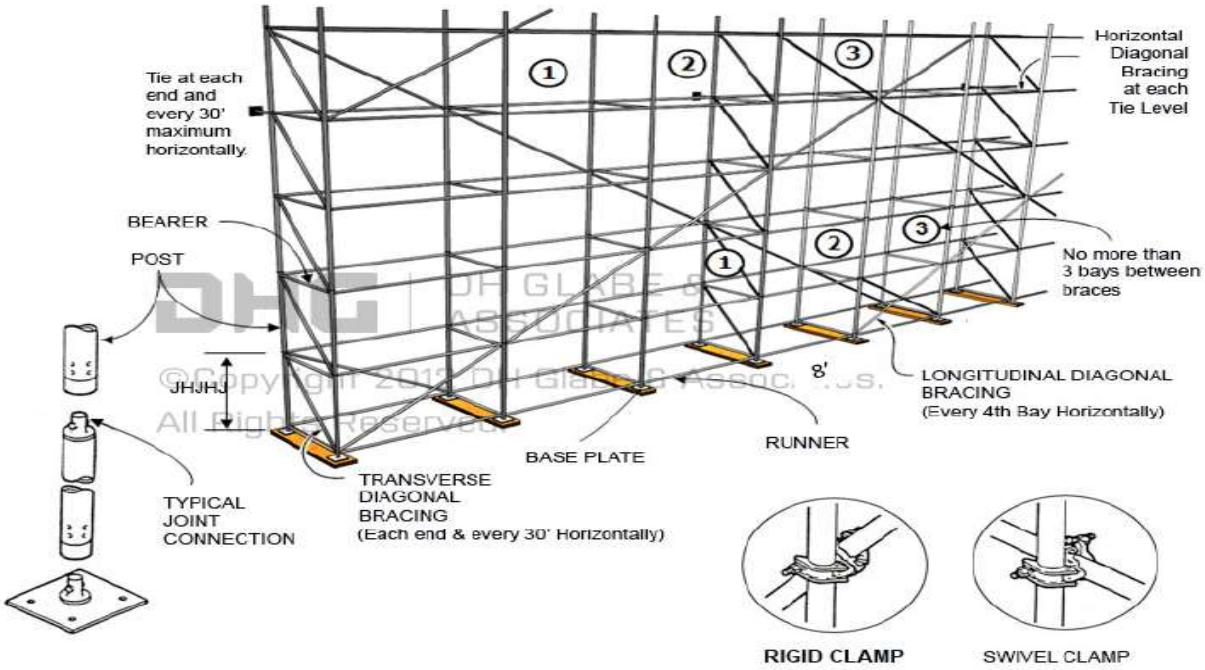
- Suspended scaffolds are platforms suspended by ropes, or other non-rigid means, from an overhead structure.
- Requirements for use are to be preapproved by HSE Head, under a specific Permit to Work.

Rolling Scaffolds

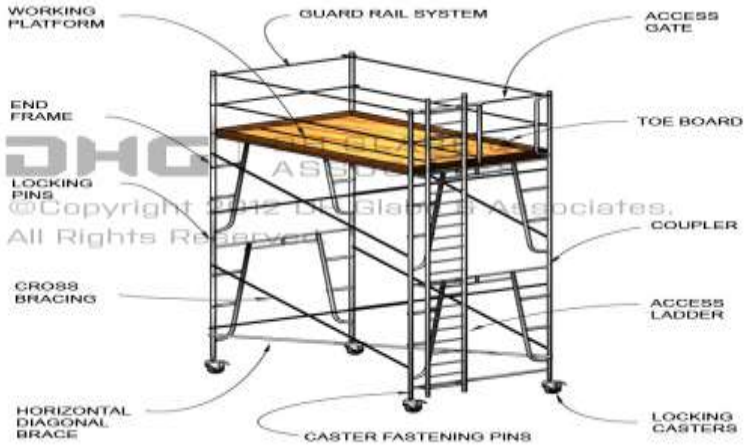
- The height of rolling scaffolds shall not exceed three times the minimum base dimension.
- The minimum base dimension of rolling scaffold will be 1.25 meters (4 feet).
- Adequate help must be provided when moving a rolling scaffold.
- Secure or remove all loose materials, equipment and tools before 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:

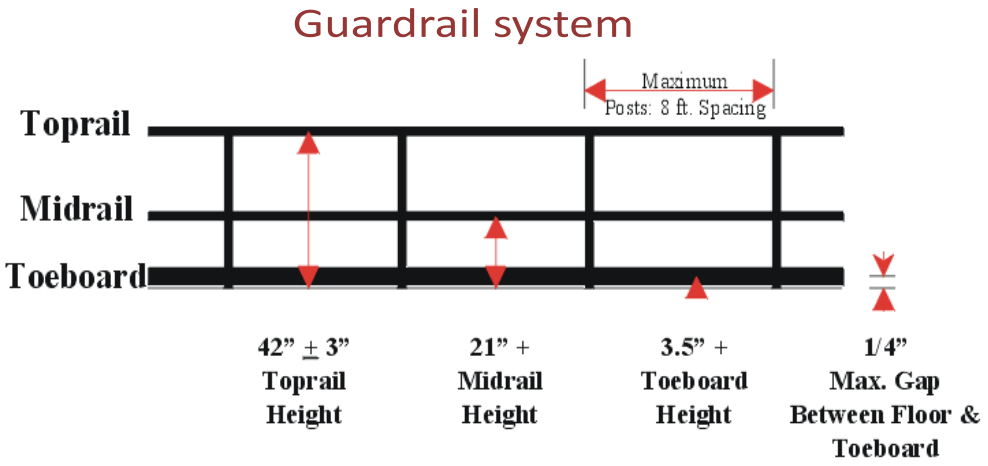
18.1SAFE USE OF LADDERS.

- 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

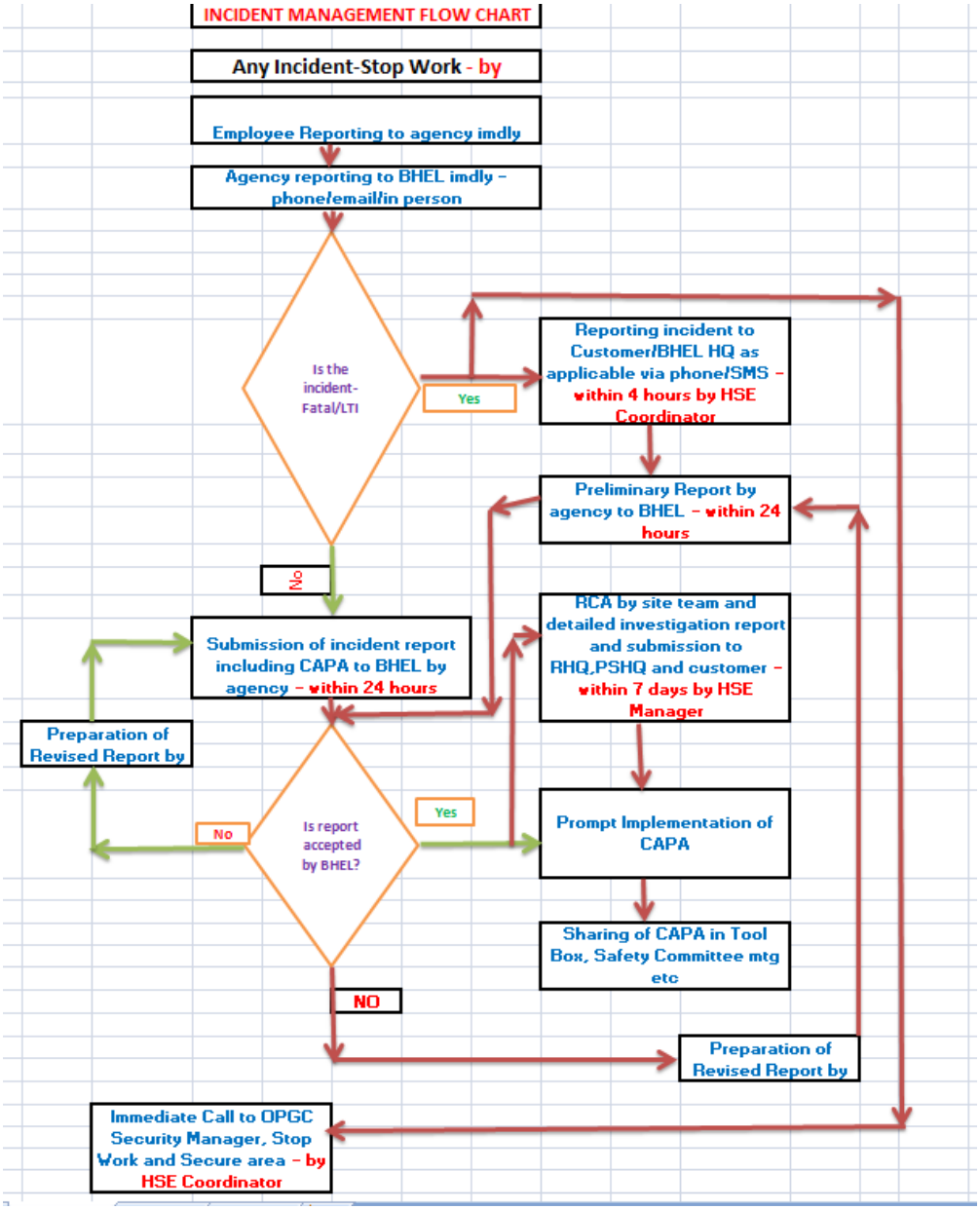
An important key to effective emergency response is an effective communication system. At BHEL, site telephone, mobile and radios will be used for communication during emergency.

- 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

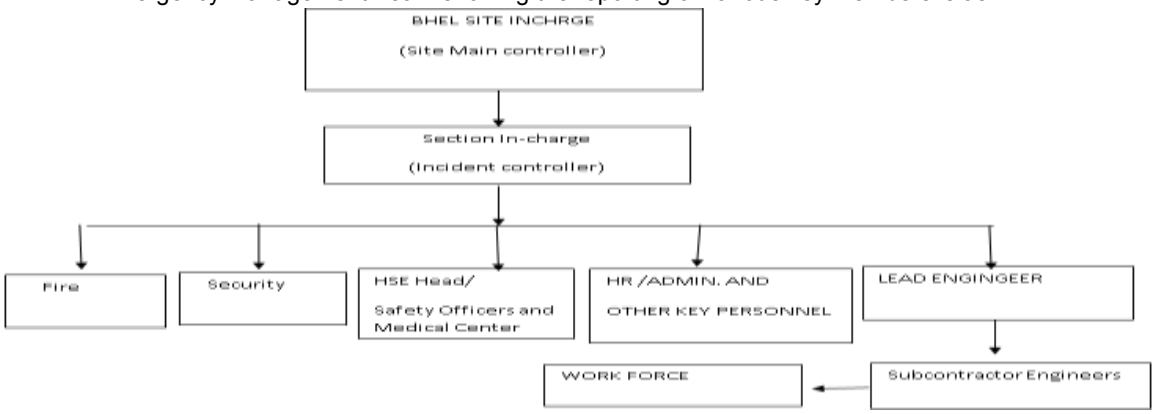
- BHEL Section In-charge will confirm the information with emergency services and also inform the Regional Manager as well as sub-contractors Site In-charge.

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.				

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.,

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

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						

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

बी एच ई एल BHEL 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.

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-T1966:19

VOLUME -IE

FORMS & PROCEDURES

FOR

Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 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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3.1			

• 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

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

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

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**			

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 pertaining 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 withheld, 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.	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 **												
Total as per last running account bill Rs.	Since last running account bill Rs	Total up to date Rs	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
1	2	3	4	5	6	7	8	9	10	11	12	13

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)											
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:

BHARAT HEAVY ELECTRICALS LIMITED,
POWER SECTOR - EASTERN REGION, KOLKATA
TENDER NO. PSER:SCT:KLN-T1966:19

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 **												
Total as per last running account bill Rs.	Since last running account bill Rs	Total up to date Rs	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
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-T1966:19

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 G

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 G

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 G

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)

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		Category of Labour	No. of Labour required as per Category	
					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			

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.

TENDER NO: PSER:SCT:KLN-T1966:19

VOLUME -IF

TECHNICAL CONDITIONS OF CONTRACT

(TCC-CML)

FOR

Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 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.

TENDER NO: PSER:SCT:KLN-T1966:19

VOLUME -IF

TECHNICAL CONDITIONS OF CONTRACT

(TCC-TS)

FOR

Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 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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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 the tender.

CLAUSE NO	DESCRIPTION
1.0	**PROJECT SYNOPSIS AND GENERAL INFORMATION**
1.1	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.
1.4	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**
	Providing labour, supervision, T&Ps, consumables, etc. for receipt from store/ storage yard, transportation to site, pre-assembly, erection, testing, commissioning, trial run, handing over, etc., as required, 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 steam turbine & its auxiliaries, generator & its auxiliaries, condenser, pump, dosing system LP, Oxygen, NaOH, etc.), condenser on line tube cleaning system, plate heat exchanger, **TG piping, various TG auxiliaries, misc. equipment, etc. including LP piping and Flue Gas De-Sulphurisation (FGD)** of 1x660 MW unit # 1 & common systems at 2x660 MW Maitree STPP, Rampal, Bangladesh.
3.0	**DELETED**
4.0	**DELETED**
5.0	**SITE VISIT**
	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	**DEVIATIONS/ CLARIFICATIONS**

	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 the 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 REQUIREMENTS (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 THE BIDDER**
	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.

9.1	Collecting materials from store/ open yard from time to time for fabrication, erection, commissioning/ construction as per the construction program as per flow of consignment. Successful bidder shall be custodian of all the materials issued till the plant/ equipment is officially taken over by owner/ BHEL after complete erection, commissioning/ construction. Successful bidder shall maintain adequate security personnel and security measures for proper precaution and safety of material.
9.2	Transport of material to their respective places of erection and erection of complete plant & equipment as supplied under this tender.
9.3	Trial run, commissioning of individual equipment/ sub-systems to the satisfaction of BHEL/ BHEL's advisor/ owner.
9.4	Deployment of all skilled & unskilled manpower required for watch & ward, erection, supervision of erection, commissioning and other services to be rendered under this tender.
9.5	Deployment of all erection tools & tackle, construction machinery, transportation vehicles, all other implements in adequate number & size, appropriate for erection work to be handled under scope of this tender, unless otherwise specified.
9.6	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 otherwise.
9.7	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 & ward for security & safety of materials under successful bidder's custody, etc, as required.
9.8	Maintaining proper documentation of all site activities undertaken by successful bidder as per the proforma mutually agreed with BHEL, submitting monthly progress reports as also any such document as & when desired by BHEL/ owner, taking approval of all statutory authorities, ie Boiler Inspector, Factory Inspector, Inspector of Explosives, etc, as applicable, for respective portions of work under the jurisdiction of such statutes of laws.
9.9	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.
9.10	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-in charge, with whom BHEL shall interact on matters related to execution of the contract. The Site-in-charge shall be the single point contact person on behalf of successful bidder. BHEL shall interact with Site-in-charge only, on all matters related to 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.
9.11	Successful bidder shall confine all field operations to those works which can be reformed without subjecting the equipment & materials to adverse effects, during inclement weather conditions, like monsoon, storms, etc and during other un-favourable 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 un-favourable construction conditions in no way relieve successful bidder of his responsibility to perform the works as per the schedule.
9.12	Successful bidder shall supply all skilled workmen like mill-wright fitters, welders, gas cutters, electricians, riggers, sarengs, erectors, carpenters, pipe fitters, masons,

	laggers, tin-smiths, instrument machanics, etc, in addition to other skilled, semi-skilled and unskilled workmen required for all works of handling and transportation from site store to erection site, erection, testing, commissioning/ construction contemplated in 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 the suitability of the workers and the 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 they find him unsuitable and successful bidder shall forthwith remove him.
9.13	The 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 engaged for the job by successful bidder and in general 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/ owner.
9.14	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 engineer.
9.15	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 his personnel shall co-operate with other personnel, and other successful bidders, coordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.
9.16	Successful bidder's supervisory staff shall execute the work in the most substantial & workman like manner within stipulated time. Accuracy of work and aesthetic finish are essential part of the contract. Successful bidder shall be responsible to ensure that assembly & workmanship conform to the dimensions & tolerance given in the drawing/ instruction given by BHEL from time to time.
9.17	It is the responsibility of successful bidder to engage his workman in shifts or on overtime basis for achieving the target set by BHEL during erection, commissioning/ construction and testing period. Successful bidder's quoted rate shall include all these contingencies.
9.18	Any other service, although not specifically called for but required for a contract of the size and nature indicated in the tender.
9.19	After completion of commissioning activity of equipment/ systems, successful bidder shall prepare test reports 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 shall be submitted in requisite number of copies to BHEL/ BHEL's advisor/ owner during the commissioning activities.
9.20	Truck/ trailers of suitable capacities and length for transportation of materials as required for normal materials plus ODC items, like feed storage tank parts, deaerator, HP/ LP heater, drain cooler, TDBFP, drive turbine, IV, HP/ IP turbine, LP rotor, generator rotor, HP turbine, IP turbine or parts, etc. is included within quoted rate of bidder. These items are to be preserved in store yard, TG hall, other designated areas as per instruction of BHEL and suitable facilities are to be arranged and maintained by successful bidder and these are to be kept under preservation for longer time during normal storage period, erection, commissioning time. For purpose of preservation, successful bidder has to make arrangement of electrical heating, dehumidifying, etc. TG preservation quality plan has to be followed for this purpose.

	No extra claim on this account for whatsoever reason will be entertained by BHEL.
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 equipment controls & 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 & 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, etc to be supplied by successful bidder within the 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 owner and other successful bidders working in site and arrange to perform his work in a manner so as to minimize interference with other successful bidder's works. BHEL's engineer 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/ owner 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 will hold weekly meeting of all successful bidders working at site at a time and a place. Successful bidder shall attend to such meetings and take notes of discussions during the meeting and the decisions of BHEL shall strictly adhere to those decisions in performing this work. In addition to the above 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 his work in accordance with the specified construction schedule. If at any time successful bidder is falling behind the schedule, he shall take necessary action to make good of such delays by increasing his work to comply with the schedule and shall communicate such action in writing to the engineer, satisfying that his action will compensate for the delay. Successful bidder shall not be allowed any extra compensation for such action.
11.5	The engineer 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 successful bidders as set out earlier.
11.6	The works under execution shall be open to inspection & supervision by BHEL/ owner engineer 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 owner/ BHEL.
11.7	Every effort shall be made to maintain the highest quality of workmanship by stringent

	supervision & inspection at every stage of execution. Manufacturer's instruction manual & 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 his account.
11.9	All the works such as cleaning, checking, leveling, blue matching, aligning, assembling, temporary erection for alignment, opening, dismantling of certain equipment for checking and 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 alignment, etc if necessary, repeatedly to satisfy engineer, with all 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 & material, in case wrongly installed, shall be removed & reinstalled to comply with the design requirement at successful bidder expense, to the satisfaction of BHEL/ owner.
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's engineer.
11.13	Successful bidder shall provide proper barricading/ cordoning/ temporary protection over all left out opening at deaerator floor, condenser surrounding, LPBP valves, different equipment erected by them, 17 mtr/ 8.5 mtr, 0 mtr floors for safe working at site at their own cost. Raw steel will be provided by BHEL free of cost from scrap.
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 organized by BHEL to discuss quality issues and next week 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 authorized / 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 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 free of 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) Inspectorate of Steam Boilers and Smoke Nuisance 2) Electrical Inspector 3) 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.			
12.5.2	Contractor should be qualified to execute pressure parts & piping work coming under the purview of IBR or Competent Inspecting Authority, for which he should register himself with CIB of state concerned / Competent Inspector. Contractor also should be aware of the latest Boiler regulations and Electricity Act, including the amendments thereof, as applicable under the scope of this contract.			
12.5.3	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 equipment and their calibration thereof. 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.			
12.5.4	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 or Registration Fee as per prevailing statutory boiler regulations. 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.			
12.6	**STORAGE & PRESERVATION OF WELDING ELECTRODES & OTHER BHEL-ISSUED MATERIAL**			
	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**
12.7.1	**GENERAL**			
12.7.1.1	Unavailability of QAE deployment schedule (duly approved by BHEL Site) matching with manpower requirement of approved L2 schedule	0.10%	0.10%	Against each RA bill
12.7.1.2	Unavailability of required number of QAE with proper experience & NDT certification as per the requirement of the Contract	Rs. 1,000.00	$16.00	Per person per day
12.7.1.3	Not attending quality meeting of BHEL by	Rs.	$32.00	Per meeting

	nominated member of vendor / sub-contractor	2,000.00		
12.7.2.	**CALIBRATION**			
12.7.2.1	Use of MMEs without valid calibration certificate	Rs. 1,000.00	$16.00	Per equipment per instance
12.7.2.2	Use of NDT equipment, welding equipment without having valid calibration certificate / condition not as per requirement	Rs. 1,000.00	$16.00	Per equipment per instance
12.7.3	**WELDING & NDT**			
12.7.3.1	Unqualified welders carrying out welding / tack welding	Rs. 1,000.00	$16.00	Per welder per instance. (Gatepass of the person shall be withheld)
12.7.3.2	Not using portable oven for welding consumables	Rs. 500.00	$8.00	Per welder per instance. (The consumables in the oven shall be confiscated)
12.7.3.3	Not using electrodes pre-baked in baking oven	Rs. 500.00	$8.00	Per instance. (The subject consumables shall be confiscated)
12.7.3.4	Not using welding consumables of approved make & not using correct type of electrode as per approved EWS / Drawing / WPS	Rs. 1,000.00	$16.00	Per instance. (The subject consumables shall be confiscated)
12.7.3.5	Non-removal of welding slag and spatters after welding	Rs. 500.00	$8.00	Per joint
12.7.3.6	Not using NDT equipment as prescribed in the manual / FQP / guidelines / Contract	Rs. 1,000.00	$16.00	Per equipment per instance
12.7.3.7	Welder doing welding without valid job card	Rs. 500.00	$8.00	Per instance
12.7.3.8	Discrepancy observed in the weld joints identified by BHEL / Customer for RT vs RT film offered	Rs. 2,000.00	$32.00	per joint
12.7.3.9	Unqualified welders carrying out welding / tack welding	Rs. 1,000.00	$16.00	Per welder per instance. (Gatepass of the person shall be withheld)
12.7.3.10	Not using portable oven for welding consumables	Rs. 500.00	$8.00	Per welder per instance. (The consumables in the oven shall be confiscated)
12.7.4	**MATERIAL MANAGEMENT**			
12.7.4.1	Non-maintenance of grid pillar marking	Rs. 200.00	$3.00	Per location week
12.7.4.2	Mismatch of location of material in store area	Rs.	$8.00	Per instance

	w.r.t. location mentioned in stock register	500.00		
12.7.4.3	Non-compliance of Preservation of material as per storage & preservation manuals	Rs. 1,000.00	$16.00	Per equipment
12.7.4.4	Not offering received material for verification within stipulated time as per contract	Rs. 500.00	$8.00	Per instance
12.7.5	**PAINTING & ALLIED WORKS**			
12.7.5.1	Not using primer / paints of approved make and as per Specifications	Rs. 1,000.00	$16.00	Per instance
12.7.5.2	Painting without proper surface preparation as per approved schedule / drawing / FQP	Rs. 500.00	$8.00	Per instance
12.7.6	**PROTOCOLS & LOG SHEETS**			
	Delay in preparation of Protocols / Log-sheets as per approved FQP within 3 days of completion of checks	Rs. 200.00	$3.00	Per protocol per day delay
12.7.7	**INSPECTION OF BOUGHT-OUT ITEMS / CONSUMABLES**			
12.7.7.1	Delay in offering inspection of Bought-out Items / Consumables / Aggregates (for items which need site inspection as per approved QP) within 3 days of receipt of material at site	1% of the item value of the LOT	1% of the item value of the LOT	per item per day delay after receipt of material
12.7.7.2	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) within 3 days of receipt of material at site.	1% of the item value of the LOT	1% of the item value of the LOT	per item per day delay after receipt of material
12.7.8	Any non-conformity requiring dismantling / rework, attributable to vendor / sub-contractor, shall be penalized at a rate mentioned above or cost to BHEL, which-ever is higher.			
13.0	**DELETED**			
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	**PROJECT MANAGEMENT/ CONSTRUCTION MANAGEMENT**			
	To meet the need of construction management at site, successful bidder shall provide the following services within accepted rates.			
16.1	PLANNING & MONITORING			
16.1.1	Within 15 days of placement of order/ LOI by BHEL, successful bidder shall interact with BHEL site for kick-off meeting to discuss & firm up item-wise/ activity-wise schedule of erection, testing, commissioning so as to complete the entire job within the stipulated completion period, matching with project schedule.			
16.1.2	Based on the discussion of the kick-off meeting or otherwise, a master schedule shall be drawn and successful bidder shall submit the same within 7 days of kick-off			

	meeting, for review & acceptance/ approval of BHEL. Successful bidder shall interact with BHEL to ensure acceptance/ approval of the master schedule within 7 days of submission.
16.1.3	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.
16.1.4	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.
16.1.5	The successful bidder shall ensure monitoring of these activities at least on fortnight basis or at other frequency as mutually agreed with BHEL.
16.1.6	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.
16.1.7	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.
16.1.8	Successful bidder shall prepare progress report indicating progress on key activities, management summary for critical activities, list of actions require BHEL's attention. The schedule shall preferably be made in Primavera/ MS Projects, so that the same is compatible with BHEL's project management software.
16.2	INFRASTRUCTURE (Only One set for all packages for entire contract duration- shall be included in the TG Contract)
16.2.1	The 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 10 or 8 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 at places, as per instruction of BHEL for exclusive use of BHEL. These computers/ printers/scanner shall remain successful bidder's property and they will be allowed to take out the same after completion of contract period including extension. The successful bidder shall provide data/ information, etc. in prescribed formats for periodical updating of progress reports, material management reports, updating of network pertaining to the successful bidder's scope of work, etc. The successful bidder shall also provide **2 nos. computer operators and 2 numbers 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 work 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.
16.2.1.1	@ USD 230/- (Two Hundred Thirty) per month for each computer operator or at actual rate +30%, whichever is lower.
16.2.1.2	@ USD 150 /- (One Hundred Fifty) per month for each computer with printer/scanner or at actual rate +30%, whichever is lower.

16.2.1.3	@ USD 185/- (One Hundred Eighty five) per month for each service staff or at actual rate +30%, whichever is lower.
16.2.1.4	Bidder shall ensure that in the eventuality of termination / transfer of any computer operator, there shall be overlapping of approx. one week so that all processes, records and documentation can be shared/secured/transferred properly.
16.2.2	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.
16.2.2.1	@ USD 230/- (Two Hundred Thirty) per month for each computer operator or at actual rate +30%, whichever is lower.
16.2.2.2	@ USD 185/- (One Hundred Eighty five) per month for each service staff or at actual rate +30%, whichever is lower.
16.2.2	The successful bidder's site office must have facilities of communications like Fax, E-mail, and telephone with STD facility within a month from LOI.
16.3	PROGRESS REPORTING
16.3.1	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 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.
16.3.2	The progress report shall indicate the progress achieved against planned with reasons indicating delays, if any, and shall give the remedial actions which the 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.
16.3.3	The daily work force reports shall clearly indicate the work force deployed, category-wise specifying also the activities in which they are engaged.
16.3.4	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, the successful bidder shall present program of subsequent week. The successful bidder shall constantly update/ revise his work program to meet the overall requirement.
16.3.5	Periodic progress reviews on the entire activities of execution in respect of supply and works in scope of successful bidder will be held once in a month at site/ Kolkata. These meetings will be attended by reasonably higher officials of the successful bidder and will be used as a forum for discussing all areas where progress needs to be speeded up. The successful bidder shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.
16.4	SITE ORGANIZATION
16.4.1	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 a competent Site In-charge (SIC) for site operations with sufficient level of authority to take site decisions. The successful bidder will submit organization chart (showing the name of SIC) with individual bio-data indicating various levels of experts to be posted for supervision in the fields of supervision & 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 schedule without any commercial implication to BHEL. The organization chart is to be submitted within 10 days from date of LOI.
16.4.2	The successful bidder shall provide experienced engineer / supervisors in various area of operation depending upon requirement. Further, following (minimum) manpower with power plant construction background to be deployed at site by the

	successful bidder for their day to day supervision, etc., within specified days from start of work or otherwise decided jointly with Construction Manager, BHEL. Regarding qualification & experience of each of following categories of manpower, successful bidder shall take prior approval of Construction Manager, BHEL, whose decision shall be final & binding regarding acceptance of any person.	
	Area	Quantity, deployment schedule (From Start of work)
16.4.2.1	**TG & AUX PKG - UNIT #1 & COMMON SYSTEMS**	
16.4.2.1.1	Planning engineer.	1 no. within 15 days,
16.4.2.1.2	Qualified safety officers with stewards (exclusive for safety supervision for project jobs).	As per HSE manual.
16.4.2.1.3	Site engineer and supervisors for supervision.	Engineers – 3 nos. 1 no within 15 days. Balance as per requirement. Supervisors – 7 nos. 2 nos. within 15 days. 1 no within 30 days. Balance as per requirement.
16.4.2.1.4	Site engineer and supervisors for quality inspection.	As detailed below. Deployment schedule to be decided at site.
16.4.2.1.5	NDT specialist with NDT level 2 certification.	1 no.
16.4.2.2	**LP PIPE**	
16.4.2.2.1	Planning engineer.	1 no. within 15 days,
16.4.2.2.2	Qualified safety officers with stewards (exclusive for safety supervision for project jobs).	As per HSE manual.
16.4.2.2.3	Site engineer and supervisors for supervision.	Engineers – 2 nos. 1 no within 15 days. Balance as per requirement. Supervisors – 4 nos. 1 no. within 15 days. 1 no. within 30 days. Balance as per requirement.
16.4.2.2.4	Site engineer and supervisors for quality inspection.	As detailed below. Deployment schedule to be decided at site.
16.4.2.2.5	NDT specialist with NDT level 2 certification.	1 no.
16.4.2.3	**FGD PACKAGE**	
16.4.2.3.1	Planning engineer.	1 no. within 15 days,
16.4.2.3.2	Qualified safety officers with stewards (exclusive for safety supervision for project jobs).	As per HSE manual.
16.4.2.3.3	Site engineer and supervisors for supervision.	Engineers – 1 nos. 1 no within 15 days. Supervisors – 2 nos. 1 nos. within 15 days. Balance as per requirement days.
16.4.2.3.4	Site engineer and supervisors for quality inspection.	As detailed below. Deployment schedule to be decided at site.
16.4.2.3.5	NDT specialist with NDT level 2 certification.	1 no.
16.4.3	Engineer/ supervisor for other functions like store & purchase, material management, planning, FIN, administration etc. are to be provided as per site requirement and not referred above.	
16.4.4	In the event of failure of the successful bidder to provide necessary manpower	

	indicated above as per requirement, BHEL reserve the right to deduct USD 770 per man-month for engineer and USD 460 per man-month for the supervisor/ safety/ quality officer/ NDT specialist from the date of deputation as indicated as above from RA bills. Further induction of manpower regarding site supervisor & site engineer will be decided at site as per requirement. Further induction of manpower regarding site supervisor & site engineer will be decided at site as per requirement.
16.4.5	For rendering commissioning assistance with effect from HT, Chemical Cleaning, BLU till handing over of the set, a dedicated gang of six persons along with an exclusive supervisor need to be deployed by the successful bidder to attend the incidental works of commissioning as per the instruction of BHEL commissioning engineer. The total gang will report to BHEL and will follow instruction of BHEL's commissioning engineer. This gang with supervisor shall be separate and will be their besides other personnel to be provided by successful bidder for his day-to-day work. The gang (6+1 as per above) need to be provided during all shifts also whenever required by BHEL commissioning engineer. They shall be equipped with all necessary hand-tools to attend all incidental work during commissioning.
16.4.5.1	In the event of failure of the successful bidder to provide necessary manpower indicated above as per requirement for a continuous period of 3 days or more, BHEL reserve the right to recover at the following rates. USD 230 /- for semi-skilled/ un-skilled worker from the date of deputation as indicated above from RA bills.
16.4.6	BHEL reserve 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.
16.4.7	In addition to above, a well experienced qualified engineer to be designated, as 'Project Coordinator', 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 complete execution period of contract.
16.4.8	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.
16.4.9	Successful bidder should also submit network programs for the erection of various items. These networks shall show owner/ BHEL 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 & 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.
16.5	CONSTRUCTION MANAGEMENT
16.5.1	Based on approved program, successful bidder shall submit program of construction/ erection/ commissioning for implementation. These programs would be amplified showing start of erection & subsequent activities and shall form the basis for site execution & detail monitoring. Three monthly rolling program with first month's program being tentative based on the site condition would be prepared based on these programs. The successful bidder shall also be involved along with owner/ BHEL to tie up detailed resources mobilization plan over the period of the contract matching with the performance targets.
16.5.2	The program would be jointly finalized by the site in-charge of successful bidder with BHEL/ customer's project coordinator as well as site-planning representative.

	Erection program will also identify sequential events matching financial turnover.
16.5.3	Successful bidder is liable to furnish all documentary evidences towards payment of Works Contract Tax as and when required by BHEL.
17.0	**LAND**
17.1	Land will be provided free of cost by BHEL to the extent available/ considered necessary by BHEL to the successful bidder for their **office, store, and labour colony** within project 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/other successful bidders and storage of plant machineries & materials. The existing land shall be shared by all agencies deployed by BHEL at site.
17.2	BHEL shall hand over such allotted land to the successful bidder on as is where is condition. The 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.
17.3	All temporary roads for crane movement shall be constructed and maintained by BHEL.
17.4	Land, as available, may be provided for labour colony outside plant boundary, free of cost. The 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 drawing, after obtaining approval of formalities from statutory body.
17.5	The successful bidder shall provide adequate no of toilet in their labour colony.
17.6	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 the successful bidder at their cost. In the event of failure to do so, the 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 the successful bidder's site office, yard and other spaces occupied by successful bidder.
18.0	**WATER**
18.1	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.
18.2	Further network for construction & potable water system for construction work shall be arranged by successful bidder at their own cost.
18.3	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.
18.4	Successful bidder will have to arrange for storage of water to meet day-to-day requirement.
18.5	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 utilization & 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.
18.6	Construction water, as available, may be provided for labour colony within 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.
18.7	Successful bidder shall make their own arrangement of potable water facility for labour colony, at their own cost.
18.8	Bidder to note that no ground water is allowed for construction purpose by the project authority.
19.0	**ELECTRICITY**
19.1	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.
19.2	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.
19.3	Successful bidder shall have to provide earth leakage circuit breaker at each point wherever human operated electrical drives/ T&Ps are deployed.
19.4	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.
19.5	Successful bidder will have to arrange sufficient illumination at their own work areas.
19.6	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.
19.7	Successful bidder have to make arrangement at their own cost for illumination for their working area for execution of the work & safety of workmen.
19.8	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.
19.9	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.
20.0	**CONSTRUCTION OF TEMPORARY OFFICE, STORES ETC**
20.1	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 the watch & ward, etc.
20.2	Labour colony as per owner's/BHEL standard practice has to be made by successful bidder. Rest sheds, toilet, canteen facility for workers and staff, storage sheds for oils, lubricants/ waste/ hazardous items – To be done in line with safety, HSE policy, statutory, Labour Law requirement as applicable at owner.
20.3	Storage sheds for oils, lubricants/ waste/ hazardous items (for successful bidders own items for vehicles, cranes, etc.) – To be done in line with safety, HSE policy, statutory, Labour Law requirement as applicable at site.
21.0	**CONSUMABLE**
21.1	Successful bidder shall provide all consumables required for carrying out the work covered under this tender excepting those which are specifically indicated as BHEL scope. TG special consumables like Hylomar, Golden Hermetite, Stag-B, Molykote, Anabond compounds, Locktite, Rubber fixing compounds/ rubber hoses, petrol, CTC, etc will have to be arranged by the contractor within the quoted rate. Erection, commissioning jobs should not suffer due to non-availability of these types of consumables. Failure to arrange the same in time may call for BHEL's intervention and BHEL shall arrange the same at successful bidder's risk and cost with BHEL's standard overhead charges.
21.2	All consumables/ special materials/ cements/ paints, etc arranged by successful bidder to be used for the work shall have prior approval of BHEL engineer with regard to brand and quality specifications. Test reports/ certificates in respect of these consumables, wherever applicable, shall be submitted to BHEL.
21.3	PRIMERS & PAINT
	Successful bidder will provide paint & primer for finish paintings of total area of applications like, turbine, generator, condenser, BFPs, CEPs and other auxiliaries including arranging all associated arrangements like spray guns, brushes, nozzles etc. within quoted rate. Painting is to be done as per BHEL/ owner's instruction/ applicable code/ drawings/ documents. Required thickness is to be achieved as per owner's requirement. Painting thickness measuring instruments is to be arranged by successful bidder within quoted rate. The paint shall be sourced from BHEL/ Owner approved manufacturers/suppliers.
21.4	WELDING ELECTRODE, FILLER WIRE FOR TIG WELDING AND GAS
21.4.1	Unless specifically mentioned otherwise in the tender, all welding consumables including electrodes/ SS electrodes/ filler wires shall be supplied by successful bidders within the quoted rates/ price. Any TIG/ filler wire supplied by BHEL manufacturing unit for use in TG area, shall be issued free of cost by BHEL.
21.4.2	All the required welding electrodes as approved by BHEL shall be arranged by successful bidder at their cost. It shall be the responsibility of successful bidder to obtain prior approval of BHEL, before procurement, regarding manufacturer, type of electrodes, etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL regarding type of electrodes, batch number, date of expiry, etc. Batch test certificates shall be made available for verification & record before the actual use of the welding consumables.
21.5	All the required gases like Argon, Oxygen, Acetylene, etc including required high

	purity Nitrogen gas (for purging of generator stator water system) shall be arranged by successful bidder at their cost.
21.6	In the event of failure of successful bidder to bring necessary and sufficient consumables, 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.
21.7	BHEL reserves the right to reject the use of any consumable, if found non-acceptable because of bad quality, deterioration in quality due to improper storage, shelf life expiry, unapproved type/ brand, etc.
21.8	Filler wires, for TIG welding of piping to the extent supplied by the manufacturing units of BHEL along with the components/ equipment only shall be provided by BHEL free of cost. Successful bidder shall at their cost meet requirements of TIG filler wires, if any, beyond these free issues of BHEL.
22.0	**MMR**
22.1	Successful bidder shall ensure deployment of reliable & calibrated measuring and monitoring Resources (MMR). The MMRs shall have test calibration certificate from authorized/ Govt. approved agencies. Successful bidder shall also keep provision of alternate engagement for such MMRs so that the work does not suffer when a particular MMR is sent for calibration. Re-testing/ re-calibration shall also be arranged by the successful bidder at their own cost at regular interval during the period of use as advised by BHEL.
22.2	In the event of failure of successful bidder to bring necessary and sufficient MMRs, 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.
23.0	**TEST CERTIFICATE FOR T&P**
	All T&P, lifting tackles, pulling devices, other material to be deployed/ supplied by successful bidder must bear valid/ latest test certificates for their suitability before their use/ application and the documents shall be preserved at site.
24.0	**T&Ps TO BE PROVIDED BY BHEL AND TERMS OF ISSUE**
24.1	List of T&Ps to be provided by BHEL free of cost on sharing basis is given in the relevant annexure of this tender. The T&Ps shall be shared by various other agencies and successful bidder shall plan their activities accordingly in co-ordination with BHEL site engineers.
24.2	BHEL will make available the crane (as per relevant appendix of this tender) with fuel & operators free of charges as applicable, to successful bidder on sharing basis mainly for the purpose of pre-assembly and erection of components. The crane shall be available for 14 (fourteen) hours inclusive of one hour lunch break daily, excluding Sundays and scheduled holidays. If crane is required beyond normal working hours or on Sundays/ holidays, prior permission of Construction Manager, BHEL is to be obtained. However, Construction Manager, BHEL decision in this regard will be final after judging proficiency of successful bidder's crane requirement.
24.3	These cranes have to be shared with other agencies/ successful bidders of BHEL. Allocation of cranes shall be the discretion of Construction Manager, BHEL, which shall be binding on successful bidder.
24.4	All arrangements, including providing & laying of sleeper beds, back-filling of approaches wherever necessary for safe movement of the cranes as directed by BHEL shall be the responsibility of successful bidder. Successful bidder shall provide sleepers for this purpose at their cost.
24.5	Any boom reduction, extension for their use & restoration to previous state or as directed by BHEL after the use shall be successful bidder's responsibility and to be done with successful bidder's own T&P, cranes, consumables, manpower.

24.6	For dismantling/ assembly and unloading/ loading of BHEL cranes during mobilization/ demobilization process, successful bidder shall render assistance in the form of manpower with tools & tackles including cranes, etc (Except cranes of 75 T or above capacity) at no extra cost to BHEL.
24.7	Major breakdown will be attended by BHEL. The cranes provided by BHEL will be withdrawn for regular & capital maintenance as per schedule of maintenance. As far as possible such schedules will be intimated to successful bidder 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.
24.8	Where services of cranes provided by BHEL are to be shared by other agencies/ successful bidder of BHEL, successful bidder's responsibilities defined above will also be apportioned accordingly to the beneficiary agency. BHEL will do working arrangements in this regard and BHEL's decision shall be final & binding.
24.9	Loading of materials at BHEL stores for transportation to working area shall be done by successful bidder using their cranes. However BHEL crane(s) shall also be provided for handling components which can not be handled by the T&Ps to be deployed by the contractor.
24.10	Responsibilities of successful bidder defined above for BHEL cranes shall also be applicable, mutatis–mutandis, in respect of other tool & plants provided by BHEL.
24.11	Special tools which are supplied by BHEL as part of maintenance tools, to be handed over to owner under regular DU/ DESS numbers in various product groups, may be issued to successful bidder free of charge for specific activities, at BHEL's discretion. Successful bidder shall return these after completion of specific activities, for which the tools were spared, in good working order.
24.12	Lubricants like engine oil, Cardium compound, hydraulic oil, gear oil, grease for BHEL's T&Ps including cranes will be provided by BHEL free of charge. Similarly filters for cranes will be provided free of charge by BHEL.
24.13	Successful bidder must not use these equipment for any purpose other than what they are intended for.
24.14	If the above items issued to successful bidder are found not utilized/ not maintained to the satisfaction of BHEL engineer or misused, these will be withdrawn and no replacement will be done for such items.
25.0	**TOOLS & PLANTS, MMR TO BE PROVIDED BY SUCCESSFUL BIDDER**
25.1	Except for the T&Ps provided by BHEL as per relevant clause, all other T&Ps, as may be required for completion of the work, have to be provided by the successful bidder within the quoted rates.
	A tentative list of such T&Ps to be deployed by the bidder for successful completion of work is given in the relevant annexure of this tender.
25.2	It may be noted that the list is not exhaustive and is only for general guidance purpose. Successful bidder is required to provide all necessary T&P (other than those specified to be provided by BHEL, if any) MMRs, handing equipment for timely completion of total work as per contract. For project requirement, some activities may have to pre-pone; and in such cases the successful bidder may have to deploy additional T&Ps. Accepted rates shall be inclusive of all above requirements.
25.3	In the event of any failure on the part of successful bidder and as a result, progress of work suffers, BHEL may at their discretion, also terminate the contract on this ground and take out any or whole amount of the 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, in case progress of work is suffered, at the risk & cost of successful bidder including transportation cost of same from any of BHEL site/ other agency & charges, as applicable, shall be deducted from successful bidder's RA bill, Decision of BHEL in

	this regard will be final & binding on successful bidder.
25.4	The successful bidder shall mobilize T&Ps, as per contract/ mutually agreed schedule at site to meet the project requirement. Successful bidder will have to give advance intimation & certification regarding capacity etc. prior to dispatch of major equipment.
25.5	Timely deployment of adequate quantity of T&P is the responsibility of the successful bidder. The successful bidder shall be prepared to augment the T & P at short notice to match the planned program and to achieve the milestones.
25.6	Successful bidder shall maintain and operate his tools and 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 the progress of work is not hampered.
25.7	For welding, use of welding generators/ rectifiers only is permitted.
25.8	The successful bidder at his cost shall carry out periodical testing of his construction equipment and calibration of measuring instruments (MMRs) and tests. Test/ calibration certificates shall be furnished to BHEL. MMRs shall be calibrated only at accredited laboratory as per the list available with BHEL or any other laboratory approved by BHEL.
26.0	**CLEANLINESS**
26.1	The successful bidder shall be responsible for keeping the entire area allotted to him clean and free from rubbish, debris etc. during the period of contract. The successful bidder shall employ enough number of special personnel to thoroughly clean his work-area at least once in a day. All such rubbish and 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 the area. In areas where equipment might drip oil and cause damage to the floor surface, a suitable protective cover of a flame resistant, oil proof sheet shall be provided to protect the floor from such damage.
26.2	Similarly, the labor colony, the offices and the residential areas of the 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 the successful bidder, in the work-areas, office and residential areas of the successful bidder.
27.0	**REPORTING DAMAGES AND CARRYING OUT REPAIRS**
27.1	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.
27.2	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.
27.3	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.
27.4	Successful bidder shall carry out fabrication of any material lost/ damages as per Instructions from BHEL.
27.5	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.
27.6	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.
27.7	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.
27.8	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.
28.0	**FACILITIES TO BE PROVIDED BY THE SUCCESSFUL BIDDER**
28.1	All tools and tackles, machinery, equipment, instruments required for the work have to be arranged by the successful bidder including its transportation before and after work and including storage, insurance etc.
28.2	Successful bidder shall provide all the necessary scaffolding materials, temporary structures, as may be required and necessary safety devices etc.
28.3	The T&P to be arranged by the successful bidder 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 equipment, material, property and men. All arrangements for the movement of the T&P, etc, shall be the successful bidder's responsibility. Valid test certificate of all the applicable T&Ps are required to be produced at the time of deployment.
28.4	The successful bidder shall arrange adequate nos. of wooden sleepers /steel plates for compaction of approach for crane movement and material stacking near work site failing which BHEL may get the same done at their risk & cost.
28.5	Temporary toilet blocks are to be constructed/fabricated at different elevations of boiler & boiler work area, material pre-assembly yard, etc. for maintaining proper sanitation.
29.0	**RESPONSIBILITIES WITH REGARD TO EMPLOYMENT OF LABOUR, ETC**
29.1	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).
29.2	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. Successful bidder shall enable such facilities to BHEL / Customer.
29.3	It is the responsibility of the successful bidder 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 successful bidder. Successful bidder 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 successful bidder shall arrange necessary work permits for working beyond normal working hours.

29.4	If at any time during the execution of work, it is noticed that the work is suffering on account of non-availability/shortfall in provision of resources from the successful bidder's side BHEL will make suitable alternate arrangements at the risk and cost of successful bidder. The expenditure incurred with overheads thereby shall be recovered from the successful bidder.
29.5	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.
29.6	It is the responsibility of the successful bidder 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 set the erection and commissioning targets will be final and binding on the successful bidder.
29.7	Successful bidder shall deploy only qualified and experienced engineers/ supervisors. They shall have professional approach in executing the work.
29.8	The 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 the assembly and workmanship conform to dimensions and tolerances given in the drawings/instructions given by BHEL engineer from time to time.
29.9	The supervisory staff employed by the successful bidder shall ensure proper outturn of work and discipline on the part of the labour put on the job by the successful bidder. 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.
29.10	If at any time, it is found that the successful bidder 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 successful bidder's risk and cost.
30.0	**RECONCILIATION OF BHEL ISSUED MATERIALS**
30.1	Successful bidder shall submit a reconciliation statement of material s issued to them, once in two months. The same may be submitted along with RA bill.
30.2	Successful bidder shall properly account for the material issued to them as specified herein to the satisfaction of BHEL certifying that the balance material are available with successful bidder's custody at site.
31.0	**METHOD OF MEASUREMENT**
	Shall be as per GCC-1B.
32.0	**INSURANCE**
32.1	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.
32.2	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.	
32.3	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.	
32.4	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.	
32.5	Other conditions of Insurance shall be as per relevant clause of GCC/SCC.	
33.0	**COMPLETION PERIOD**	
33.1	The package wise work of erection, testing and commissioning, up to handing over of unit shall be completed as per below mentioned schedule from the date of start of work (SOW) of respective package:	
33.1.1	**TG & AUX PKG - UNIT #1 & COMMON SYSTEMS**	
	19 months (Nineteen months)	
33.1.2	**LP PIPE EXCLUDING CW & ACW PIPING**	
	21 months (Twenty-One months)	
33.1.3	**FGD- UNIT #1 & COMMON SYSTEMS**	
	12 months (Twelve months)	
33.2	Successful bidder shall arrange to mobilize and start the erection work within 15 days from the date of written notice/ intimation by BHEL.	
33.3	The actual date of start of work of each package will be certified by Construction Manager, BHEL after adequate mobilization of manpower, T&P by successful bidder and availability of minimum fronts to start the works. This certificate date will be deemed as start of work of respective packages at site for the purpose of the contract time schedule.	
33.4	The work under the scope of contract will be deemed to be completed in all respects only when all the components are erected and trial runs, testing and commissioning of all individual equipment including trial operations of each unit with full load are conducted and handed over. The decision of BHEL shall be final and binding on successful bidder.	
34.0	**CONSTRUCTION SCHEDULE**	
34.1	Entire work shall be carried out in accordance with the broad schedule of this package as furnished below, 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.	
34.2	Project Schedule for the subject job	
	Milestone	Project Schedule (From Start of Work)
34.2.1	**TG & AUX PKG. (Unit # 1 & COMMON SYSTEMS)**	
34.2.1.1	Condenser erection start	Within 15 days
34.2.1.2	TG erection start	Within 01 month
34.2.1.3	Erection of TG cycle piping	Within 06 months

34.2.1.4	TG Box Up - **(M1)**	Within 10 months
34.2.1.5	TG Oil flushing completion	Within 11 months
34.2.1.6	TG on Barring gear – **(M2)**	Within 12 months
34.2.1.7	Synchronization with grid.	Within 14 months
34.2.1.8	Reliability Run	Within 16 months
34.2.1.9	Final completion	Within 19 months
34.2.2	**FGD PKG. (Unit # 1 & Common System)**	
34.2.2.1	Start of Work	Within 15 days
34.2.2.2	Readiness of FGD system for Light-Up of Unit # 1 **(M1)**	Within 8 months
34.2.2.3	Completion of erection & commissioning of FGD Unit # 1 & common system **(M2)**	Within 10 months
34.2.2.4	Final completion.	Within 12 months
34.2.4.	**LP PIPING**	
34.2.4.1	Start of erection	Within 15 days
34.2.4.2	Readiness For Boiler Light Up Unit#1 - **(M1)**	Within 08 months
34.2.4.3	Readiness For Synchronization Unit#1	Within 12 months
34.2.4.4	Readiness For Boiler Light Up Unit#2 - **(M2)**	Within 14 months
34.2.4.5	Readiness For Synchronization Unit#2	Within 19 months
34.2.4.6	Final completion	Within 21 months
34.3	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 each package after getting LOI from BHEL and prior to issuance of detailed work order.**	
34.4	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 adherence to this schedule will attract penalty/ LD as per tender provision.	
34.5	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 the successful bidder and will be used as a forum for discussing all areas where progress needs to be speeded up. The successful bidder shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings. Review shall be done in applicable BHEL format (F-14 etc.) and shall have to be signed jointly by BHEL engineer and site incharge of vendor. This signed document shall form the basis for future delay analysis of the project.	
35.0	**CERTIFICATE TOWARDS COMPLETION**	
	The work under the scope of the successful bidder shall be deemed to have been completed in all respects only when so certified by BHEL/ owner. The decision of BHEL in this regard shall be final and binding on the successful bidder.	
36.0	**EXTENSION OF TIME FOR COMPLETION**	
36.1	If the completion of work as detailed in the scope of work gets delayed beyond the contract/ completion period, the successful bidder shall request for an extension of the contract and BHEL at its discretion may extend the contract.	
36.2	Based on the reviews jointly signed, the works balance at the end of original contract period less the backlog attributable to the 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', the successful bidder is bound to complete the portion of backlog attributable to the successful bidder. Any	

	further 'Time extension' or 'Time extensions' at the end of the previous extension shall be worked out similarly.	
36.2	However if any 'Time extension' is granted to successful bidder to facilitate continuation of work & 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 take at the risk and cost of successful bidder.	
36.3	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 the successful bidder as per specified format. Review of the programme and record of shortfall shall be done.	
36.4	During the period of 'Time extension', successful bidder shall maintain their resources as per mutually agreed program	
36.5	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) 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 the successful bidder.	
37.0	**INTEREST BEARING RECOVERABLE ADVANCE/ MOBILISATION ADVANCE**	
	Not applicable for this tender.	
38.0	**OVER RUN CHARGES**	
	Applicable as per GCC subject to a minimum amount of USD 1,500/- and a maximum amount of USD 7,500 /- per month for each package (Considering respective start & completion dates).	
39.0	**REVISION ON ACCEPTED CONTRACT RATE**	
	Not applicable in this tender.	
40.0	**PRICE VARIATION CLAUSE/ ESCALATION**	
	Not applicable in this tender.	
41.0	**EXTRA/ ADDITIONAL ITEMS OF WORK**	
41.1	Extra/ additional work for all items/ systems, except for high pressure joints, shall be as per GCC.	
41.2	EXTRA/ ADDITIONAL ITEMS OF WORK FOR HIGH PRESSURE JOINT	
	The following are all inclusive rates applicable for rectification/ modification/ rework involving welding of high pressure joints.	
41.2.1	Unit rate per equivalent water wall joint of size OD 63.5 mm x 6.3 mm thick.	
41.2.2	Rate	
	Type of material	Average rate per joint (USD)
41.2.2.1	Carbon steel	3.00
41.2.2.2	Alloy steel	4.00
41.2.3	The rates indicated above are firm and are not subject to any escalation during the contract period including extension if any, till the completion of work. Unit rates for welding are all inclusive but excluding scaffolding, joint preparation, cutting, edge preparation, welding and stress relieving, radiography with all consumables and tools and plants.	
41.2.4	For additional radiography, if so desired by BHEL, payment @ USD 0.10 per cm length of film (100 mm wide) exposed and accepted by site engineer, and further certified by site engineer that the length of film exposed is minimum required for carrying out the radiography, shall be paid.	

41.2.5	No PVC, rate revision, over run charge/ compensation is applicable for extra works.
41.2.6	In the event of any dispute regarding acceptance of any work as “EXTRA", the work has to be carried out by keeping man-hour and consumables record jointly signed with remark "for EHQ decision". Under no circumstances, the bidder can refuse to carry out such work with pre-condition, save and except of keeping daily record of category of man-hours and consumables spent for the particular job for further consideration by EHQ at Kolkata.
42.0	**SECURITY DEPOSIT, PERFORMANCE BOND & FINAL BILL**
42.1	Security deposit shall be applicable as per relevant clause of GCC (Volume-IB).
42.2	Performance bond is not applicable for the tender.
42.3	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.
42.3.1	For SD BG- further extension beyond date of acceptance of final bill will not be enforced if the following is fulfilled.
42.3.1.1	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
42.3.1.2	Joint protocol of set of documents as submitted as detailed in below is certified by site & successful bidder’s representative.
42.3.1.3	There is no negative value of the final bill (after release of SD BG) - site to certify the same before release of SD BG.
42.3.1.4	Successful bidder has returned the property belonging to BHEL - site to certify the same before release of SD BG.
42.3.1.5	Successful bidder has submitted joint protocol against `Delay analysis’, if applicable for delayed execution of job.
42.3.2	List of documents to be submitted & jointly protocoled indicating acceptance of final bill by BHEL.
42.3.2.1	Final bill.
42.3.2.2	Measurement for final bill signed, jointly signed by BHEL & successful bidder’s representative.
42.3.2.3	Statement having cumulative joint measurement for the contract, jointly signed by BHEL & successful bidder’s representative.
42.3.2.4	Claim by successful bidder for refund of security deposit.
42.3.2.5	Jointly signed material reconciliation statement.
42.3.2.6	Statement of payment received from BHEL – Bill wise (Including RA/ PVC/ ORC/ rate revision/ extra work).
42.3.2.7	No claim certificate by successful bidder.
42.3.2.8	Clearance certificates wherever applicable, viz clearance certificates from customer, various statutory authorities, like Labour Department, PF Authorities, Commercial Department, etc.
42.3.2.9	Notarized Indemnity Bond as per prescribed format.
43.0	**TAXES, DUTIES, ETC**
43.1	**IMPORT DUTIES:**
43.1.1	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 S.R.O-73 dtd. 19-03-1997. Also Regulatory Duty (RD), Advance Trade VAT (ATV) & AIT are exempted / not applicable. Any documentation needed for availing of Duty Free Imports will be submitted by the bidder in reasonable time having regard to the time for delivery of the work and the time for completion.

43.1.2	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.
43.1.3	Temporarily imported erection materials, machineries and spare parts during Construction period of Project are exempted from payment of Customs Duty and VAT. Such items shall be exported within six months from the commercial operation date. Documentation for the same to be submitted / maintained by the bidder.
43.1.4	Any Taxes for exporting material from source country & as applicable in the source Country shall be on bidder's account. However, bidder 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 bidder may take into account the benefit of above provisions, as the cost of input to the bidder will be net of such taxes and adjust their offer price accordingly to make it more competitive.
43.2.0	**BANGLADESH VAT**
43.2.1	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.
43.2.2	The subject job shall be a Construction Job. As per Section 6 (4aa) of The Bangladesh Value Added Tax Act, 1991, the bidder shall not collect VAT from BHEL as the Employer (i.e. Customer of BHEL) shall make deduction of VAT from BHEL's invoice and deposit the same to the Government Treasury. Documentary evidence shall be provided to the bidder.
43.2.3	Adequate documents for not charging/ claiming VAT from BHEL shall be made available to the Bidder.
43.2.4	The bidder shall raise Tax Invoice (Challan Patra) as per Rule 16(1) (Musak-11) of the Value Added Tax Rules, 1991 mentioning Name, Address and VAT Registration Number of BHEL site office.
43.2.5	Bidder shall note that the Tax Invoice complying with Rule16(1) of the Value Added Tax Rules, 1991 must contain the 'Bill to' and 'Ship to' details as below: BHEL Bangladesh VAT Regn. No. 000761853 Bharat Heavy Electricals Limited Power Sector Eastern Region, 2x660 MW Maitree Super Thermal Power Project Moidara Village, Rampal Upazila, Bagerhat District, Bangladesh
43.2.6	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.
43.2.7	Value Added Tax Deduction at Source:
	BHEL will not deduct any VAT from Bidder's Gross Bill and such bidder need not to load any Output VAT in Bidder's quoted price.
43.3	**INCOME TAX DEDUCTION AT SOURCE:**
43.3.1	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
43.3.2	Since payment shall be made in Bangladesh. Bangladesh Income Tax shall be

	deducted, as is applicable.
43.3.3	The Bidder shall carry out their own tax diligence to get acquainted with the relevant rules and regulations of Bangladesh pertaining to the subject job.
43.3.4	The bidder is responsible for compliance of all relevant Tax Laws of Bangladesh and all other related places outside Bangladesh in connection with this contract and BHEL will not bear any such liability.
43.3.5	Except otherwise mentioned above bidder shall quote their rates/ price inclusive of all taxes, duties, Cess, any State or Central Levy, social security contribution and other Taxes in or outside Bangladesh (but excluding Bangladesh VAT) in line with provisions as mentioned above etc. together with variation thereto during contract period including extension, if any. BHEL shall not release any additional payment in this regard.
43.3.6	New tax & duties, if imposed subsequent to latest due date of offer submission, as per NIT & TCN, as applicable, by statutory authority after due date of submission of latest price offer and within the contract period including extension, if any (provided reason for extension is not attributable to vendor), shall be reimbursed by BHEL at actual on production of relevant supporting document to the satisfaction of BHEL. However, the vendor shall obtain prior approval from BHEL before depositing new taxes & duties. Benefits and/or abolition of all existing taxes must be passed on to BHEL against new Taxes, if any, proposed to be introduced at a later date.
44.0	**TERMS OF PAYMENT**
44.1	Successful bidder shall submit RA bill once in a month at the end of each month. as per billing break-up of the tender. The measurement will be taken by BHEL engineer as per relevant clause of GCC and certify regarding the actual work executed in the measurement book and bills for work.
44.2	Progressive payment shall be made by BHEL against successful bidder's RA bill, complete & correct in all respects accompanied by BHEL engineer's certified/ measurement sheet, jointly signed; requisite statutory certificates, certified by BHEL; within 60 days of submission of the bill.
44.3	However no extra payment / interest charges shall be made in the event of deferment in payment.
44.4	For all items of work as per the break-up, interim payment shall be limited to 95 % of the gross value of interim bill. Balance 5 % shall be payable along with final bill. However, this 5 %, retained from each RA bill, may be released against submission of a separate bank guarantee as per Performance Bank Guarantee format, to be kept valid till final bill & guarantee period, subject to (i) Receipt of certificate that all works are completed in all respects; (ii) Reconciliation of materials/ T&P/ MMR; (iii) Completion of final bill formalities and (iv) Handing over to BHEL/ customer.
44.5	Out of above 95 %, 2.5 % 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-fulfillment of respective activity by successful bidder in each month, no payment shall be made by BHEL against corresponding activity and no claim of successful bidder, at a later date, whatsoever, in this regard will be entertained by BHEL.
44.5.1	0.5 % shall be paid on compliance of house-keeping of successful bidder's working area and store/ office areas.
44.5.2	0.5 % shall be paid on compliance of general illumination of successful bidder's working area and stores, office area.
44.5.3	0.5 % shall be paid on compliance of applicable OHSAS requirement as per guidelines of BHEL and as specified in the tender.
44.5.4	0.75 % shall be paid on compliance of applicable safety requirement as per guidelines of BHEL and as specified in the tender.

44.5.5	0.25 % shall be paid on compliance of applicable security requirement as per guidelines of BHEL.	
44.6	Each RA bill shall accompany with latest agreed & jointly signed L-3/ construction schedule, as enumerated in this tender.	
44.7	All admissible recovery/ adjustment, etc. shall be made from interim payable amount.	
45.0	**BIILING BREAK-UP**	
45.1	Progressive payment, as per terms of payment provision of the tender, shall be made as per following billing schedule break-up, operated on contract rate/ price. The percentages of billing schedule are only for the purpose of progressive payments and should not be construed as price of individual items and successful bidder shall complete the work without any reference to the break up.	
45.2	Description of activity	Percentage allocated
45.2.1	**Billing Break-up of Sl. No. 1 (TG PKG) of Schedule-II of Price Schedule**	
45.2.1.1	Condenser.	18.00%
45.2.1.2	Turbine.	15.00%
45.2.1.3	Generator.	10.00%
45.2.1.4	Static auxiliaries & accessories.	7.50%
45.2.1.5	Rotating auxiliary & accessories.	10.00%
45.2.1.6	Integral piping & TG piping.	15.00%
45.2.1.7	Common system equipment & auxiliaries.	1.50%
45.2.1.8	Erection of Misc. hoist & chain pulley block and other Misc. packages.	1.50%
45.2.1.9	Painting.	4.00%
45.2.1.10	Pre-commissioning & commissioning.	13.00%
45.2.1.11	PG test.	1.50%
45.2.1.12	Liquidation of pending points.	2.00%
45.2.1.13	Handing over of the unit to BHEL/ owner.	0.50%
45.2.1.14	Reconciliation of issued materials.	0.50%
	TOTAL	**100.00%**
45.2.2	**Billing Break-up of Sl. No. 2 (FGD PKG) of Schedule-II of Price Schedule**	
45.2.2.1	Completion of pre-assembly	15.00 %
45.2.2.2	Placement in position	25.00 %
45.2.2.3	Alignment, welding, grouting & bolting as required	35.00 %
45.2.2.4	Completion of non-destructive examination & stress relieving/ heat treatment	17.00 %
45.2.2.5	Finish painting	5.00 %
45.2.2.6	Submission of as-built drawings	0.50 %
45.2.2.7	Liquidation of pending points	2.00 %
45.2.2.8	Reconciliation of issued materials	0.50 %
	Total	**100.00%**
45.2.3	Please refer price schedule for billing break-up of LP Piing works.	
45.3	Out of above break up for progressive payment, 5% will be retained from each RA bill and will be released on completion of guarantee period. However, this 5% payment can be released against submission of performance bank guarantee valid for the guarantee period as stated above in prescribed proforma subject to receipt of certificate that all works are completed in all respects. Submission of bank guarantee towards performance guarantee is separate and the bank guarantee towards security deposit cannot be utilized for this purpose. The security deposit will be refunded as per GCC.	
45.4	BHEL, at their discretion, may further split up above percentages and effect payment to suit the site condition, cash flow requirement and according to the progress of	

	work.
45.5	The billing break-up is drawn for progressive payment and shall not be construed as the value/ price of corresponding item, unless otherwise decided by BHEL.
46.0	**RETENTION AMOUNT**
46.1	Shall be as per as per terms of payment/ billing schedule of this volume.
46.2	No retention will be effected on successful bidder's bills for extra/ additional item of works.
47.0	**LIQUIDATED DAMAGE**
47.1	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.
47.2	**INTERMEDIATE LD**
47.2.1	Package wise intermediate LD milestones **(M1 & M2)** have been defined as per **clause no. 34.0**. In case of slippages of these milestones, delay analysis shall be carried out on achievement of each of these two intermediate milestone.
47.2.2	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.
47.2.3	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.
47.2.4	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.
47.2.5	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.
47.2.6	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.
47.2.7	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.
47.2.8	* ***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*
47.3	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.
47.4	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.
47.5	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.
47.6	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.
47.7	The successful bidder shall continue with performance of the order/ contract under all circumstances, to the extent not cancelled.
47.8	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.
47.9	Other provision shall be as per the GCC.
48.0	**GUARANTEE**
48.1	Even though the work will be carried out under supervision of BHEL, the successful bidder will be responsible for the quality of workmanship, quality of materials/ items and design for which the successful bidder is responsible.
48.2	The 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 the 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 & cost without prejudice to any other rights and recover the same from security deposit/ other dues.
48.3	The guarantee period will commence from the date of handing over of respective unit to customer or six months after completion of full load operation of respective unit, whichever is earlier, provided, all erection, testing and commissioning works are completed in all respect for respective unit.
48.4	Other provision shall be as per the GCC.
49.0	**CUSTOM CLEARANCE**
49.1	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.
49.2	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.
49.3	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.
50.0	**IDENTIFICATION OF CONTRACTOR'S EMPLOYEES, VEHICLES AND BUILDINGS**
50.1	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.
50.2	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.
50.3	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.
50.4	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.
51.0	**EXPATRIATE PERSONNEL**
51.1	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.
51.2	Any expense associated with illness of the Contractor's personnel, including replacement thereof, shall be to the Contractor's account.
51.3	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.
51.4	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.
52.0	**BANK DETAILS**
52.1	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.

52.2	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.
53.0	**LAWS AND REGULATIONS**
53.1	The Successful bidder agrees and acknowledges that:
53.1.1	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.
53.1.2	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.
53.1.3	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.
53.2	Without prejudice to the generality of the foregoing:
53.2.1	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.
53.2.2	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.
53.2.3	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.
53.2.4	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.
53.2.5	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.
53.3	**Compliance**
53.3.1	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.
53.3.2	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.
53.3.3	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.
53.4	**Related Compliance Obligations**
53.4.1	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.
53.4.2	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.
53.4.3	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).
53.4.4	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.
53.5	**Permits and Licenses**
53.5.1	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.
53.5.2	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.
53.5.3	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.
53.6	**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.
54.0	**CONTRACT PRICE**
54.1	The bidder shall quote their rates strictly in accordance with prescribed price schedule of Volume-III (latest version). The total price quoted in Price Schedule, Volume-III, shall be considered for evaluation & awarding.
54.2	Based on the total quoted price and the weightage of individual packages, separate orders shall be placed for: **a. TG & AUX PKG - UNIT #1 & COMMON SYSTEMS** **b. FGD SYSTEM - UNIT #1 & COMMON SYSTEMS** **c. LP PIPE**
54.3	**Following clauses are applicable for TG portion of contract:**
54.1.1	The bidder shall quote their rates strictly in accordance with prescribed price schedule of Volume-III (latest version).
54.1.2	The quantities/ weights mentioned in weight schedule/ equipment description is approximate only and given to facilitate bidder to make assessment of magnitude of work of the tender. These are liable to variations as per design consideration. The quoted/ accepted rates/ price shall remain firm for variation in weights for items under rate schedule and no revision of rates/ price will be entertained for increase in weight of these items, except for TG & misc. piping of relevant annexure.
54.1.3	The quoted rate/ price shall remain firm for variation upto +/- 20% in the weight for TG & misc piping, as specified in relevant section of tender. If the variation in actual erected tonnage of TG & misc piping exceeds variation limit of +/- 20%, payment/ recovery for the differential tonnage will be made in the final bill at the rate of $275 (USD) per MT for CS & alloy steel piping."
54.1.4	Omission of specific reference to any method and equipment, system or material necessary for proper and efficient services towards installations of the plant shall not relieve successful bidder of the responsibility of providing all services/ facilities to complete the work or portion of the work awarded to them. The quoted/ accepted rate/ price shall deem to be inclusive of such contingencies. Only exclusion specifically mentioned in this tender shall be entertained in all matters.
54.2	**For FGD potion of the contract, following clauses are applicable**
54.2.1	This shall be an item rate contract and paid on tonnage basis for the actual item weight erected.
54.2.2	The item/PGMA wise Category / Group distribution, indicated in the tender as per weight schedule, is tentative and in case of any discrepancy, BHEL Site CM/GM's decision in this regard shall be final.
55.0	**OTHER TERMS**
55.1	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.
55.2	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.
55.3	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.
55.4	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.
55.5	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.
55.6	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.
55.7	The Contractor shall provide and employ in connection with the execution of the Works :
55.7.1	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.
55.7.2	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.
55.7.3	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.
55.7.4	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.
55.7.5	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.

55.7.6	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.
55.7.7	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 activates will be borne by the Contractor.
55.7.8	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.
55.7.9	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.
55.7.10	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.
55.7.11	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.
55.7.12	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.
55.7.13	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.
55.8	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:
55.8.1	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.
55.8.2	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.
55.8.3	Any and all Losses arising directly or indirectly from or incurred by reason of any failure of Contractor:
55.8.3.1	To pay any Taxes relating to income or any other Taxes required to be paid by such person;
55.8.3.2	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.
55.8.3.3	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;
55.8.4	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;
55.8.5	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
55.8.6	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.
55.8.4	Contractor Obligation to Ensure
55.8.4.1	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.
55.8.4.2	All accidents shall be reported by the Contractor directly to the appropriate Governmental Authority as per Applicable Law remaining in force.
55.8.4.3	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.
55.8.4.4	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.
55.9	Laws and Regulations : The contractor agrees and acknowledges that :
55.9.1	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.
55.9.2	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.
55.9.3	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.
55.10	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
55.11	Without prejudice to the generality of the foregoing :
55.11.1	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.
55.11.2	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.
55.11.3	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.
55.11.4	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.
55.11.5	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.
55.12	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.
55.13	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.
55.14	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.
55.15	Successful bidder shall provide temporary barricade all around the working area to avoid any untoward incident, as per guideline of customer.
55.16	Successful bidder shall strictly comply with the HSE guidelines of BHEL & customer and follow the Access Control System regarding security aspect of the project.
55.17	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.
55.18	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.
55.19	The successful bidder shall make arrangement at their own cost for necessary access to the work site from common access road.
55.20	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.
55.21	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.
55.22	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.
55.23	Duly filled & Signed, BHEL Evaluation Report (Customer Approval Format) as per attached format to be submitted by the bidders alongwith their offer.
55.24	EXIM Bank undertaking as per attached format to be furnished by the bidder along with their offer.
55.25	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 ON SHARING BASIS FREE OF HIRE CHARGE

SL NO	DESCRIPTION & CAPACITY OF T&P	QTY	REMARKS
1.0	EOT crane in TG hall (Capacity 200T/ 20T as installed)	1 no., as per availability	For handling and erection inside TG hall. Second EOT crane shall be for unit#2 erection. However for tandem operation and other usage, it may be allotted for use by BHEL.
2.0	EOT crane in BC Bay (Capacity 28T or as installed)	1 no. (If available)	Operation and maintenance (both mechanical & electrical) of the crane along with arrangement is included in successful bidder's scope.
3.0	EOT crane in CW Pump House (Capacity 55/10T or as installed)	1 no. (If available)	Operation and maintenance (both mechanical & electrical) of the crane along with arrangement is included in successful bidder's scope.
4.0	Above 80T capacity crawler /tyre mounted crane(s)	1 no., as per availability	As per requirement for any item under this contract which cannot be handled by cranes upto 80MT.
5.0	Special T&P as supplied by BHEL's manufacturing units	2 set	For erection, commissioning of TG & aux. In case T&Ps get damaged/ lost, same shall be replaced/ made good by successful bidder before returning to BHEL/ owner.
6.0	High capacity hydro-test pump (400 kg/ sqcm or above)	1 no	For hydro-test of power cycle piping, De-aerator / FST etc.
7.0	Loads like plate, block, etc	As required	For load testing of different hoists & lifting equipment. However, successful bidder has to arrange for required shifting & handling arrangement on their own for issuing from BHEL/ owner's store and returning to BHEL/ owner's store.
8.0	Industrial Blower	As required	As required

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.
2.0	BHEL shall provide above T&P to the successful bidder in running condition. However, for all T&P except cranes, operation and maintenance including supply of spares, if required, shall be in the scope of the bidder.

ANNEXURE – II

MAJOR CONSUMABLES TO BE PROVIDED BY BHEL FREE OF COST

SL NO	DESCRIPTION OF ITEMS
1.0	Chemicals for chemical cleaning for carrying out pre-commissioning, commissioning activities
2.0	Lub-oil & control fluid (FRF) for oil flushing & trial run of equipment.
3.0	Imported electrodes / filler wires supplied by BHEL manufacturing units.
4.0	Shims and gaskets going into the equipment, supplied by BHEL manufacturing units.
5.0	Any other special consumables as supplied by BHEL manufacturing units.

NOTE	
1.0	Successful bidder shall note that since above consumable will be used as per direction of BHEL. Terms of issue shall be as specified in the tender.

ANNEXURE – III
MAJOR TOOLS & PLANTS AND MMRs TO BE DEPLOYED BY SUCCESSFUL BIDDER

SL NO	DESCRIPTION OF EQUIPMENT	MINIMUM QUANTITY	Mobilization from start of work (SOW)
A	T&P		
1.0	75/80 MT Hydraulic crawler crane	1 no.	As per requirement
2.0	40 MT Hydraulic crane	1 no.	As per requirement
3.0	14MT New Generation Tyre mounted mobile crane (TRX / SX or Equivalent model). Note: Hydra or similar crane shall not be accepted	3 nos.	1st Crane: Within 15 days from SOW of TG pkg. 2nd Crane: Within 15 days from SOW of FGD pkg. 3rd Crane: As per requirement.
4.0	Electro hydraulic pipe bending m/c	1 no.	As required at site
5.0	Trailers with suitable capacity as required	As required	As required at site
6.0	Special Hydraulic trailer of suitable capacity to transport items to be handled by successful bidder	1 no.	As required for transportation of heavy equipment, like heaters, rotors, TDBFP, deaerator, feed storage tank components, IV, LP rotor, generator rotor, TG parts turbine casing, MDBFP etc.
7.0	Welding generator (Electric as well as diesel)	7 nos.	Continuously as required at site. During peak condenser internal activity, requirement may go beyond specified quantity
8.0	3 phase complete set up for drawal of construction power	As required	As required at site
9.0	Radiography arrangement including source and film viewer	--do--	--do--
10.0	TIG welding sets	--do--	--do--
11.0	Stress reliving equipment with temp recorders	--do--	--do--
12.0	Electrical baking oven (big)	--do--	--do--
13.0	Electrical baking oven (portable)	--do--	--do--
14.0	Mixer machine for grouting of equipment on foundations	--do--	--do--
15.0	Vacuum cleaner (industrial)	1 no	--do--
16.0	Portable pipe cutting & bending m/c for bending pipes upto Nb 100	1 no	--do--

	mm.		
17.0	Air compressor	1 no	--do--
18.0	Step down transformer (230 V/ 24V) with adequate number of lamps of 24 V	As required (Minimum 1 no transformer and at least 6 nos lamps in working condition)	--do--
19.0	Condenser tube expander set, flare up tool/ bell mouthing tools as per requirement set with adequate spares, mandrels, expanders, accessories consumables, etc	Minimum 3 sets	As per site requirement and to be arranged at site at least one month before tube expansion start
20.0	Condenser tube cutting set with adequate accessories, spares, consumables and cutting tools	Minimum 3 sets	As per site requirement and to be arranged at site at least one month before tube expansion start
21.0	Electrically operated winches 5/ 3 T capacity	As required	As required at site
22.0	Jacking bolt/ press out bolt	--do--	--do--
23.0	Hydraulic Jack of 100 T capacity with hand operated pump and jack, hose, etc	4 nos	--do--
24.0	Hydraulic Jack of 50 T capacity with hand operated pump and jack, hose, etc	4 nos	--do--
25.0	Torque wrench (0-200 N-M capacity) with all fittings	1 no	--do--
26.0	Torque wrench upto 2000 N-M capacity or above	1 no	--do--
27.0	Bolts stretching device (For turbine, generator and auxiliaries)	As required	--do--
28.0	Long filler set	--do--	--do--
29.0	Spanner/ eye bolt/ de-shakle	--do--	--do--
30.0	Centrifugal oil purifier/ electro-static oil purifier with heating arrangement	1 set	Before start of oil flushing of BFP/ LPBP
31.0	Erection/ commissioning fixture	As required	As required at site
32.0	Scaffolding material with steel pipe, clamp, GI sheet, plank, etc	--do--	--do--
33.0	Coat-meter for thickness checking of paint thickness	1 no	--do--
34.0	M64 x 2 tap set / Any other required special tap sets	2 nos	--do--
35.0	Digital multimeter (3.5 digits)	2 nos	--do--
36.0	Digital multimeter (4.5 digits)	1 no	--do--
37.0	Tongue tester	As required	--do--
38.0	30 A 3-phase variac	--do--	--do--
39.0	Micro-ohm meter (measuring upto	--do--	--do--

	1 micro-ohm)		
40.0	Motorised megger (measuring upto 5KV range)	--do--	--do--
41.0	HV test kit (upto 50 KV DC)	--do--	--do--
42.0	Vernier	--do--	--do--
43.0	Dial gauge of different sizes and types as per requirement	--do--	--do--
44.0	Micro-meter (both inside and outside)	--do--	--do--
45.0	Welding rectifier	--do--	--do--
46.0	Chain pulley block of 16 T	--do--	--do--
47.0	Chain pulley block of other capacities	--do--	--do--
48.0	Pulling & lifting m/c upto 5 T capacity	--do--	--do--
49.0	Multi Sheave pulley upto 100 MT	--do--	--do--
50.0	Single sheave pulley blocks upto 20 T capacity	--do--	--do--
51.0	Gas cutting torches of different sizes and capacity	--do--	--do--
52.0	Grinding machine	As required (around 10 nos)	--do--
53.0	Drilling machine	As required (around 10 nos)	--do--
54.0	Pistol drilling m/c	As required	--do--
55.0	Wire rope sling (different sizes)	--do--	--do--
56.0	Loose wire rope (different sizes)	--do--	--do--
57.0	Hydraulic jack with total sets of 25, 10, 5 T capacity as per requirement	--do--	--do--
58.0	Wooden sleepers	--do--	--do--
59.0	Hydro-test pump (hand operated), at least 150 Kg/ cm2 capacity	1 no	--do--
60.0	NDT test kit as per requirement	As required	--do--
61.0	Steel tape of different sizes as per requirement	--do--	--do--
62.0	Plumb block as per requirement	--do--	--do--
63.0	Surface plate of different sizes	--do--	--do--
64.0	Straight edge of different sizes	--do--	--do--
65.0	Feeler gauges of different sizes	--do--	--do--
66.0	Calliper of different sizes as per requirement	--do--	--do--
67.0	Bolt heating thermocouple	--do--	--do--
68.0	Magnifying glass as per requirement	--do--	--do--
69.0	Piano-wire as per requirement	--do--	--do--
70.0	Precision water level micro-meter as per requirement	--do--	--do--
71.0	Parallel and V-blocks as per requirement	--do--	--do--

72.0	Taper wedge as per requirement	--do--	--do--
73.0	Lead wire as per requirement	--do--	--do--
74.0	Dial bore indicator as per requirement	--do--	--do--
75.0	Balancing machine	--do--	--do--
76.0	Thermometer of different ranges	--do--	--do--
77.0	Depth gauges as per requirement	--do--	--do--
78.0	Vernier calliper of different sizes as per requirement	--do--	--do--
79.0	GO & NO GO gauge as per requirement	--do--	--do--
80.0	Drill set as per requirement	--do--	--do--
81.0	Taps and die set as per requirement	--do--	--do--
82.0	Spirit level as per requirement	--do--	--do--
83.0	Hg manometer	--do--	--do--
84.0	1.0 KV/ 500 V megger as per requirement	--do--	--do--
85.0	Reamer of different sizes as per requirement	--do--	--do--
86.0	Sand blasting m/c as per requirement	--do--	--do--
87.0	Spray painting m/c as per requirement	--do--	--do--
88.0	Bearing puller as per requirement	--do--	--do--
89.0	Bearing scrapper and other scrapper as per requirement	--do--	--do--
90.0	Slip gauge as per requirement	--do--	--do--
91.0	MIG welding set as per requirement	--do--	--do--
92.0	Filler of different sizes as per requirement	--do--	--do--
93.0	Allen key/ screw driver set as per requirement	--do--	--do--
94.0	File of different sizes as per requirement	--do--	--do--
95.0	Socket wrench set as per requirement	--do--	--do--
96.0	Bench grinder as per requirement	--do--	--do--
97.0	Belt, number, letter punch as per requirement	--do--	--do--
98.0	Lead, steel, test, wooden, plastic, nylon hammer set as per requirement	--do--	--do--
99.0	Fire proof tarpaulin as per requirement	--do--	--do--
100.0	Pipe cutters as per requirement	--do--	--do--
101.0	Rubber, PVC hose with/ without re-enforcement of different sizes as per requirement	--do--	--do--
102.0	Magnetic base for drilling m/c	--do--	--do--

103.0	Vibrator and mixer m/c for grouting as per requirement	--do--	--do--
104.0	End mill cutter or suitable device for cutting condenser tubes as per requirement	--do--	--do--
105.0	Mercury plumb block	--do--	--do--
106.0	Copper rod	--do--	--do--
107.0	All kinds of NDT test kit as per requirement	--do--	--do--
108.0	Other T&Ps as per requirement to complete the job	--do--	--do--
109.0	Ropes of different sizes and lengths as per requirement. Plastic/ Nylon material special slings of all sizes to handle rotor and other delicate items.	--do--	--do--
110.0	ELC/ portable purification m/c	--do--	--do--
111.0	Hardness testing m/c	1 no	--do--
112.0	PMI m/c / MPI machine	1 no. each	--do--
113.0	Machining facility comprising of 1 no lathe machine and 1 no small shaper machine	As required	--do--
114.0	20 HP or of suitable capacity (as decided by BHEL) diesel pump – minimum 2 nos for dewatering of inside of piping, low lying areas, CW/ CEP pit, different trenches in case of inundation, etc due to rain/ maloperation of various equipment/ systems. This facility is to be maintained till handing over	As required (Minimum 2 nos)	--do--
115.0	20 HP or of suitable capacity (as decided by BHEL) electric pump – minimum 2 nos for dewatering of inside of piping, low lying areas, CW/ CEP pit, different in case of inundation etc due to rain/mal-operation of various equipment/ systems. This facility is to be maintained till handing over	As required (Minimum 2 nos)	--do--
116.0	Surface Grinder	As required	--do--
117.0	Boroscope / tachmometer / Temp. measuring portable hand set / portable vibration measuring set	--do--	--do--
118.0	UT machine for checking welding, inspection of bearings	--do--	--do--
119.0	Scaffolding materials like pipes, clamps, platforms with fitness for use	--do--	--do--
120.0	Equipment/ MMD for voltage drop test and Helium leak test of generator	--do--	--do--

121.0	Resistance heating equipment for welding, pre-heating, stress relieving/ PW HT for welding of alloy pipes	--do--	--do--
B	MMR		
	List of MMR to be supplied by the bidder is attached separately.		

NOTE	
1.0	Bidder shall note that this T&P list is not exhaustive and they may be required to provide additional T&Ps not stated in this list for proper execution of job, at no extra cost to BHEL.
2.0	MMR and T&P shall be mobilized and deployed by successful bidder, as required at site for successful execution of the job. Once, the requirement for a particular T&P is over, vendor can demobilize the T&P with due permission from BHEL. Deployment plan of T&P, MMR shall be jointly finalised based on project requirement prior to start of work. The plan might undergo revision depending on project requirement. Depending upon the jointly agreed deployment program, any additional T&P, MMR, if required, for proper completion of job, shall have to be deployed by successful bidder. Similarly, if any of the aforesaid T&P is not required for the job as per jointly agreed program, successful bidder need not have to deploy the same.
3.0	Apart from above, in case successful bidder fail to deploy other T&Ps as per jointly agreed schedule, BHEL reserve the right to deploy the same at the risk & cost of successful bidder or levy penalty at a rate, to be rationally derived by BHEL. Decision of BHEL shall be final & binding on successful bidder. Further, if BHEL has to provide any T&P due to non-deployment of such T&P by the successful bidder, then BHEL shall deduct appropriate charges on the basis of its T&P hire charges, revised from time to time.
4.0	Bidder shall note periodical testing & calibration of testing equipment are to be done and copy of test certificates to be submitted to BHEL as per ‘ISO’ norms.
5.0	Sufficient measures shall be taken by the successful bidder to minimise the radiography test at site and maximise the use of Ultrasonic testing wherever applicable.
6.0	The above major T&P list is indicative only. Additional T&Ps, if required have to be mobilized by the successful bidder within the accepted rate.

ANNEXURE – IV
MAJOR CONSUMABLES TO BE DEPLOYED BY THE SUCCESSFUL BIDDER

SL NO	DESCRIPTION OF EQUIPMENT	CAPACITY	MINIMUM QUANTITY
1.0	Gases like O2, CO2, N2, Argon, D/A, LPG and others as per requirement (For construction purpose and not for commissioning uses)	As required	Sufficient stock has be maintained.
1.0A	Gases like H2, CO2 & 02 as per requirement for commissioning uses 1. Hydrogen – 400 cylinders 2. CO2 – 150 cylinders 3. 02 – 30 cylinders	All these gasses shall be of ultra high purity as per BHEL/ Siemens/ OEM standards.	1. Empty cylinders shall be provided by BHEL 2. Expenses towards Consumption beyond these quantities shall be reimbursed at actuals by BHEL.
2.0	Ultra high purity Nitrogen required for generator PW system, accumulators charging for pre-commissioning, commissioning, and operation period till handing over to owner	--do--	Sufficient stock has be maintained.
3.0	Filler wire for both SS and others as required	--do--	
4.0	Ordinary portland cement (OPC) with shuttering material	--do--	
5.0	Grouting material/ grouting cement with shuttering material	--do--	
6.0	Florescence powder	--do--	For condenser tube leak detection
7.0	Plugs for condenser tube	--do--	For plugging damaged tubes of condenser
8.0	Lapping compound	--do--	For valves servicing
09.0	Mercury	--do--	For generator gas tightness test and other applications as required
10.0	Hydraulic oil	--do--	For uses in different equipment and hydraulic jacks, pumps and other applications
11.0	Paints for preservation, touch up painting, normal and final cum finish painting	--do--	For painting
12.0	Different types of electrical lamp, tube light, halogen lamp, sodium vapour lamp with fixture	--do--	As required
13.0	Electrodes as per requirement	--do--	--do--
14.0	Test pieces for welders test like plate, pipe, etc	--do--	--do--
15.0	Brazing rod	--do--	--do--
16.0	Soldering consumable	--do--	--do--
17.0	Consumables for welding and NDT	--do--	--do--
18.0	Thermal chalks of different range	--do--	--do--
19.0	Consumables for pre-heating, stress relieving, post	--do--	--do--

	heating, etc.		
20.0	Consumables for arranging welders' qualifying works	--do--	--do--
21.0	Welders accessories	--do--	--do--
22.0	Handling accessories for handling chemicals, control fluid and other items as required	--do--	--do--
23.0	Services for effluent disposal	--do--	--do--
24.0	Rustolene	--do--	--do--
25.0	Kerosene	--do--	--do--
26.0	CTC, Acetone as per requirement	--do--	--do--
27.0	Petrol	--do--	--do--
28.0	Diesel	--do--	--do--
29.0	Special consumables for TG & aux, like Hylomar, Golden Hermetite, Stag-B, Molykote, Anabond compounds, Locktite, rubber fixing compounds/ rubber, plastic, PVC hoses as per requirement	--do--	--do--
30.0	Shellack compound	--do--	--do--
31.0	Red lead	--do--	--do--
32.0	Hemp fibre	--do--	--do--
33.0	Asbestos rope (Pure) 2,4, 6, 8, 10, 12, 25 mm and other sizes as required	--do--	--do--
34.0	Insulation adhesive tape 20 mm width and other sizes as per requirement	--do--	--do--
35.0	Emery tape as per requirement	--do--	--do--
36.0	Hack-shaw of different sizes as per requirement	--do--	--do--
37.0	Emery paper Gr 60, 80, 100, 120, 150 , 220 and others as per requirement	--do--	--do--
38.0	Asbestos cloth in wax paper 1x1 m – as required	--do--	--do--
39.0	Packing black paper 1x1 m	--do--	--do--
40.0	Adhesive tape 0.3 mm thickness-as required	--do--	--do--
41.0	White cotton tape 12 mm width-as required	--do--	--do--
42.0	Graphite powder fine quality – as required	--do--	--do--
43.0	Graphite flakes as required	--do--	--do--
44.0	Raw lineseed oil as required	--do--	--do--
45.0	Double boiled linseed oil as required	--do--	--do--
46.0	Cylinder oil as required	--do--	--do--
47.0	Enamel paint (of required colour) as required	--do--	--do--
48.0	Mobile velocite oil 's' as required	--do--	--do--
49.0	Turpentine oil as required	--do--	--do--
50.0	Trichloro ethylene as required	--do--	--do--
51.0	Methylated spirit as required	--do--	--do--
52.0	Mobilox grease 2 (IOC) as required	--do--	--do--
53.0	Servogem – 2,3 grease as per requirement	--do--	--do--
54.0	Other special grease as per requirement	--do--	--do--
55.0	Rust ban (ESSO) as per requirement	--do--	--do--
56.0	Molykote paste as per requirement	--do--	--do--
57.0	Birkosite as per requirement	--do--	--do--
58.0	Washing soda and soap as per requirement	--do--	--do--
59.0	Cotton waste as per requirement	--do--	--do--
60.0	Clean rag as per requrement	--do--	--do--
61.0	White cloth (cearse) and used cloths as required	--do--	--do--

62.0	Sack cloth as per requiremnt	--do--	--do--
63.0	Jelley soap or bar soap as per requirement	--do--	--do--
64.0	Emery cloth 100 mm width roll Gr 60, 100, 120, 150, 220 and others as per requirement	--do--	--do--
65.0	Sand papers Gr 60, 80, 120 and other as per requirement	--do--	--do--
66.0	Emery paste (valve lapping compound) Gr 60, 80, 100, 220 and others as per requirement.	--do--	--do--
67.0	Grinding wheels, stones of different sizes as per requirement	--do--	--do--
68.0	Welding electrode (carbon steel, MS, alloy steel and filler wires, stainless steel both ferrous and non-ferrous) excepting those supplied by BHEL as per relevant annexure) as per requirement	--do--	--do--
69.0	Soldering stick (lead-tin alloy) as per requirement	--do--	--do--
70.0	Soldering wire (silver alloy) as per requrement	--do--	--do--
71.0	Soldering flux (silver alloy) as per requirement	--do--	--do--
72.0	Brazing flux/ borax as required	--do--	--do--
73.0	Soldering flux (lead-tin alloy) as required	--do--	--do--
74.0	MS gas welding wire as required	--do--	--do--
75.0	DP test kit with magnifying glass as required	--do--	--do--
76.0	Iron and steel sections as required	--do--	For arranging scaffolding and fixtures, etc
77.0	MS bolt and nut with two plain washers and one spring washer as required	--do--	As required
78.0	MS angle assorted as required	--do--	--do--
79.0	MS channel assorted as required	--do--	--do--
80.0	Rounds, flat, MS plate assorted as required	--do--	--do--
81.0	Engineers blue/ prussian blue as required	--do--	--do--
82.0	Chalk pieces - white, colour and powder as required	--do--	--do--
83.0	Teine as required	--do--	--do--
84.0	Battery cells 1.5 V torch light cells, pencil battery, etc as required	--do--	--do--
85.0	Red and blue pencils as required	--do--	--do--
86.0	Galvanised steel wire 1 mm dia and other sizes as required	--do--	--do--
87.0	Flannel cloth 1m width as per requirement	--do--	--do--
88.0	Split pins 2 mm to 6 mm and other sizes as per requirement	--do--	--do--
89.0	Wood screws 3/4" to 3" as per requirement	--do--	--do--
90.0	Lead sheet 3 mm and 4 mm thickness as per requirement	--do--	--do--
91.0	Tarpauline 3x3 m and 5x5 m and 10x5 m and other sizes as per requirement	--do--	--do--
92.0	Vulcanised rubber fibre 0.5 m x 0.5 m x 15 mm thickness as per requirement	--do--	--do--
93.0	Plywood 1 m x 2 m x 3 mm and other sizes as per requirement	--do--	--do--
94.0	Nails-wire 1' to 3'as per requirement	--do--	--do--
95.0	Candles medium size as per requirement	--do--	--do--

96.0	Portable switch board containing 15 A metal clad switch with fuse 3x15 A, switche and 3 plug sockets as per requirement	--do--	--do--
97.0	Wooden plank pulleys as required	--do--	--do--
98.0	All kind of water/ oil/ steam gasket (asbestos free) (other than those being supplied by BHEL units)	--do--	--do--
99.0	SS shim/ other shim (for thickness of less than 5.0 mm)		--do--
100.0	Any other items as required to complete the jobs	-do--	--do--

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. Successful bidder may have to provide nut, bolt, washer, etc as referred in exceptional cases in case of any shortage of supply from BHEL's end. Accordingly, total implication in this regard is insignificant in comparison to total magnitude of work and bidder may work out implication of these items base on their previous exposure.
2.0	Deployment plan of major consumables shall be jointly finalized based on project requirement prior to start of work. The plan might undergo revision depending on project requirement. Depending upon the jointly agreed deployment program, any additional consumables, if required for proper completion of job, shall have to be deployed by successful bidder. Similarly, if any of the aforesaid items is not required for the job as per jointly agreed program, successful bidder need not have to deploy the same.
3.0	This above list is only indicative and neither exhaustive nor limiting. Successful bidder shall deploy all necessary consumable to meet the schedules & as prescribed by BHEL.

		DOCUMENT TITLE: ESTIMATED BILL OF MATERIALS FOR FUEL OIL PIPING																				**DOCUMENT NO:**	**REV NO: 00**
																						PC:7328-04	**DATE : 24.08.18**
		PROJECT TITLE: MAITREE 2x660MW										**PREPARED BY**		**CHECKED BY:**			**APPROVED BY:**						
		CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH										**JITENDRA**		**VENKAT**			**K. V. RAMANI**					**Document Referred: MAITREE-00-HJ-FF-150024-TRY-A**	
												THIS BOM IS FOR ONE UNIT ONLY											

Sl. No.	**LINE DESCRIPTION**	**DESIGN**		**PIPE MATERIAL**	**PIPE**			**BENDS / ELBOWS**			**REDUCERS**		**TEES**		**FLANGES**			**MISCELLANEOUS**			**REMARKS**
		PRESS. Kg/cm^2 (g)	**TEMP (^{o}C)**		**OD (mm)**	**THK (mm)**	**LEN (M)**	**R**	**θ deg**	**No**	**SIZE (NB)**	**No**	**SIZE (NB)**	**No**	**SIZE (NB)**	**Rating**	**No**	**SIZE**	**(NB)**	**No**	SHEET 1 OF 1
1.00	**FUEL OIL PIPING**																				
1.01	**HSD SUPPLY TO UNIT#1 & #2**	**25**	**31**	**SA106GrB**	**168.3**	**7.11**	**830**	**1.5D**	**90**	**20**			**150**	**1**							
1.02	**HSD SUPPLY TO UNIT#1**	**25**	**31**	**SA106GrB**	**168.3**	**7.11**	**135**	**1.5D**	**90**	**20**	**150/100**	**1**									
1.03	**HSD SUPPLY TO UNIT#2**	**25**	**31**	**SA106GrB**	**114.3**	**6.02**	**310**	**1.5D**	**90**	**25**	**150/100**	**1**									
1.04	**HSD RETURN FROM UNIT#2**		**31**	**SA106GrB**	**88.9**	**5.49**	**310**	**1.5D**	**90**	**25**	**100/80**	**1**									
1.05	**HSD RETURN FROM UNIT#1**		**31**	**SA106GrB**	**88.9**	**5.49**	**135**	**1.5D**	**90**	**20**											
1.06	**HSD RETURN FROM UNIT#1& #2**		**31**	**SA106GrB**	**114.3**	**6.02**	**830**	**1.5D**	**90**	**20**			**100/80**	**1**							
1.07	**DRAIN OIL FROM UNIT#2**	**10**	**31**	**SA106GrB**	**48.3**	**5.08**	**310**	**1.5D**	**90**	**25**											
1.08	**DRAIN OIL FROM UNIT#1**	**10**	**31**	**SA106GrB**	**48.3**	**5.08**	**150**	**1.5D**	**90**	**14**											
1.09	**DRAIN OIL FROM UNIT#1 & #2**	**10**	**31**	**SA106GrB**	**48.3**	**5.08**	**830**	**1.5D**	**90**	**20**			**40**	**1**							
1.10	**DRAIN & VENT FOR OIL LINES**		**31**	**SA106GrB**	**33.4**	**4.55**	**400**														

***NOTE: PEM YET TO FINALIZE THE TRESTLE DRAWINGS. FINAL BOM WILL BE RELEASED AFTER PEM CONFIRMS THE SAME.**

		DOCUMENT TITLE: ESTIMATED BILL OF MATERIALS FOR SERVICE AIR PIPING														**DOCUMENT NO:**				**REV NO: 00**	
																PC:7328-06				**DATE : 09.07.18**	
		PROJECT TITLE: MAITREE 2x660MW										**PREPARED BY**		**CHECKED BY:**		**APPROVED BY:**				**Document Referred: MAITREE-01-QFB-MFB-550005-PCC-0, Maitree-00-LB-MB-00307-31623-PC**	
		CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH										**JITENDRA**		**VENKAT**		**K. V. RAMANI**					
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Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			BENDS / ELBOWS			REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		PRESS. Kg/cm^2 (g)	TEMP (^oC)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
1.00	SERVICE AIR PIPING HEADER																			
1.01	SERVICE AIR PIPING HEADER	8.5	50	ASTM A53 G&T	168.3	5.56	250	1.5D	90	15			150/150	1						
2.00	ATOMISING AIR FOR HSD FIRING AND HEA IGNITOR												150/100	1						
2.01	ATOMISING AIR FOR HSD FIRING AND HEA IGNITOR UP TO TRICHY TP	8.5	50	ASTM A53 G&T	114.3	4.78	20	1.5D	90	8			150/80	1						
3.00	SERVICE AIR TO FURNANCE TEMP. PROBE												150/50	8						
3.01	SERVICE AIR TO FURNANCE TEMP. PROBE (RIGHT)	8.5	50	ASTM A53 G&T	60.3	3.91	70	1.5D	90	14			25/15	2						
3.02	TO AIR TRAP	8.5	50	ASTM A53 G&T	21.3	3.73	2	1.5D	90	4			15/15	2						
3.03	SERVICE AIR TO FURNANCE TEMP. PROBE (LEFT)	8.5	50	ASTM A53 G&T	60.3	3.91	65	1.5D	90	16			25/25	6						
3.04	TO AIR TRAP	8.5	50	ASTM A53 G&T	21.3	3.73	2	1.5D	90	4			25/15	54						
4.00	SERVICE AIR TO MILL COAL SAMPLING AT MDV END												150/25	40						
4.01	SERVICE AIR TO MILL-A COAL SAMPLING AT MDV END	8.5	50	ASTM A53 G&T	33.4	4.55	40	1.5D	90	10			150/15	8						
		8.5	50	ASTM A53 G&T	21.3	3.73	16	1.5D	90	24										
4.02	SERVICE AIR TO MILL-B COAL SAMPLING AT MDV END	8.5	50	ASTM A53 G&T	33.4	4.55	40	1.5D	90	7										
		8.5	50	ASTM A53 G&T	21.3	3.73	16	1.5D	90	24										
4.03	SERVICE AIR TO MILL-C COAL SAMPLING AT MDV END	8.5	50	ASTM A53 G&T	33.4	4.55	40	1.5D	90	7										
		8.5	50	ASTM A53 G&T	21.3	3.73	16	1.5D	90	24										

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																PC:7328-06				**DATE : 09.07.18**	
		PROJECT TITLE: MAITREE 2x660MW										**PREPARED BY**		**CHECKED BY:**		**APPROVED BY:**				**Document Referred:**	
		CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH										**JITENDRA**		**VENKAT**		**K. V. RAMANI**				**MAITREE-01-QFB-MFB-550005-PCC-0, Maitree-00-LB-MB-00307-31623-PC**	
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		PRESS. Kg/cm^2 (g)	TEMP (^{o}C)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
4.04	SERVICE AIR TO MILL-D COAL SAMPLING AT MDV END	8.5	50	ASTM A53 G&T	33.4	4.55	40	1.5D	90	7										
		8.5	50	ASTM A53 G&T	21.3	3.73	16	1.5D	90	24										
4.05	SERVICE AIR TO MILL-E COAL SAMPLING AT MDV END	8.5	50	ASTM A53 G&T	33.4	4.55	40	1.5D	90	7										
		8.5	50	ASTM A53 G&T	21.3	3.73	16	1.5D	90	24										
4.06	SERVICE AIR TO MILL-F COAL SAMPLING AT MDV END	8.5	50	ASTM A53 G&T	33.4	4.55	40	1.5D	90	10										
		8.5	50	ASTM A53 G&T	21.3	3.73	16	1.5D	90	24										
5.00	SERVICE AIR TO MILL FEEDER BULLS EYE OPENING																			
5.01	SERVICE AIR TO MILL-A FEEDER BULLS EYE OPENING	8.5	50	ASTM A53 G&T	21.3	3.73	28	1.5D	90	6										
5.02	SERVICE AIR TO MILL-B FEEDER BULLS EYE OPENING	8.5	50	ASTM A53 G&T	21.3	3.73	28	1.5D	90	6										
5.03	SERVICE AIR TO MILL-C FEEDER BULLS EYE OPENING	8.5	50	ASTM A53 G&T	21.3	3.73	28	1.5D	90	6										
5.04	SERVICE AIR TO MILL-D FEEDER BULLS EYE OPENING	8.5	50	ASTM A53 G&T	21.3	3.73	28	1.5D	90	6										
5.05	SERVICE AIR TO MILL-E FEEDER BULLS EYE OPENING	8.5	50	ASTM A53 G&T	21.3	3.73	28	1.5D	90	6										
5.06	SERVICE AIR TO MILL-F FEEDER BULLS EYE OPENING	8.5	50	ASTM A53 G&T	21.3	3.73	28	1.5D	90	6										
6.00	SERVICE AIR TO FURNACE OBSERVATION DOOR (OBD) - BLEED AIR/AIR CURTAIN																			
6.01	OBD FRONT	8.5	50	ASTM A53 G&T	33.4	4.55	90	1.5D	90	10			25/15	38				PLUG NB25	1	
		8.5	50	ASTM A53 G&T	21.3	3.73	200	1.5D	90	35										
6.02	OBD REAR	8.5	50	ASTM A53 G&T	33.4	4.55	65	1.5D	90	10			25/15	38				PLUG NB25	1	
		8.5	50	ASTM A53 G&T	21.3	3.73	220	1.5D	90	45										

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		PROJECT TITLE: MAITREE 2x660MW										**PREPARED BY**		**CHECKED BY:**		**APPROVED BY:**				**Document Referred: MAITREE-01-QFB-MFB-550005-PCC-0, Maitree-00-LB-MB-00307-31623-PC**	
		CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH										**JITENDRA**		**VENKAT**		**K. V. RAMANI**					
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		PRESS. Kg/cm^2 (g)	TEMP (^oC)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
7.00	SERVICE AIR PIPING TO ACCOUSTIC STEAM LEAK DETECTION SYSTEM & OBD																			
7.01	SERVICE AIR PIPING TO ACCOUSTIC STEAM LEAK DETECTION SYSTEM & OBD-RIGHT SIDE	8.5	50	ASTM A53 G&T	60.3	3.91	100	1.5D	90	20			50/15	55				PLUG NB50 PIPE WITH THREAD 1/2" NPT(F)	1 15	
		8.5	50	ASTM A53 G&T	21.3	3.73	620	1.5D	90	70										
7.02	SERVICE AIR PIPING TO ACCOUSTIC STEAM LEAK DETECTION SYSTEM & OBD-LEFT SIDE	8.5	50	ASTM A53 G&T	60.3	3.91	100	1.5D	90	20			50/15	55				PLUG NB50 PIPE WITH THREAD 1/2" NPT(F)	1 15	
		8.5	50	ASTM A53 G&T	21.3	3.73	700	1.5D	90	75										
8.00	SERVICE AIR PIPING TO AIR HEATER SOOOT BLOWING																			
8.01	SERVICE AIR PIPING TO AIR HEATER SOOT BLOWING (GALVANISED PORTION)	8.5	50	ASTM A53 G&T	88.9	3.96	70	1.5D	90	10										
8.02	SERVICE AIR PIPING TO AIR HEATER SOOT BLOWING (SA106GR.B PORTION)	8.5	50	SA106 GR.B	88.9	3.96	5	1.5D	90	2	OD127X12.5/ 88.9X3.96	1								
9.00	SERVICE AIR PIPING TO AIR RECEIVER																			
9.01	SERVICE AIR PIPING TO AIR RECEIVER-A INLET NOZZLE(UP TO MATCHING EXPANDERS)-LEFT	8.5	50	ASTM A53 G&T	60.3	3.91	42	1.5D	90	10	150/100 100/50	1 1								
9.02	SERVICE AIR PIPING TO AIR RECEIVER-B INLET NOZZLE(AFTER MATCHING EXPANDERS)-RIGHT	8.5	50	ASTM A53 G&T	60.3	3.91	45	1.5D	90	10	150/100 100/50	1 1								
10.00	SERVICE AIR PIPING FROM AIR RECEIVER TO APH																			
10.01	SERVICE AIR PIPING FROM AIR RECEIVER-A OUTLET NOZZLE TO APH-A(AFTER MATCHING REDUCERS)	8.5	50	ASTM A53 G&T	33.4	4.55	45	1.5D	90	10	150/100 100/50 50/25	1 1 1						PIPE WITH THREAD 1" BSP(M)	1	
10.02	SERVICE AIR PIPING FROM AIR RECEIVER-B OUTLET NOZZLE TO APH-A(AFTER MATCHING REDUCERS)	8.5	50	ASTM A53 G&T	33.4	4.55	45	1.5D	90	10	150/100 100/50 50/25	1 1 1						PIPE WITH THREAD 1" BSP(M)	1	
11.00	SERVICE AIR TO PULVERISED COAL SAMPLING																			

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		CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH										**JITENDRA**		**VENKAT**		**K. V. RAMANI**				**MAITREE-01-QFB-MFB-550005-PCC-0, Maitree-00-LB-MB-00307-31623-PC**	
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		PRESS. Kg/cm^2 (g)	TEMP (^oC)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
11.01	SERVICE AIR TO PULVERISED COAL SAMPLING-LEFT1	8.5	50	ASTM A53 G&T	33.4	4.55	35	1.5D	90	8								PLUG NB25	1	
		8.5	50	ASTM A53 G&T	21.3	3.73	20	1.5D	90	24			25/15	14						
11.02	SERVICE AIR TO PULVERISED COAL SAMPLING-LEFT2	8.5	50	ASTM A53 G&T	33.4	4.55	35	1.5D	90	10								PLUG NB25	1	
		8.5	50	ASTM A53 G&T	21.3	3.73	20	1.5D	90	24			25/15	14						
11.03	SERVICE AIR TO PULVERISED COAL SAMPLING-RIGHT1	8.5	50	ASTM A53 G&T	33.4	4.55	35	1.5D	90	8								PLUG NB25	1	
		8.5	50	ASTM A53 G&T	21.3	3.73	20	1.5D	90	24			25/15	14						
11.04	SERVICE AIR TO PULVERISED COAL SAMPLING-RIGHT2	8.5	50	ASTM A53 G&T	33.4	4.55	35	1.5D	90	10								PLUG NB25	1	
		8.5	50	ASTM A53 G&T	21.3	3.73	20	1.5D	90	24			25/15	14						
12.00	BOP(C&I)																			
12.01	BOP(C&I)	8.5	50	ASTM A53 G&T	21.3	3.73	100	1.5D	90	20										
13.00	SPARES																			
13.01	NB50 SPARE HEADERS ON ALL 4 CORNERS OF FURNANCE	8.5	50	ASTM A53 G&T	60.3	3.91	10	1.5D	90	10								PLUG NB50	5	
13.02	NB25 SPARE LINES	8.5	50	ASTM A53 G&T	33.4	4.55	35	1.5D	90	4								PLUG NB25	5	
13.03	NB15 INDIVIDUAL SPARE LINES	8.5	50	ASTM A53 G&T	21.3	3.73	10	1.5D	90	4								PLUG NB15	10	
14.00	DRAINS																			
14.01	DRAIN HEADER TO AUTO DRAIN TRAP ASSEMBLY	8.5	50	ASTM A53 G&T	33.4	4.55	200	1.5D	90	30			25x15	6						
14.02	PRESSURE BALANCING FOR AIR TRAP	8.5	50	ASTM A53 G&T	21.3	3.73	20	1.5D	90	12			25x25	12						
15.00	LIE / LIR INTERMITTENT PURGING OF TRANSMITTER IMPULSE LINES-EDN																			
15.01	SERVICE AIR HEADER TO LIE / LIR INTERMITTENT PURGING OF TRANSMITTER IMPULSE LINES	8.5	50	ASTM A53 G&T	33.4	4.55	120	1.5D	90	20			25X15	35				PLUG NB25	1	

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		PROJECT TITLE: MAITREE 2x660MW										**PREPARED BY**		**CHECKED BY:**		**APPROVED BY:**				**Document Referred:**	
		CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH										**JITENDRA**		**VENKAT**		**K. V. RAMANI**				**MAITREE-01-QFB-MFB-550005-PCC-0, Maitree-00-LB-MB-00307-31623-PC**	
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		PRESS. Kg/cm^2 (g)	**TEMP (^{o}C)**		**OD (mm)**	**THK (mm)**	**LEN (M)**	**R**	**θ deg**	**No**	**SIZE (NB)**	**No**	**SIZE (NB)**	**No**	**SIZE (NB)**	**Rating**	**No**	**SIZE (NB)**	**No**	
15.02	**SERVICE AIR INDIVIDUAL LINES TO LIE / LIR INTERMITTENT PURGING OF TRANSMITTER IMPULSE LINES**	**8.5**	**50**	**ASTM A53 G&T**	**21.3**	**3.73**	**1000**	**1.5D**	**90**	**200**										
16.00	**FOR INSTRUMENTS**	**8.5**	**50**	**ASTM A53 G&T**	**21.3**	**3.73**	**1**						**150/15**	**2**						

NOTE: SOCKETS, UNIONS AND NIPPLES SHALL BE CONSIDER SUITABLY FOR RELEASE

mtl	OD (mm)	THK (mm)	LEN (M)	elb no	REDUCERS	red no	tee	tee no	SIZE (NB)	mis no
ASTM A53 G&T	168.3	5.56	250	15			150/150	1		
ASTM A53 G&T							150/100	1		
ASTM A53 G&T	114.3	4.78	20	8			150/80	1		
ASTM A53 G&T							150/50	8		
ASTM A53 G&T	60.3	3.91	70	14			25/15	2		
ASTM A53 G&T	21.3	3.73	2	4			15/15	2		
ASTM A53 G&T	60.3	3.91	65	16			25/25	6		
ASTM A53 G&T	21.3	3.73	2	4			25/15	54		
ASTM A53 G&T							150/25	40		
ASTM A53 G&T	33.4	4.55	40	10			150/15	8		
ASTM A53 G&T	21.3	3.73	16	24						
ASTM A53 G&T	33.4	4.55	40	7						
ASTM A53 G&T	21.3	3.73	16	24						
ASTM A53 G&T	33.4	4.55	40	7						
ASTM A53 G&T	21.3	3.73	16	24						
ASTM A53 G&T	33.4	4.55	40	7						
ASTM A53 G&T	21.3	3.73	16	24						
ASTM A53 G&T	33.4	4.55	40	10						
ASTM A53 G&T	21.3	3.73	16	24						
ASTM A53 G&T										
ASTM A53 G&T	21.3	3.73	28	6						
ASTM A53 G&T	21.3	3.73	28	6						
ASTM A53 G&T	21.3	3.73	28	6						
ASTM A53 G&T	21.3	3.73	28	6						
ASTM A53 G&T	21.3	3.73	28	6						
ASTM A53 G&T	21.3	3.73	28	6						
ASTM A53 G&T										
ASTM A53 G&T	33.4	4.55	90	10			25/15	38	PLUG NB25	1
ASTM A53 G&T	21.3	3.73	200	35						
ASTM A53 G&T	33.4	4.55	65	10			25/15	38	PLUG NB25	1
ASTM A53 G&T	21.3	3.73	220	45					PLUG NB50	2
ASTM A53 G&T										
ASTM A53 G&T	60.3	3.91	100	20			50/15	55	PIPE WITH THREAD 1/2" NPT(F)	30
ASTM A53 G&T	21.3	3.73	620	70						
ASTM A53 G&T	60.3	3.91	100	20			50/15	55		
ASTM A53 G&T	21.3	3.73	700	75						
ASTM A53 G&T										
ASTM A53 G&T	88.9	3.96	70	10						
SA106 GR.B	88.9	3.96	5	2	OD127X12.5/88.9X3.96	1				
ASTM A53 G&T										
ASTM A53 G&T	60.3	3.91	42	10						
ASTM A53 G&T	60.3	3.91	45	10						
ASTM A53 G&T										
ASTM A53 G&T	33.4	4.55	45	10	150/100	4			PIPE WITH THREAD 1" BSP(M)	1
ASTM A53 G&T	33.4	4.55	45	10	100/50	4			PIPE WITH THREAD 1" BSP(M)	1
ASTM A53 G&T					50/25	2				
ASTM A53 G&T	33.4	4.55	35	8					PLUG NB25	1
ASTM A53 G&T	21.3	3.73	20	24			25/15	14		
ASTM A53 G&T	33.4	4.55	35	10					PLUG NB25	1
ASTM A53 G&T	21.3	3.73	20	24			25/15	14		
ASTM A53 G&T	33.4	4.55	35	8					PLUG NB25	1
ASTM A53 G&T	21.3	3.73	20	24			25/15	14		
ASTM A53 G&T	33.4	4.55	35	10					PLUG NB25	1
ASTM A53 G&T	21.3	3.73	20	24			25/15	14		
ASTM A53 G&T										
ASTM A53 G&T	21.3	3.73	100	20						

mtl	OD (mm)	THK (mm)	Sum of LEN (M)
ASTM A53 G&T	21.3	3.73	3219
	33.4	4.55	980
	60.3	3.91	432
	88.9	3.96	70
	114.3	4.78	20
	168.3	5.56	250
	(blank)	(blank)	
SA106 GR.B	88.9	3.96	5
(blank)	(blank)	(blank)	
Grand Total			4976

mtl	OD (mm)	Sum of elb no
ASTM A53 G&T	21.3	745
	33.4	178
	60.3	100
	88.9	10
	114.3	8
	168.3	15
	(blank)	
SA106 GR.B	88.9	2
(blank)	(blank)	
Grand Total		1058

mtl	REDUCERS	Sum of red no
ASTM A53 G&T	100/50	4
	150/100	4
	50/25	2
	(blank)	
SA106 GR.B	OD127X12.5/88.9X3.96	1
(blank)	(blank)	
Grand Total		11

Row Labels	Sum of tee no
15/15	2
150/100	1
150/15	10
150/150	1
150/25	40
150/50	8
150/80	1
25/15	229
25/25	18
50/15	110
(blank)	
Grand Total	420

Row Labels	Sum of mis no
PIPE WITH THREAD 1" BSP(M)	2
PIPE WITH THREAD 1/2" NPT(F)	30
PLUG NB15	10
PLUG NB25	12
PLUG NB50	7
(blank)	
Grand Total	61

ASTM A53 G&T													
ASTM A53 G&T	60.3	3.91	10	10					PLUG NB50	5			
ASTM A53 G&T	33.4	4.55	35	4					PLUG NB25	5			
ASTM A53 G&T	21.3	3.73	10	4					PLUG NB15	10			
ASTM A53 G&T													
ASTM A53 G&T	33.4	4.55	200	30			25/15	6					
ASTM A53 G&T	21.3	3.73	20	12			25/25	12					
ASTM A53 G&T													
ASTM A53 G&T	33.4	4.55	120	20			25/15	35	PLUG NB25	1			
ASTM A53 G&T	21.3	3.73	1000	200									
ASTM A53 G&T	21.3	3.73	1				150/15	2					

	DOCUMENT TITLE: ESTIMATED BILL OF MATERIALS FOR AUX. STEAM PIPING	**DOCUMENT NO: PC:7328-07**	**REV NO: 00 DATE :03.09.2018**
	PROJECT TITLE: MAITREE 2x660MW	**PREPARED BY**	**CHECKED BY:**	**APPROVED BY:**	**DOCUMENT REFERRED:**
	CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH	**JITENDRA**	**VENKAT**	**K.V.RAMANI**	**MAITREE-01-LBG-MFB-119107-PEM, MAITREE-00-UZT-MB-120018-PEM**
		THIS BOM IS FOR ALL UNITS*			

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE						REDUCERS		TEES		FLANGES			MISCELLANEOUS		REV	REMARKS
		PRESS. Kg/cm^2 (g)	TEMP (^oC)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No		
1.00	AUX. STEAM FROM AUX. BOILER TO AUX. STEAM HEADER																				
1.1	AUX. STEAM FROM AUX. BOILER TO AUX. STEAM HEADER	20	350	SA106GRB	273	6.35	700	1.5D	90	90											
1.2	DRAIN & VENT	20	350	SA106GRB	33.4	4.55	150						NB25	36				STUB NB25	22		SITE WELDED

NOTE: PEM TO YET TO FINALIZE THE RACK. REVISED WILL BE GIVEN ACCORDINGLY

	DOCUMENT TITLE: ESTIMATED BILL OF MATERIALS FOR LP PIPING DRAINS	**DOCUMENT NO: PC:7328-08**	**REV NO: 00 DATE : 03.09.18**
	PROJECT TITLE: MAITREE 2x660MW	**PREPARED BY** / **CHECKED BY:** / **APPROVED BY:**	**Document Referred: P&ID-MAITREE-00-LCL-MFB-550002-PCC-A, MAITREE-01-LBG-MFB-550003-PCC, MAITREE-01-LBG-MFB-550007-PCC**
	CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH	**JITENDRA** / **VENKAT** / **K. V. RAMANI**	SHEET 1 OF 1
		THIS BOM IS FOR ONE UNIT ONLY*	

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE						REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		PRESS. Kg/cm^2 (g)	TEMP (^oC)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
1.00	AUX STEAM SYSTEM DRAINS																			
1.01	AUX. STEAM TO SCAPH	20	350	SA106GRB	33.4	4.55	150	1.5D	90	40			25	15						
1.02	AUX. STEAM TO SOOT BLOWING	20	350	SA106GRB	33.4	4.55	100	1.5D	90	20			25	6						
		20	350	SA106GRB	60.3	5.54	5													
1.03	AUX. STEAM TO MILL INERTING	20	350	SA106GRB	33.4	4.55	200	1.5D	90	30			25	20						
1.04	IMPULSE PIPING	20	350	SA106GRB	21.3	3.73	75													
2.00*	LP START-UP SYSTEM DRAINS																			
2.01	LP CONDENSATE PUMP DISCHARGE DRAIN	7	177	SA106GRB	33.4	4.55	40													
2.02	LP CONDENSATE PUMP DISCHARGE DRAIN U/S LOOP	7	177	SA106GRB	60.3	5.54	20													
2.03	FTDT DRAIN TO NEAREST TRENCH	7	177	SA106GRB	355.6	9.53	20	1.5D	90	10										

NOTE : * NEAREST TRENCH LOCATION IS YET TO BE KNOWN AS RESPECTIVE PAVING DRAWING IS NOT RELEASED BY PEM. QUANTITY MAY VARY ON RECEIPT OF THE SAME

	DOCUMENT TITLE: ESTIMATED BILL OF MATERIALS FOR SEAL AIR FOR SOOT BLOWERS-WB & LRSB			DOCUMENT NO: PC:7328:10	REV NO: 00 DATE :18-12-18
	PROJECT TITLE: MAITREE 2x660MW	PREPARED BY	CHECKED BY:	APPROVED BY:	Document Ref: 2-00-301-31895, Maitree-00-LB-MB-00307-31623-PC
	CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH	VENKAT	VENKAT	K.V.RAMANI	Sheet No: 1 of 2
		THIS BOM IS FOR ONE UNIT ONLY*			

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE						REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		PRESS. Kg/cm^2 (g)	TEMP (^{o}C)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
1.00	SEAL AIR																			
1.00	FROM SEAL AIR FAN OUTLET TO DAMPER	1	40	API5LGRB	610	6.4	10	1.5D	90 45	2 2										
2.00	SEAL AIR MAIN HEADER	1	40	API5LGRB	610	6.4	25	1.5D	90	4	600/550	1	600/150	1						BRANCH AT SITE
		1	40	API5LGRB	559	6.4	35	1.5D	90 45	3 2	550/500	1	550/150	3						BRANCH AT SITE
		1	40	API5LGRB	508	6.4	10				500/450	1	500/200 500/150	1 1						BRANCH AT SITE
		1	40	API5LGRB	457	4.8	10				450/400	1	450/150	2						BRANCH AT SITE
		1	40	API5LGRB	406.4	4.8	25	1.5D	90	7	400/350	1	400/200	1						BRANCH AT SITE
		1	40	API5LGRB	355.6	6.4	5				350/250	1	350/200	1						BRANCH AT SITE
		1	40	API5LGRB	273.1	4	5				250/200	1	250/200	1						BRANCH AT SITE
2.01	SEAL AIR HEADER FOR WB@22716,22880	1	40	ASTM A53 GRB	168.3	5.56	99	1.5D	90	11			150	1				STUBS NB40	22	
	WB@22716	1	40	ASTM A53 GRB	48.3	4.05	51	1.5D	90	10								THREADED PIPE 1.5" NPT MALE	10	
	WB@22880	1	40	ASTM A53 GRB	48.3	4.05	55	1.5D	90	14								THREADED PIPE 1.5" NPT MALE	12	
2.02	SEAL AIR HEADER FOR WB@38275,38325	1	40	ASTM A53 GRB	168.3	5.56	104	1.5D	90	10			150	1				STUBS NB40	22	
	WB@38275	1	40	ASTM A53 GRB	48.3	4.05	59	1.5D	90	10								THREADED PIPE 1.5" NPT MALE	10	
	WB@38325	1	40	ASTM A53 GRB	48.3	4.05	45	1.5D	90	14								THREADED PIPE 1.5" NPT MALE	12	

	DOCUMENT TITLE: ESTIMATED BILL OF MATERIALS FOR SEAL AIR FOR SOOT BLOWERS-WB & LRSB			DOCUMENT NO: PC:7328:10	REV NO: 00 DATE :18-12-18
	PROJECT TITLE: MAITREE 2x660MW	PREPARED BY	CHECKED BY:	APPROVED BY:	Document Ref: 2-00-301-31895, Maitree-00-LB-MB-00307-31623-PC
	CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH	VENKAT	VENKAT	K.V.RAMANI	Sheet 1 of 2
		THIS BOM IS FOR ONE UNIT ONLY*			

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE						REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		PRESS. Kg/cm^2 (g)	TEMP (^{o}C)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
2.03	SEAL AIR HEADER FOR WB@41310,41318, LRSB@40800	1	40	ASTM A53 GRB	168.3	5.56	82	1.5D	90 45	5 2			150	1				STUBS NB40	18	
	WB @41310	1	40	ASTM A53 GRB	48.3	4.05	37	1.5D	90	10								THREADED PIPE 1.5" NPT MALE	10	
	WB @41318	1	40	ASTM A53 GRB	48.3	4.05	33	1.5D	90	8								THREADED PIPE 1.5" NPT MALE	8	
	HEADER FOR LRSB @40880	1	40	ASTM A53 GRB	168.3	5.56	60	1.5D	90	2								STUBS NB80	4	
	LRSB @40880	1	40	ASTM A53 GRB	88.9	4.85	12	1.5D	90	4	80/40	4						THREADED PIPE 1.5" NPT MALE	4	
2.04	SEAL AIR HEADER FOR WB@44295,44303, LRSB@44000,44300,47500	1	40	ASTM A53 GRB	168.3	5.56	80	1.5D	90	2			150	1				STUBS NB40	18	
	WB @44295	1	40	ASTM A53 GRB	48.3	4.05	37	1.5D	90	10								THREADED PIPE 1.5" NPT MALE	10	
	WB @44303	1	40	ASTM A53 GRB	48.3	4.05	33	1.5D	90	8								THREADED PIPE 1.5" NPT MALE	8	
	HEADER FOR LRSB @40880	1	40	ASTM A53 GRB	219.1	4	48	1.5D	90	3			200	1				STUBS NB80	8	
	LRSB @44000,44300,47500	1	40	ASTM A53 GRB	88.9	4.85	21	1.5D	90	8	80/40	8						THREADED PIPE 1.5" NPT MALE	8	
2.05	SEAL AIR HEADER FOR LRSB@51600,51800,54700,55200	1	40	ASTM A53 GRB	168.3	5.56	85	1.5D	90	4			150	2				STUBS NB80	8	
	LRSB @51600,54700	1	40	ASTM A53 GRB	88.9	4.85	13	1.5D	90	4	80/40	4						THREADED PIPE 1.5" NPT MALE	4	
	LRSB @51800,55200	1	40	ASTM A53 GRB	88.9	4.85	11	1.5D	90	4	80/40	4						THREADED PIPE 1.5" NPT MALE	4	
2.06	SEAL AIR HEADER FOR LRSB@58578,58750.60508	1	40	ASTM A53 GRB	219.1	4	88	1.5D	90	3								STUBS NB80	8	
	LRSB @58578,58750.60508	1	40	ASTM A53 GRB	88.9	4.85	18	1.5D	90	8	80/40	8						THREADED PIPE 1.5" NPT MALE	8	

	DOCUMENT TITLE: ESTIMATED BILL OF MATERIALS FOR SEAL AIR FOR SOOT BLOWERS-WB & LRSB	**DOCUMENT NO: PC:7328:10**	**REV NO: 00 DATE :18-12-18**
	PROJECT TITLE: MAITREE 2x660MW	**PREPARED BY** / **CHECKED BY:** / **APPROVED BY:**	
	CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH	**VENKAT** / **VENKAT** / **K.V.RAMANI**	**Document Referred: 2-00-301-31895, Maitree-00-LB-MB-00307-31623-PC**
		THIS BOM IS FOR ONE UNIT ONLY*	

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE						REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		PRESS. Kg/cm^2 (g)	TEMP (^{o}C)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
2.07	SEAL AIR HEADER FOR LRSB@62200,62258	1	40	ASTM A53 GRB	219.1	4	92	1.5D	90	3								STUBS NB80	10	
	LRSB @62200,62258	1	40	ASTM A53 GRB	88.9	4.85	21	1.5D	90	11	80/40	10						THREADED PIPE 1.5" NPT MALE	10	
2.08	SEAL AIR HEADER FOR LRSB@64800,64885	1	40	ASTM A53 GRB	219.1	4	113	1.5D	90	3								STUBS NB80	8	
	LRSB @64800,64885	1	40	ASTM A53 GRB	88.9	4.85	20	1.5D	90	8	80/40	8						THREADED PIPE 1.5" NPT MALE	8	
2.09	SEAL AIR HEADER FOR LRSB@67800	1	40	ASTM A53 GRB	219.1	4	90	1.5D	90	5								STUBS NB80	8	
	LRSB @67800	1	40	ASTM A53 GRB	88.9	4.85	15	1.5D	90	8	80/40	8						THREADED PIPE 1.5" NPT MALE	8	
2.10	SPARE	1	40	ASTM A53 GRB	219.1	4	70	1.5D	90	10	80/40	6						STUBS NB80	5	
		1	40	ASTM A53 GRB	168.3	5.56	75	1.5D	90	10								STUBS NB40	5	
		1	40	ASTM A53 GRB	88.9	4.85	70	1.5D	90	108										
		1	40	ASTM A53 GRB	48.3	4.05	70	1.5D	90	160								THREADED PIPE 1.5" NPT MALE	10	

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
*			MAIN CIRCULATION WATER PIPING										1.000	0.000	0.000	1,85,561.565
*	A2		BOM FOR CW INSIDE TG HALL		NU							00	1.000	0.000	0.000	79,917.930
*	93		ACW PIPING INSIDE TG4		NU							00	1.000	0.000	0.000	6,404.132
*	87		ACW PIPING INSIDE TG3		NU							00	1.000	0.000	0.000	4,373.205
*	69		ACW PIPING INSIDE TG2		NU							00	1.000	0.000	0.000	13,025.531
*	45		ACW PIPING INSIDE TG1		NU							00	1.000	0.000	0.000	18,229.476
*	44		DUPLEX SS BOM		NU	NO						00	1.000	0.000	0.000	11,337.250
*	39		FITTINGS FOR ACW INSIDE TG4		00							00	1.000	0.000	0.000	6,227.715
*	34		FITTINGS FOR ACW INSIDE TG3		00							00	1.000	0.000	0.000	2,449.955
*	22		FITTINGS FOR ACW INSIDE TG2		00							00	1.000	0.000	0.000	6,094.178
*	04		FITTINGS FOR ACW INSIDE TG1		00							00	1.000	0.000	0.000	9,153.549
*	01		PUDDLE FLANGE NB2600- OG- (PU COATING)		NU							00	1.000	0.000	0.000	28,348.644
001	01	01	PUDDLE FLANGE OD2632X16 OG (PU COATING)	3-80-468-34322	NU	NO			C	410179623		02	2.000	0.000	0.000	9,418.872
001	02	01	P.F.PIPE OD 2632 X 16 L=2250	3-80-468-34340	NU	NO	PLATE 16.0 MM - SA515GR70	SA515GR70	C		159421120000	00	2.000	2,250.000	8,216.000	4,643.684
001	02	02	SLEEVE PAD 16 X 4158X 1000	3-80-468-34322	NU	NO	PLATE 16.0 MM - SA515GR70	SA515GR70	C		159421120000	02	4.000	4,158.000	1,000.000	2,088.980
001	02	03	PUDDLE FLANGE PLATE 20X3200X3200	3-80-468-34322	NU	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C	410179623	159421130000	02	2.000	3,200.000	3,200.000	1,470.400
001	02	04	RIB PL-1 20 X 440 X 875	3-80-468-34322	NU	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C		159421130000	02	16.000	440.000	875.000	967.120
001	02	05	RIB PL-2 20 X 440 X 225	3-80-468-34322	NU	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C		159421130000	02	16.000	440.000	225.000	248.688
002	01	02	PUDDLE FLANGE OD2332X16 OG (PU COATING)	3-80-468-34549	NU	NO			C	410179484		02	6.000	0.000	0.000	18,929.772
002	03	01	PLATE FORMED PIPE OD2332 X 16;L=1200	3-80-468-34549	NU	NO	PLATE 16.0 MM - SA515GR70	SA515GR70	C	410176466	159421120000	02	6.000	7,274.000	1,500.000	8,222.532
002	03	02	SLEEVE PAD 16 X 3686X 1000	3-80-468-34549	NU	NO	PLATE 16.0 MM - SA515GR70	SA515GR70	C	410176415	159421120000	02	12.000	3,686.000	1,000.000	5,555.544
002	03	03	PUDDLE FLANGE PLATE 20 X 2800 X 2800	3-80-468-34549	NU	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C	410179623	159421130000	02	6.000	2,800.000	2,800.000	3,250.656
002	03	04	RIB PLATE-1 20 X 440X 750	3-80-468-34549	NU	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C	410176415	159421130000	02	48.000	440.000	750.000	1,458.240
002	03	05	RIB PLATE-2 20 X 440X 200	3-80-468-34549	NU	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C	410176415	159421130000	02	48.000	440.000	200.000	442.800
003	04	01	90D ELB NB450 WITH FL (R/L) A-1015	3-80-468-35130	00	NO			C			00	1.000	0.000	0.000	262.990
003	05	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35130	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182887	995043070000	00	1.000	0.000	0.000	113.370
003	05	02	PIPE OD-457X9.53 L=312	3-80-468-35130	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	312.000	0.000	32.810
003	05	03	PIPE OD-457X9.53 L=312	3-80-468-35130	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	312.000	0.000	32.810
003	05	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	84.000
004	04	02	90D ELB NB450 WITH FL (R/L) A-800	3-80-468-35131	00	NO			C			00	4.000	0.000	0.000	871.088
004	06	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35131	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182887	995043070000	00	4.000	0.000	0.000	453.480
004	06	02	PIPE OD-457X9.53 L=97	3-80-468-35131	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	4.000	97.000	0.000	40.804
004	06	03	PIPE OD-457X9.53 L=97	3-80-468-35131	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	4.000	97.000	0.000	40.804
004	06	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	8.000	10.000	10.000	336.000
005	04	03	90D ELB NB450 WITH FL (R/L) A-916	3-80-468-35132	00	NO			C			00	1.000	0.000	0.000	242.168
005	07	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35132	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182887	995043070000	00	1.000	0.000	0.000	113.370
005	07	02	PIPE OD-457X9.53 L=213	3-80-468-35132	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	213.000	0.000	22.399
005	07	03	PIPE OD-457X9.53 L=213	3-80-468-35132	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	213.000	0.000	22.399
005	07	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	84.000
006	04	04	90D ELB NB450 WITH FL (R/L) A-964	3-80-468-35133	00	NO			C			00	2.000	0.000	0.000	252.264
006	08	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35133	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182887	995043070000	00	1.000	0.000	0.000	113.370
006	08	02	PIPE OD-457X9.53 L=261	3-80-468-35133	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	261.000	0.000	27.447
006	08	03	PIPE OD-457X9.53 L=261	3-80-468-35133	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	261.000	0.000	27.447
006	08	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	84.000
007	04	05	90D ELB NB450 WIT FL(R/L) A-923/686 HOLD	3-80-468-35134	00	NO			C			00	1.000	0.000	0.000	270.456
007	09	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35134	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182887	995043070000	00	1.000	0.000	0.000	113.370
007	09	02	PIPE OD-457X9.53 L=246	3-80-468-35134	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	246.000	0.000	25.869
007	09	03	PIPE OD-457X9.53 L=449	3-80-468-35134	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	449.000	0.000	47.217
007	09	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	84.000
008	04	06	90D SR ELB NB450 WITH FL (R/L) A-826	3-80-468-35136	00	NO			C			00	1.000	0.000	0.000	233.562
008	10	01	BW SR 90DEG ELL OD457.2X9.53	3-80-468-35136	00	NO	BW SR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182887	925042930000	00	1.000	0.000	0.000	75.530
008	10	02	PIPE OD-457X9.53 L=352	3-80-468-35136	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	352.000	0.000	37.016
008	10	03	PIPE OD-457X9.53 L=352	3-80-468-35136	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	352.000	0.000	37.016
008	10	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	84.000
009	04	07	45D ELB NB450 WITH FL (R/L) A-386	3-80-468-35137	00	NO			C			00	1.000	0.000	0.000	146.538
009	11	01	BW LR 45DEG ELL OD457.2X9.53	3-80-468-35137	00	NO	BW LR 45DEG ELL OD406.4X9.53 SA234WPB	SA234WPB	C	410182887	995043060000	00	1.000	0.000	0.000	44.660
009	11	02	PIPE OD-457X9.53 L=85	3-80-468-35137	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	85.000	0.000	8.939
009	11	03	PIPE OD-457X9.53 L=85	3-80-468-35137	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	85.000	0.000	8.939
009	11	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	84.000
010	04	08	45D ELB NB450 WITH FL (R/L) A-360	3-80-468-35138	00	NO			C			00	1.000	0.000	0.000	154.155
010	12	01	BW SR 45DEG ELL OD457.2X9.53	3-80-468-35138	00	NO	BW SR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182887	925042930000	00	1.000	0.000	0.000	37.765
010	12	02	PIPE OD-457X9.53 L=154	3-80-468-35138	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	154.000	0.000	16.195
010	12	03	PIPE OD-457X9.53 L=154	3-80-468-35138	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	154.000	0.000	16.195
010	12	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	84.000
011	04	09	90D ELB NB500 WITH FL (R/L) A-876	3-80-468-35145	00	NO			C			00	2.000	0.000	0.000	541.912
011	13	01	BW LR 90DEG ELL OD508X9.53	3-80-468-35145	00	NO	BW LR 90DEG ELL OD508X9.53 SA234WPB	SA234WPB	C	410182887	995043270000	00	2.000	0.000	0.000	280.460
011	13	02	PIPE OD-508X9.53 L=97	3-80-468-35145	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389936000	00	2.000	97.000	0.000	22.726
011	13	03	PIPE OD-508X9.53 L=97	3-80-468-35145	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389936000	00	2.000	97.000	0.000	22.726
011	13	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182887	159421180000	00	4.000	10.000	10.000	216.000
012	04	10	90D ELB NB500 WITH FL (R/L) A-1054	3-80-468-35146	00	NO			C			00	2.000	0.000	0.000	625.316
012	14	01	BW LR 90DEG ELL OD508X9.53	3-80-468-35146	00	NO	BW LR 90DEG ELL OD508X9.53 SA234WPB	SA234WPB	C	410182887	995043270000	00	2.000	0.000	0.000	280.460
012	14	02	PIPE OD-508X9.53 L=275	3-80-468-35146	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389936000	00	2.000	275.000	0.000	64.428
012	14	03	PIPE OD-508X9.53 L=275	3-80-468-35146	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389936000	00	2.000	275.000	0.000	64.428
012	14	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182887	159421180000	00	4.000	10.000	10.000	216.000
013	04	11	90D SR ELB NB600 WITH FL (R/L) A-610	3-80-468-35154	00	NO			C			00	3.000	0.000	0.000	580.545
013	15	01	90D SR MB NB600 WITH FL A-610	3-80-468-35154	00	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389946000	00	3.000	674.000	0.000	272.625
013	15	02	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182887	159421160000	00	6.000	10.000	10.000	307.920
014	04	12	RED NB600/350 WITH FL (R/L) A-511	3-80-468-35171	00	NO			C			00	3.000	0.000	0.000	430.323
014	16	01	P.F.RED NB600/350	4-80-468-82848	00	NO	PLATE 10.0 MM - SA515GR70	SA515GR70	C	410182887	159421090000	00	3.000	1,470.000	640.000	122.880
014	16	02	PIPE OD610X9.53 L=91	3-80-468-35171	00	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389946000	00	3.000	91.000	0.000	38.523
014	16	03	PIPE OD355.6X9.53 L=90	3-80-468-35171	00	NO	PIPE OD-355.6X9.53X6000-A53-GRB	A53-GRB	C	410182887	159389606000	00	3.000	90.000	0.000	21.960
014	16	04	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182887	159421160000	00	3.000	10.000	10.000	153.960
014	16	05	F.F.FLANGE NB350 CL-150	3-80-468-34835	08	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182887	159421160000	00	3.000	10.000	10.000	93.000
015	04	13	BLANK FLANGE NB800 CL-D	3-80-468-35172	00	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C		159421170000	00	2.000	1,060.000	1,060.000	530.000
016	04	14	90D SR ELB NB800 WITH FL (R/L) A-826	3-80-468-35157	00	NO			C			00	1.000	0.000	0.000	457.882
016	17	01	90D SR MB OD813X9.53 AL-811	3-80-468-35157	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	1,418.000	0.000	262.082
016	17	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	195.800
017	04	15	90D SR ELB NB800 WITH FL (R/L) A-826/106	3-80-468-35158	00	NO			C			00	1.000	0.000	0.000	507.542
017	18	01	90D SR MB OD813X9.53AL-811/1045	3-80-468-35158	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	1,681.000	0.000	311.742
017	18	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	195.800
018	04	16	UEQT N8800/600 WITH FL (R/L) L-1220/800	3-80-468-35162	00	NO			C			00	3.000	0.000	0.000	1,563.894
018	19	01	PIPE OD813X9.53 L=1190	3-80-468-35162	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	3.000	1,190.000	0.000	609.600
018	19	02	PIPE OD610X9.53 L=503	3-80-468-35162	00	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389946000	00	3.000	503.000	0.000	212.934
018	19	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	6.000	10.000	10.000	587.400
018	19	04	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182887	159421160000	00	3.000	10.000	10.000	153.960
019	04	17	UEQT N8800/450 WITH FL (R/L) L-1220/577	3-80-468-35163	00	NO			C			00	1.000	0.000	0.000	473.820
019	20	01	PIPE OD813X9.53 L=1190	3-80-468-35163	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	1,190.000	0.000	213.200
019	20	02	PIPE OD457X9.53 L=217	3-80-468-35163	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	217.000	0.000	22.820
019	20	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	195.800
019	20	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	1.000	10.000	10.000	42.000
020	04	18	UEQT N8800/500 WITH FL (R/L) L-1220/724	3-80-468-35164	00	NO			C			00	2.000	0.000	0.000	1,009.094
020	21	01	PIPE OD813X9.53 L=1190	3-80-468-35164	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	2.000	1,190.000	0.000	420.000
020	21	02	PIPE OD508X9.53 L=382	3-80-468-35164	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389936000	00	2.000	382.000	0.000	89.494
020	21	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	4.000	10.000	10.000	391.600
020	21	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182887	159421180000	00	2.000	10.000	10.000	108.000
021	22	01	90D ELB NB450 WITH FL (R/L) A-800	3-80-468-35131	00	NO			C			00	5.000	0.000	0.000	1,088.860
021	06	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35131	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182887	995043070000	00	5.000	0.000	0.000	566.850
021	06	02	PIPE OD-457X9.53 L=97	3-80-468-35131	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	5.000	97.000	0.000	51.005
021	06	03	PIPE OD-457X9.53 L=97	3-80-468-35131	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	5.000	97.000	0.000	51.005
021	06	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	10.000	10.000	10.000	420.000
022	22	02	90D ELB NB450 WITH FL (R/L) A-916	3-80-468-35132	00	NO			C			00	1.000	0.000	0.000	242.168
022	07	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35132	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182887	995043070000	00	1.000	0.000	0.000	113.370
022	07	02	PIPE OD-457X9.53 L=213	3-80-468-35132	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	213.000	0.000	22.399
022	07	03	PIPE OD-457X9.53 L=213	3-80-468-35132	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	213.000	0.000	22.399
022	07	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	84.000
023	23	03	90D ELB NB450 WITH FL (R/L) A-976/800	3-80-468-35135	00	NO			C			00	1.000	0.000	0.000	236.280
023	23	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35135	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182887	995043070000	00	1.000	0.000	0.000	113.370
023	23	02	PIPE OD-457X9.53 L=97	3-80-468-35135	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	97.000	0.000	10.201
023	23	03	PIPE OD-457X9.53 L=273	3-80-468-35135	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	273.000	0.000	28.709
023	23	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	84.000
024	22	04	60D ELB NB450 WITH FL (R/L) A-500/1269	3-80-468-35139	00	NO			C			00	1.000	0.000	0.000	254.746
024	24	01	BW LR 60DEG ELL OD457.2X9.53	3-80-468-35139	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182887	995043070000	00	1.000	0.000	0.000	75.580
024	24	02	PIPE OD-457X9.53 L=85	3-80-468-35139	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	85.000	0.000	8.939
024	24	03	PIPE OD-457X9.53 L=858	3-80-468-35139	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	858.000	0.000	90.227
024	24	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	80.000
025	22	05	60D ELB NB450 WITH FL (R/L) A-452/1269	3-80-468-35140	00	NO			C			00	1.000	0.000	0.000	256.230
025	25	01	BW SR 60DEG ELL OD457.2X9.53	3-80-468-35140	00	NO	BW SR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182887	925042930000	00	1.000	0.000	0.000	50.350
025	25	02	PIPE OD-457X9.53 L=171	3-80-468-35140	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	171.000	0.000	17.982
025	25	03	PIPE OD-457X9.53 L=988	3-80-468-35140	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	988.000	0.000	103.898
025	25	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	84.000
026	22	06	60D ELB NB450 WITH FL (R/L) A-452/951	3-80-468-35141	00	NO			C			00	2.000	0.000	0.000	445.578
026	26	01	BW SR 60DEG ELL OD457.2X9.53	3-80-468-35141	00	NO	BW SR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182887	925042930000	00	2.000	0.000	0.000	100.700
026	26	02	PIPE OD-457X9.53 L=171	3-80-468-35141	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	2.000	171.000	0.000	35.964
026	26	03	PIPE OD-457X9.53 L=670	3-80-468-35141	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	2.000	670.000	0.000	140.914
026	26	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	4.000	10.000	10.000	168.000
027	22	07	45D ELB NB450 WITH FL (R/L) A-386/866	3-80-468-35142	00	NO			C			00	1.000	0.000	0.000	197.014

027	27	01	BW LR 45DEG ELL OD457.2X9.53	3-80-468-35142	00	NO	BW LR 45DEG ELL OD406.4X9.53 SA234WPB	SA234WPB	C	410182887	995043060000	00	1.000	0.000	0.000	44.660
027	27	02	PIPE OD-457X9.53 L=85	3-80-468-35142	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	85.000	0.000	8.939
027	27	03	PIPE OD-457X9.53 L=565	3-80-468-35142	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	565.000	0.000	59.415
027	27	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	84.000
028	22	08	45D ELB NB450 WITH FL (R/L) A-502/1100	3-80-468-35143	00	NO			C			00	1.000	0.000	0.000	233.820
028	28	01	BW LR 45DEG ELL OD457.2X9.53	3-80-468-35143	00	NO	BW LR 45DEG ELL OD406.4X9.53 SA234WPB	SA234WPB	C	410182887	995043060000	00	1.000	0.000	0.000	44.660
028	28	02	PIPE OD-457X9.53 L=799	3-80-468-35143	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	799.000	0.000	84.023
028	28	03	PIPE OD-457X9.53 L=201	3-80-468-35143	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	201.000	0.000	21.137
028	28	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	84.000
029	22	09	30D ELB NB450 WITH FL (R/L) A-400/800	3-80-468-35144	00	NO			C			00	1.000	0.000	0.000	205.998
029	29	01	BW LR 30DEG ELL OD457.2X9.53	3-80-468-35144	00	NO	BW LR 45DEG ELL OD406.4X9.53 SA234WPB	SA234WPB	C	410182887	995043060000	00	1.000	0.000	0.000	37.660
029	29	02	PIPE OD-457X9.53 L=601	3-80-468-35144	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	601.000	0.000	63.201
029	29	03	PIPE OD-457X9.53 L=201	3-80-468-35144	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389926000	00	1.000	201.000	0.000	21.137
029	29	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	84.000
030	22	10	90D SR ELB NB500 WITH FL (R/L) A-820	3-80-468-35147	00	NO			C			00	2.000	0.000	0.000	541.184
030	30	01	BW SR 90DEG ELL OD508X9.53	3-80-468-35147	00	NO	BW SR 90DEG ELL OD508X9.53 SA234WPB	SA234WPB	C	410182887	925242860000	00	2.000	0.000	0.000	186.960
030	30	02	PIPE OD-508X9.53 L=295	3-80-468-35147	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389936000	00	2.000	295.000	0.000	69.112
030	30	03	PIPE OD-508X9.53 L=295	3-80-468-35147	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389936000	00	2.000	295.000	0.000	69.112
030	30	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182887	159421180000	00	4.000	10.000	10.000	216.000
031	22	11	60D ELB NB500 WITH FL (R/L) A-615/496	3-80-468-35149	00	NO			C			00	1.000	0.000	0.000	227.602
031	31	01	BW SR 60DEG ELL OD508X9.53	3-80-468-35149	00	NO	BW LR 90DEG ELL OD508X9.53 SA234WPB	SA234WPB	C	410182887	995043270000	00	1.000	0.000	0.000	62.320
031	31	02	PIPE OD-508X9.53 L=185	3-80-468-35149	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389936000	00	1.000	185.000	0.000	21.671
031	31	03	PIPE OD-508X9.53 L=304	3-80-468-35149	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389936000	00	1.000	304.000	0.000	35.611
031	31	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182887	159421180000	00	2.000	10.000	10.000	108.000
032	22	12	60D ELB NB500 WITH FL (R/L) A-615/615	3-80-468-35150	00	NO			C			00	2.000	0.000	0.000	477.032
032	32	01	BW LR 60DEG ELL OD508X9.53	3-80-468-35150	00	NO	BW LR 90DEG ELL OD508X9.53 SA234WPB	SA234WPB	C	410182887	995043270000	00	2.000	0.000	0.000	187.000
032	32	02	PIPE OD-508X9.53 L=158	3-80-468-35150	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389936000	00	2.000	158.000	0.000	37.016
032	32	03	PIPE OD-508X9.53 L=158	3-80-468-35150	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389936000	00	2.000	158.000	0.000	37.016
032	32	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182887	159421180000	00	4.000	10.000	10.000	216.000
033	22	13	60D ELB NB500 WITH FL (R/L) A-556/496	3-80-468-35151	00	NO			C			00	1.000	0.000	0.000	220.690
033	33	01	BW SR 60DEG ELL OD508X9.53	3-80-468-35151	00	NO	BW SR 90DEG ELL OD508X9.53 SA234WPB	SA234WPB	C	410182887	925242860000	00	1.000	0.000	0.000	62.320
033	33	02	PIPE OD-508X9.53 L=185	3-80-468-35151	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389936000	00	1.000	185.000	0.000	21.671
033	33	03	PIPE OD-508X9.53 L=245	3-80-468-35151	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389936000	00	1.000	245.000	0.000	28.699
033	33	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182887	159421180000	00	2.000	10.000	10.000	108.000
034	22	14	90D SR ELB NB800 WITH FL (R/L) A-826	3-80-468-35157	00	NO			C			00	1.000	0.000	0.000	457.882
034	17	01	90D SR MB OD813X9.53 AL-811	3-80-468-35157	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	1,418.000	0.000	262.082
034	17	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	195.800
035	22	15	UEQT NB800/500 WITH FL (R/L) L-1220/724	3-80-468-35164	00	NO			C			00	2.000	0.000	0.000	1,009.094
035	21	01	PIPE OD813X9.53 L=1190	3-80-468-35164	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	2.000	1,190.000	0.000	420.000
035	21	02	PIPE OD508X9.53 L=382	3-80-468-35164	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182887	159389936000	00	2.000	382.000	0.000	89.494
035	21	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	4.000	10.000	10.000	391.600
035	21	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182887	159421180000	00	2.000	10.000	10.000	108.000
036	34	01	90D SR ELB NB800 WITH FL (R/L) A-826	3-80-468-35155	00	NO			C			00	2.000	0.000	0.000	884.798
036	35	01	90D SR MB OD813X9.53AL-811 (R=1D)	3-80-468-35155	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	2.000	1,336.000	0.000	493.198
036	35	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	4.000	10.000	10.000	391.600
037	34	02	90D SR ELB NB800 WITSTUBS&FL(R/L) A-813	3-80-468-35159	00	NO			C			00	1.000	0.000	0.000	473.046
037	36	01	90D SR MB OD813X9.53AL-811 (R=0.75D)	3-80-468-35159	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	1,392.000	0.000	257.173
037	36	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	195.800
037	36	03	PIPE OD-114.3X4.78 L=100	3-80-468-35159	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410182887	159389756000	00	3.000	100.000	0.000	3.873
037	36	04	F.F.FLANGE NB1000 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410182887	159421140000	00	3.000	10.000	10.000	16.200
038	34	03	90D SR ELB NB800 WITSTUBS&FL (R/L) A-838	3-80-468-35173	00	NO			C			00	1.000	0.000	0.000	482.487
038	37	01	90D SR MB OD813X9.53AL-823 (R=0.75D)	3-80-468-35173	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	1,442.000	0.000	266.614
038	37	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	195.800
038	37	03	PIPE OD-114.3X4.78 L=100	3-80-468-35173	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410182887	159389756000	00	3.000	100.000	0.000	3.873
038	37	04	F.F.FLANGE NB1000 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410182887	159421140000	00	3.000	10.000	10.000	16.200
039	34	04	EQT NB800 WITH FL (R/L) L-1220/800	3-80-468-35165	00	NO			C			00	1.000	0.000	0.000	609.624
039	38	01	PIPE OD813X9.53 L=1190	3-80-468-35165	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	1,190.000	0.000	185.827
039	38	02	PIPE OD813X9.53 L=689	3-80-468-35165	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	689.000	0.000	130.097
039	38	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	195.800
039	38	04	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	1.000	10.000	10.000	97.900
040	39	01	90D LR ELB NB800 WITH FL (R/L) A-826	3-80-468-35155	00	NO			C			00	5.000	0.000	0.000	2,211.995
040	35	01	90D SR MB OD813X9.53AL-811 (R=1D)	3-80-468-35155	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	5.000	1,336.000	0.000	1,232.995
040	35	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	10.000	10.000	10.000	979.000
041	39	02	90D LR ELB NB800 WITH FL (R/L) A-826/887	3-80-468-35156	00	NO			C			00	1.000	0.000	0.000	453.917
041	40	01	90D SR MB OD813X9.53AL-811/872 (R=1D)	3-80-468-35156	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	1,397.000	0.000	258.117
041	40	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	195.800
042	39	03	90D SR ELB NB800 WITH STUBS&FL(R/L)A-813	3-80-468-35159	00	NO			C			00	3.000	0.000	0.000	1,419.138
042	36	01	90D SR MB OD813X9.53AL-811 (R=0.75D)	3-80-468-35159	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	3.000	1,392.000	0.000	771.519
042	36	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	6.000	10.000	10.000	587.400
042	36	03	PIPE OD-114.3X4.78 L=100	3-80-468-35159	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410182887	159389756000	00	9.000	100.000	0.000	11.619
042	36	04	F.F.FLANGE NB1000 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410182887	159421140000	00	9.000	10.000	10.000	48.600
043	39	04	EQT NB800 WITH FL (R/L) L-610/772/1534	3-80-468-35166	00	NO			C			00	1.000	0.000	0.000	779.176
043	41	01	PIPE OD813X9.53 L=1352	3-80-468-35166	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	1,352.000	0.000	216.785
043	41	02	PIPE OD813X9.53 L=1423	3-80-468-35166	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	1,423.000	0.000	268.691
043	41	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	195.800
043	41	04	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	1.000	10.000	10.000	97.900
044	39	05	EQT NB800 WITH FL (R/L) L-610/972/1000	3-80-468-35167	00	NO			C			00	1.000	0.000	0.000	716.101
044	42	01	PIPE OD813X9.53 L=1552	3-80-468-35167	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	1,552.000	0.000	254.540
044	42	02	PIPE OD813X9.53 L=889	3-80-468-35167	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	889.000	0.000	167.861
044	42	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	195.800
044	42	04	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	1.000	10.000	10.000	97.900
045	39	06	EQT NB800 WITH FL (R/L) L-610/610/1000	3-80-468-35168	00	NO			C			00	1.000	0.000	0.000	647.388
045	43	01	PIPE OD813X9.53 L=1190	3-80-468-35168	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	1,190.000	0.000	185.827
045	43	02	PIPE OD813X9.53 L=889	3-80-468-35168	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182887	159389898000	00	1.000	889.000	0.000	167.861
045	43	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	2.000	10.000	10.000	195.800
045	43	04	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182887	159421170000	00	1.000	10.000	10.000	97.900
046	44	01	PIPEOD 219.1 X 3.76X 6000 - SA790-S32205		NU	M	PIPEOD 219.1 X 3.76X 6000 - SA790-S32205	SA790-S32205	C		154550016000	00	200.000	0.000	0.000	3,994.000
047	44	02	PIPEOD 168.3 X 3.40X6000 - SA790-S32205		NU	M	PIPEOD 168.3 X 3.40X 6000 - SA790-S32205	SA790-S32205	C		154550026000	00	50.000	0.000	0.000	691.500
048	44	03	PIPEOD 114.3 X 3.05X6000 - SA790-S32205		NU	M	PIPEOD 114.3 X 3.05X 6000 - SA790-S32205	SA790-S32205	C		154550036000	00	100.000	0.000	0.000	837.000
049	44	04	PIPEOD 323.9 X 4.57X6000 - SA790-S32205		NU	M	PIPEOD 323.9 X 4.57X 6000 - SA790-S32205	SA790-S32205	C		154550056000	00	100.000	0.000	0.000	3,650.000
050	44	05	PIPE OD-273X4.19X6000-SA790-S32205		NU	M	PIPE OD-273X4.19X6000-SA790-S32205	SA790-S32205	C		154550136000	00	50.000	0.000	0.000	1,388.750
051	44	06	PIPEOD 60.3 X 3.91X 6000 - SA790-S32205		NU	M	PIPEOD 60.3 X 3.91X 6000 - SA790-S32205	SA790-S32205	C		154550076000	00	50.000	0.000	0.000	272.000
052	44	07	PIPEOD 33.4 X 3.38X 6000 - SA790-S32205		NU	M	PIPEOD 33.4 X 3.38X 6000 - SA790-S32205	SA790-S32205	C		154550086000	00	100.000	0.000	0.000	250.000
053	44	08	PIPEOD 21.3 X 2.77X 6000 - SA790-S32205		NU	M	PIPEOD 21.3 X 2.77X 6000 - SA790-S32205	SA790-S32205	C		154550046000	00	200.000	0.000	0.000	254.000
054	45	01	PIPE NB450 WITH FLANGES R/L L-6000	3-80-468-35080	01	NO			C			00	2.000	6,000.000	0.000	1,423.610
054	46	01	PIPE OD-457X9.53 L=5970	3-80-468-35080	01	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389926000	00	2.000	5,970.000	0.000	1,255.610
054	46	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	4.000	10.000	10.000	168.000
055	45	02	PIPE NB450 WITH FLANGES R/L L-3893	3-80-468-35080	02	NO			C			00	1.000	3,893.000	0.000	490.233
055	47	01	PIPE OD-457X9.53 L=3863	3-80-468-35080	02	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389926000	00	1.000	3,863.000	0.000	406.233
055	47	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	84.000
056	45	03	PIPE NB450 WITH FLANGES R/L L-5532	3-80-468-35080	03	NO			C			00	1.000	5,532.000	0.000	662.590
056	48	01	PIPE OD-457X9.53 L=5502	3-80-468-35080	03	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389926000	00	1.000	5,502.000	0.000	578.590
056	48	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	84.000
057	45	04	PIPE NB450 WITH FLANGES R/L L-4901	3-80-468-35080	04	NO			C			00	1.000	4,901.000	0.000	596.234
057	49	01	PIPE OD-457X9.53 L=4871	3-80-468-35080	04	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389926000	00	1.000	4,871.000	0.000	512.234
057	49	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	84.000
058	45	05	PIPE NB450 WITH FL R/L L-2094 (VAL)HOLD	3-80-468-35081	00	NO			C			00	1.000	2,094.000	0.000	301.050
058	50	01	PIPE OD-457X9.53 L=2064	3-80-468-35081	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389926000	00	1.000	2,064.000	0.000	217.050
058	50	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	1.000	10.000	10.000	42.000
058	50	03	FLANGE NB450 (VALVE END)	3-80-468-35081	00	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	1.000	10.000	10.000	42.000
059	45	06	PIPE NB500 WITH FL R/L L-3118 (VAL)HOLD	3-80-468-35083	03	NO			C			00	2.000	3,118.000	0.000	939.456
059	51	01	PIPE OD-508X9.53 L=3088	3-80-468-35083	03	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389936000	00	2.000	3,088.000	0.000	723.456
059	51	02	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410183192	159421180000	00	2.000	10.000	10.000	108.000
059	51	03	FLANGE NB500 (VALVE END)	3-80-468-35083	03	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	2.000	10.000	10.000	108.000
060	45	07	PIPE NB500 WITH STUBS&FL R/L L-1475	3-80-468-35087	00	NO			C			00	1.000	1,475.000	0.000	303.631
060	52	01	PIPE OD-508X9.53 L=1445	3-80-468-35087	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389936000	00	1.000	1,445.000	0.000	169.267
060	52	02	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410183192	159421180000	00	2.000	10.000	10.000	108.000
060	52	03	PIPE OD-114.3X4.78 L=100	3-80-468-35087	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183192	159389756000	00	4.000	100.000	0.000	5.164
060	52	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183192	159421140000	00	4.000	10.000	10.000	21.200
061	45	08	PIPE NB600 WITH FL R/L L-1464 (VAL)HOLD	3-80-468-35091	02	NO			C			00	2.000	1,464.000	0.000	609.984
061	53	01	PIPE OD-610X9.53 L=1434	3-80-468-35091	02	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389946000	00	2.000	1,434.000	0.000	404.704
061	53	02	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183192	159421160000	00	2.000	10.000	10.000	102.640
061	53	03	FLANGE NB600 (VALVE)) HOLD	3-80-468-35091	02	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	2.000	10.000	10.000	102.640
062	45	09	PIPE NB600 WITH FL R/L L-922 (VAL) HOLD	3-80-468-35091	03	NO			C			00	1.000	922.000	0.000	228.510
062	54	01	PIPE OD-610X9.53 L=892	3-80-468-35091	03	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389946000	00	1.000	892.000	0.000	125.870
062	54	02	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183192	159421160000	00	1.000	10.000	10.000	51.320
062	54	03	FLANGE NB600 (VALVE)) HOLD	3-80-468-35091	03	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	1.000	10.000	10.000	51.320
063	45	10	PIPE NB600 WITH FL R/L L-555 (VAL) HOLD	3-80-468-35092	01	NO			C			00	3.000	0.000	0.000	530.169
063	55	01	PIPE OD-610X9.53 L=525	3-80-468-35092	01	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389946000	00	3.000	525.000	0.000	222.249
063	55	02	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183192	159421160000	00	3.000	10.000	10.000	153.960
063	55	03	FLANGE NB600 (VALVE)) HOLD	3-80-468-35092	01	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	3.000	10.000	10.000	153.960
064	45	11	PIPE NB600 WITH FL R/L L-922 (VAL) HOLD	3-80-468-35092	02	NO			C			00	1.000	922.000	0.000	228.510
064	56	01	PIPE OD-610X9.53 L=892	3-80-468-35092	02	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389946000	00	1.000	892.000	0.000	125.870
064	56	02	FLANGE NB600 (VALVE1) HOLD	3-80-468-35092	02	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	1.000	10.000	10.000	51.320
064	56	03	FLANGE NB600 (VALVE2) HOLD	3-80-468-35092	02	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	1.000	10.000	10.000	51.320
065	45	12	PIPE NB600 WITH STUB&FL R/L L-348(TPHOLD	3-80-468-35096	00	NO			C			00	3.000	348.000	0.000	2,427.639
065	57	01	PIPE OD-610X9.53 L=4865	3-80-468-35096	00	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389946000	00	3.000	4,865.000	0.000	2,059.500

065	57	02	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183192	159421160000	00	3.000	10.000	10.000	153.960
065	57	03	PIPE OD-114.3X4.78 L=100	3-80-468-35096	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183192	159389756000	00	9.000	100.000	0.000	11.619
065	57	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183192	159421140000	00	9.000	230.000	230.000	48.600
065	57	05	FLANGE NB600 (TP END)	3-80-468-35096	00	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	3.000	10.000	10.000	153.960
066	45	13	PIPE NB800 WITH FLANGES R/L L-3474	3-80-468-35097	01	NO			C			00	1.000	3,474.000	0.000	846.096
066	58	01	PIPE OD-813X9.53 L=3444	3-80-468-35097	01	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	3,444.000	0.000	650.296
066	58	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
067	45	14	PIPE NB800 WITH FLANGES R/L L-3477	3-80-468-35097	02	NO			C			00	1.000	3,477.000	0.000	846.663
067	59	01	PIPE OD-813X9.53 L=3447	3-80-468-35097	02	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	3,447.000	0.000	650.863
067	59	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
068	45	15	PIPE NB800 WITH FLANGES R/L L-4345	3-80-468-35097	03	NO			C			00	1.000	4,345.000	0.000	1,010.558
068	60	01	PIPE OD-813X9.53 L=4315	3-80-468-35097	03	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	4,315.000	0.000	814.758
068	60	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
069	45	16	PIPE NB800 WITH FLANGES R/L L-860	3-80-468-35097	04	NO			C			00	1.000	860.000	0.000	352.521
069	61	01	PIPE OD-813X9.53 L= 830	3-80-468-35097	04	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	830.000	0.000	156.721
069	61	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
070	45	17	PIPE NB800 WITH FLANGES R/L L-5182	3-80-468-35097	05	NO			C			00	1.000	5,182.000	0.000	1,168.601
070	62	01	PIPE OD-813X9.53 L=5152	3-80-468-35097	05	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	5,152.000	0.000	972.801
070	62	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
071	45	18	PIPE NB800 WITH FLANGES R/L L-800	3-80-468-35097	06	NO			C			00	1.000	800.000	0.000	341.191
071	63	01	PIPE OD-813X9.53 L= 770	3-80-468-35097	06	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	770.000	0.000	145.391
071	63	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
072	45	19	PIPE NB800 WITH NB300BR&FL R/L L-941	3-80-468-35099	00	NO			C			00	1.000	941.000	0.000	428.591
072	64	01	PIPE OD-813X9.53 L= 911	3-80-468-35099	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	911.000	0.000	172.015
072	64	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
072	64	03	PIPE OD-323.9X9.53 L=200	3-80-468-35099	00	NO	PIPE OD-323.9X9.53X6000-A53-GRB	A53-GRB	C	410183192	159389616000	00	1.000	200.000	0.000	14.776
072	64	04	F.F.FLANGE NB300 CL-150	3-80-468-34835	07	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183192	159421160000	00	2.000	10.000	10.000	46.000
073	45	20	PIPE NB800 WIT FE,STUBS&FL R/L L-6M(HOLD	3-80-468-35100	00	NO			C			00	1.000	6,000.000	0.000	1,329.646
073	65	01	PIPE OD-813X9.53 L=5970	3-80-468-35100	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	5,970.000	0.000	1,127.255
073	65	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	1.000	10.000	10.000	97.900
073	65	03	PIPE OD-114.3X4.78 L=100	3-80-468-35100	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183192	159389756000	00	1.000	100.000	0.000	1.291
073	65	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183192	159421140000	00	1.000	10.000	10.000	5.300
073	65	05	FLANGE NB800 (FE) HOLD	3-80-468-35100	00	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	1.000	10.000	10.000	97.900
074	45	21	PIPE NB800 WITH STUBS&FL R/L L-3905	3-80-468-35101	00	NO			C			00	1.000	3,905.000	0.000	947.251
074	66	01	PIPE OD-813X9.53 L=3875	3-80-468-35101	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	3,875.000	0.000	731.678
074	66	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
074	66	03	PIPE OD-114.3X4.78 L=100	3-80-468-35101	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183192	159389756000	00	3.000	100.000	0.000	3.873
074	66	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183192	159421140000	00	3.000	10.000	10.000	15.900
075	45	22	PIPE NB800 WITH NB300 BR&FL R/L L-6M	3-80-468-35103	00	NO			C			00	1.000	6,000.000	0.000	1,398.607
075	67	01	PIPE OD-813X9.53 L= 5970	3-80-468-35103	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	5,970.000	0.000	1,127.255
075	67	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
075	67	03	PIPE OD-323.9X9.53 L=200	3-80-468-35103	00	NO	PIPE OD-323.9X9.53X6000-A53-GRB	A53-GRB	C	410183192	159389616000	00	2.000	200.000	0.000	29.552
075	67	04	F.F.FLANGE NB300 CL-150	3-80-468-34835	07	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183192	159421160000	00	2.000	10.000	10.000	46.000
076	45	23	PIPE NB800 WITH BR&FL R/L L-3234	3-80-468-35104	00	NO			C			00	1.000	3,234.000	0.000	818.135
076	68	01	PIPE OD-813X9.53 L=3204	3-80-468-35104	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	3,204.000	0.000	604.979
076	68	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
076	68	03	PIPE OD-219.1X5.56 L=200	3-80-468-35104	00	NO	PIPE OD-219.1X5.56X6000-A53-GRB	A53-GRB	C	410183192	159389776000	00	1.000	200.000	0.000	5.856
076	68	04	F.F.FLANGE NB200 CL-150	3-80-468-34835	05	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410183192	159421990000	00	1.000	10.000	10.000	11.500
077	69	01	PIPE NB450 WITH FLANGES R/L L-3575	3-80-468-35080	05	NO			C			00	1.000	3,575.000	0.000	456.792
077	70	01	PIPE OD-457X9.53 L=3545	3-80-468-35080	05	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389926000	00	1.000	3,545.000	0.000	372.792
077	70	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	84.000
078	69	02	PIPE NB450 WITH FLANGES R/L L-6000	3-80-468-35080	01	NO			C			00	2.000	6,000.000	0.000	1,423.610
078	46	01	PIPE OD-457X9.53 L=5970	3-80-468-35080	01	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389926000	00	2.000	5,970.000	0.000	1,255.610
078	46	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	4.000	10.000	10.000	168.000
079	69	03	PIPE NB450 WITH FLANGES R/L L-2447	3-80-468-35080	06	NO			C			00	1.000	2,447.000	0.000	338.172
079	71	01	PIPE OD-457X9.53 L=2417	3-80-468-35080	06	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389926000	00	1.000	2,417.000	0.000	254.172
079	71	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	84.000
080	69	04	PIPE NB450 WITH FLANGES R/L L-696	3-80-468-35080	07	NO			C			00	1.000	696.000	0.000	154.037
080	72	01	PIPE OD-457X9.53 L=666	3-80-468-35080	07	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389926000	00	1.000	666.000	0.000	70.037
080	72	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	84.000
081	69	05	PIPE NB450 WITH FLANGES R/L L-5010	3-80-468-35080	08	NO			C			00	1.000	5,010.000	0.000	607.697
081	73	01	PIPE OD-457X9.53 L=4980	3-80-468-35080	08	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389926000	00	1.000	4,980.000	0.000	523.697
081	73	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	84.000
082	69	06	PIPE NB450 WITH FLANGES R/L L-5896	3-80-468-35080	09	NO			C			00	1.000	5,896.000	0.000	700.869
082	74	01	PIPE OD-457X9.53 L=5866	3-80-468-35080	09	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389926000	00	1.000	5,866.000	0.000	616.869
082	74	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	84.000
083	69	07	PIPE NB500 WITH FLANGES R/L L-1740	3-80-468-35082	02	NO			C			00	2.000	1,740.000	0.000	623.648
083	75	01	PIPE OD-508X9.53 L=1740	3-80-468-35082	02	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389936000	00	2.000	1,740.000	0.000	407.648
083	75	02	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410183192	159421180000	00	4.000	10.000	10.000	216.000
084	69	08	PIPE NB500 WIT STUB&FL R/L L-684(VALHOLD	3-80-468-35088	00	NO			C			00	1.000	684.000	0.000	210.974
084	76	01	PIPE OD-508X9.53 L=654	3-80-468-35088	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389936000	00	1.000	654.000	0.000	76.610
084	76	02	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410183192	159421180000	00	1.000	10.000	10.000	54.000
084	76	03	PIPE OD-114.3X4.78 L=100	3-80-468-35088	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183192	159389756000	00	4.000	100.000	0.000	5.164
084	76	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183192	159421140000	00	4.000	10.000	10.000	21.200
084	76	05	FLANGE NB500 (VALVE) HOLD	3-80-468-35088	00	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	1.000	10.000	10.000	54.000
085	69	09	PIPE NB500 WIT STUB&FL R/L L-713(VALHOLD	3-80-468-35089	00	NO			C			00	1.000	713.000	0.000	214.371
085	77	01	PIPE OD-508X9.53 L=683	3-80-468-35089	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183192	159389936000	00	1.000	683.000	0.000	80.007
085	77	02	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410183192	159421180000	00	1.000	10.000	10.000	54.000
085	77	03	PIPE OD-114.3X4.78 L=100	3-80-468-35089	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183192	159389756000	00	4.000	100.000	0.000	5.164
085	77	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183192	159421140000	00	4.000	10.000	10.000	21.200
085	77	05	FLANGE NB500 (VALVE) HOLD	3-80-468-35089	00	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	1.000	10.000	10.000	54.000
086	69	10	PIPE NB800 WITH FLANGES R/L L-4022	3-80-468-35097	08	NO			C			00	1.000	4,022.000	0.000	949.569
086	78	01	PIPE OD-813X9.53 L=3992	3-80-468-35097	08	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	3,992.000	0.000	753.769
086	78	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
087	69	11	PIPE NB800 WITH FLANGES R/L L-3106	3-80-468-35097	09	NO			C			00	1.000	3,106.000	0.000	776.610
087	79	01	PIPE OD-813X9.53 L=3076	3-80-468-35097	09	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	3,076.000	0.000	580.810
087	79	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
088	69	12	PIPE NB800 WITH FLANGES R/L L-3185	3-80-468-35097	10	NO			C			00	1.000	3,185.000	0.000	791.527
088	80	01	PIPE OD-813X9.53 L=3155	3-80-468-35097	10	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	3,155.000	0.000	595.727
088	80	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
089	69	13	PIPE NB800 WITH FLANGES R/L L-1475	3-80-468-35097	11	NO			C			00	1.000	1,475.000	0.000	468.645
089	81	01	PIPE OD-813X9.53 L=1445	3-80-468-35097	11	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	1,445.000	0.000	272.845
089	81	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
090	69	14	PIPE NB800 WITH FL RL L-1738 (VAL)HOLD	3-80-468-35098	01	NO			C			00	1.000	1,738.000	0.000	518.305
090	82	01	PIPE OD-813X9.53 L=1708	3-80-468-35098	01	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	1,708.000	0.000	322.505
090	82	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	1.000	10.000	10.000	97.900
090	82	03	FLANGE NB800 (VALVE) HOLD	3-80-468-35098	01	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	1.000	10.000	10.000	97.900
091	69	15	PIPE NB800 WITH FL R/L L-3817 (VAL)HOLD	3-80-468-35098	02	NO			C			00	1.000	3,817.000	0.000	910.861
091	83	01	PIPE OD-813X9.53 L=3787	3-80-468-35098	02	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	3,787.000	0.000	715.061
091	83	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	1.000	10.000	10.000	97.900
091	83	03	FLANGE NB800 (VALVE) HOLD	3-80-468-35098	02	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	1.000	10.000	10.000	97.900
092	69	16	PIPE NB800 WITH NB200 BR&FL R/L L-6M	3-80-468-35105	00	NO			C			00	1.000	6,000.000	0.000	1,340.411
092	84	01	PIPE OD-813X9.53 L=5970	3-80-468-35105	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	5,970.000	0.000	1,127.255
092	84	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
092	84	03	PIPE OD-219.1X5.56 L=200	3-80-468-35105	00	NO	PIPE OD-219.1X5.56X6000-A53-GRB	A53-GRB	C	410183192	159389776000	00	1.000	200.000	0.000	5.856
092	84	04	F.F.FLANGE NB200 CL-150	3-80-468-34835	05	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410183192	159421990000	00	1.000	10.000	10.000	11.500
093	69	17	PIPE NB800 WITH NB300 BR&FL R/L L-5500	3-80-468-35106	00	NO			C			00	1.000	5,500.000	0.000	1,266.421
093	85	01	PIPE OD-813X9.53 L= 5470	3-80-468-35106	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	5,470.000	0.000	1,032.845
093	85	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
093	85	03	PIPE OD-323.9X9.53 L=200	3-80-468-35106	00	NO	PIPE OD-323.9X9.53X6000-A53-GRB	A53-GRB	C	410183192	159389616000	00	1.000	200.000	0.000	14.776
093	85	04	F.F.FLANGE NB300 CL-150	3-80-468-34835	07	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183192	159421160000	00	1.000	10.000	10.000	23.000
094	69	18	PIPE NB800 WIT 300BR&STUB&FL R/L L-3142	3-80-468-35107	00	NO			C			00	1.000	2,187.000	0.000	1,273.012
094	86	01	PIPE OD-813X9.53 L= 2157	3-80-468-35107	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	5,470.000	0.000	1,032.845
094	86	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
094	86	03	PIPE OD-323.9X9.53 L=200	3-80-468-35107	00	NO	PIPE OD-323.9X9.53X6000-A53-GRB	A53-GRB	C	410183192	159389616000	00	1.000	200.000	0.000	14.776
094	86	04	F.F.FLANGE NB300 CL-150	3-80-468-34835	07	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183192	159421160000	00	1.000	10.000	10.000	23.000
094	86	05	PIPE OD-114.3X4.78 L=100	3-80-468-35107	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183192	159389756000	00	1.000	100.000	0.000	1.291
094	86	06	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183192	159421140000	00	1.000	10.000	10.000	5.300
095	87	01	PIPE NB800 WITH FLANGES R/L L-5062	3-80-468-35097	12	NO			C			00	1.000	5,062.000	0.000	1,145.942
095	88	01	PIPE OD-813X9.53 L=5032	3-80-468-35097	12	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	5,032.000	0.000	950.142
095	88	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
096	87	02	PIPE NB800 WITH FLANGES R/L L-3695	3-80-468-35097	13	NO			C			00	1.000	3,695.000	0.000	887.825
096	89	01	PIPE OD-813X9.53 L=3665	3-80-468-35097	13	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	3,665.000	0.000	692.025
096	89	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
097	87	03	PIPE NB800 WITH FLANGES R/L L-1759	3-80-468-35097	14	NO			C			00	1.000	1,759.000	0.000	522.270
097	90	01	PIPE OD-813X9.53 L=1729	3-80-468-35097	14	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	1,729.000	0.000	326.470
097	90	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
098	87	04	PIPE NB800 WITH STUB&FL R/L L-1660	3-80-468-35108	00	NO			C			00	1.000	1,660.000	0.000	510.168
098	91	01	PIPE OD-813X9.53 L= 1630	3-80-468-35108	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	1,630.000	0.000	307.777
098	91	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
098	91	03	PIPE OD-114.3X4.78 L=100	3-80-468-35108	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183192	159389756000	00	1.000	100.000	0.000	1.291
098	91	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183192	159421140000	00	1.000	10.000	10.000	5.300
099	87	05	PIPE NB800 WITH FL R/L L-2454 (VAL)HOLD	3-80-468-35098	03	NO			C			00	2.000	2,454.000	0.000	1,307.000
099	92	01	PIPE OD-813X9.53 L=2424	3-80-468-35098	03	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	2.000	2,424.000	0.000	915.400
099	92	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
099	92	03	FLANGE NB800 (VALVE) HOLD	3-80-468-35098	03	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	2.000	10.000	10.000	195.800
100	93	01	PIPE NB800 WITH FL R/L L-335 (TP)HOLD	3-80-468-35109	00	NO			C			00	2.000	335.000	0.000	506.780

100	94	01	PIPE OD-813X9.53 L=305	3-80-468-35109	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	2.000	305.000	0.000	115.180
100	94	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
100	94	03	FLANGE NB800 (TP) HOLD	3-80-468-35109	00	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	2.000	10.000	10.000	195.800
101	93	02	PIPE NB800 WITH FL R/L L-1941 (VAL)HOLD	3-80-468-35098	04	NO			C			00	2.000	1,941.000	0.000	1,113.270
101	95	01	PIPE OD-813X9.53 L=1911	3-80-468-35098	04	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	2.000	1,911.000	0.000	721.670
101	95	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
101	95	03	FLANGE NB800 (VALVE) HOLD	3-80-468-35098	04	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	2.000	10.000	10.000	195.800
102	93	03	PIPE NB800 WITH FL R/L L-1617 (VAL)HOLD	3-80-468-35098	05	NO			C			00	1.000	1,617.000	0.000	495.457
102	96	01	PIPE OD-813X9.53 L=1587	3-80-468-35098	05	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	1,587.000	0.000	299.657
102	96	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	1.000	10.000	10.000	97.900
102	96	03	FLANGE NB800 (VALVE) HOLD	3-80-468-35098	05	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	1.000	10.000	10.000	97.900
103	93	04	PIPE NB800 WITH FL R/L L-1443 (VAL)HOLD	3-80-468-35098	07	NO			C			00	2.000	1,443.000	0.000	925.206
103	97	01	PIPE OD-813X9.53 L=1413	3-80-468-35098	07	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	2.000	1,413.000	0.000	533.606
103	97	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
103	97	03	FLANGE NB800 (VALVE) HOLD	3-80-468-35098	07	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	2.000	10.000	10.000	195.800
104	93	05	PIPE NB800 WITH FLANGES R/L L-3476	3-80-468-35097	15	NO			C			00	1.000	3,476.000	0.000	846.474
104	98	01	PIPE OD-813X9.53 L= 3446	3-80-468-35097	15	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	3,446.000	0.000	650.674
104	98	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
105	93	06	PIPE NB800 WITH BR&STUB&FL R/L L-3142	3-80-468-35110	00	NO			C			00	1.000	3,142.000	0.000	827.775
105	99	01	PIPE OD-813X9.53 L= 3112	3-80-468-35110	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	3,112.000	0.000	587.608
105	99	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
105	99	03	PIPE OD-323.9X9.53 L=200	3-80-468-35110	00	NO	PIPE OD-323.9X9.53X6000-A53-GRB	A53-GRB	C	410183192	159389616000	00	1.000	200.000	0.000	14.776
105	99	04	F.F.FLANGE NB300 CL-150	3-80-468-34835	07	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183192	159421160000	00	1.000	10.000	10.000	23.000
105	99	05	PIPE OD-114.3X4.78 L=100	3-80-468-35110	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183192	159389756000	00	1.000	100.000	0.000	1.291
105	99	06	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183192	159421140000	00	1.000	10.000	10.000	5.300
106	93	07	PIPE NB800 WITH STUB&FL R/L L-3261	3-80-468-35111	00	NO			C			00	1.000	3,261.000	0.000	812.468
106	A0	01	PIPE OD-813X9.53 L= 3231	3-80-468-35111	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	1.000	3,231.000	0.000	610.077
106	A0	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	2.000	10.000	10.000	195.800
106	A0	03	PIPE OD-114.3X4.78 L=100	3-80-468-35111	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183192	159389756000	00	1.000	100.000	0.000	1.291
106	A0	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183192	159421140000	00	1.000	10.000	10.000	5.300
107	93	08	PIPE NB800 WIT STUB&FL R/L L-436(VALHOLD	3-80-468-35112	00	NO			C			00	3.000	436.000	0.000	876.702
107	A1	01	PIPE OD-813X9.53 L= 406	3-80-468-35112	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183192	159389898000	00	3.000	406.000	0.000	229.983
107	A1	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183192	159421170000	00	3.000	10.000	10.000	293.700
107	A1	03	PIPE OD-114.3X4.78 L=100	3-80-468-35112	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183192	159389756000	00	9.000	100.000	0.000	11.619
107	A1	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183192	159421140000	00	9.000	10.000	10.000	47.700
107	A1	05	FLANGE NB800 (VALVE) HOLD	3-80-468-35112	00	NO	Dummy Material	DUMMY MATERIAL	C	410183192	DUMMYKG	00	3.000	10.000	10.000	293.700
108	A2	01	PIPE NB2600 WITH DRN STUB L=1397 (PU)-OG	3-80-468-35355	NU	NO			C			00	4.000	0.000	0.000	5,806.100
108	A3	01	P.F.PIPE NB2600 L=1397 OG	3-80-468-34507	26	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184926	159420380000	00	4.000	1,397.000	8,217.000	5,767.048
108	A3	02	PIPE OD-168.3X5.56 L=200	3-80-468-35355	NU	NO	PIPE OD-168.3X5.56X6000-A53-GRB	A53-GRB	C	410184926	159389766000	00	4.000	200.000	0.000	17.852
108	A3	03	F.F.FLANGE NB150 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184926	159421140000	00	4.000	230.000	230.000	21.200
109	A2	02	90DEG MB2600 WITH B.S. & STUBS-1 (PU)-OG	2-80-468-15641	NU	NO			C			00	1.000	0.000	0.000	7,562.196
109	A4	01	90DEG MITREBEND NB2600	3-80-468-35361	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184926	159420380000	00	1.000	4,383.000	8,217.000	4,473.998
109	A4	02	PAD PLATE-1 12X1450X2000	2-80-468-15641	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111790000	00	1.000	1,450.000	2,000.000	273.180
109	A4	03	PAD PLATE-2 12X700X1900	2-80-468-15641	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111790000	00	1.000	700.000	1,900.000	125.286
109	A4	04	BASE PLATE 25X1440X2500	2-80-468-15641	NU	NO	PLATE 25MM - ASMESAIS2062E250BR	ASMESAIS2062E250BR	C	410184926	150111640000	00	1.000	1,440.000	2,500.000	706.500
109	A4	05	MIDDLE PLATE 16X2000X2400	2-80-468-15641	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	1.000	2,000.000	2,400.000	602.880
109	A4	06	STIFFNER PLATE-1 16X662X1765	2-80-468-15641	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	1,765.000	293.402
109	A4	07	STIFFNER PLATE-2 16X662X1550	2-80-468-15641	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	1,550.000	257.732
109	A4	08	STIFFNER PLATE-3 16X662X1480	2-80-468-15641	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	1.000	662.000	1,480.000	123.088
109	A4	09	STIFFNER PLATE-4 16X662X1080	2-80-468-15641	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	1,080.000	179.608
109	A4	10	STIFFNER PLATE-5 16X662X860	2-80-468-15641	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	860.000	143.014
109	A4	11	STIFFNER PLATE-6 16X662X790	2-80-468-15641	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	790.000	131.372
109	A4	12	PIPE OD-114.3X4.78 L=150	2-80-468-15641	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184926	159389756000	00	10.000	150.000	0.000	19.360
109	A4	13	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184926	159421140000	00	10.000	230.000	230.000	53.000
109	A4	14	PIPE OD-88.9X3.96 L=150	2-80-468-15641	NU	NO	PIPE OD-88.9X3.96X6000-A53-GRB	A53-GRB	C	410184926	159389746000	00	4.000	150.000	0.000	4.976
109	A4	15	FLAT FACED FLANGE NB80 CL150	3-80-468-34835	01	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184926	159421140000	00	46.000	190.000	190.000	174.800
110	A2	03	90DEG MB2600 WITH B.S. & STUBS-2 (PU)-OG	2-80-468-15642	NU	NO			C			00	1.000	0.000	0.000	7,562.196
110	A5	01	90DEG MITREBEND NB2600	3-80-468-35361	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184926	159420380000	00	1.000	4,383.000	8,217.000	4,473.998
110	A5	02	PAD PLATE-1 12X1450X2000	2-80-468-15642	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111790000	00	1.000	1,450.000	2,000.000	273.180
110	A5	03	PAD PLATE-2 12X700X1900	2-80-468-15642	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111790000	00	1.000	700.000	1,900.000	125.286
110	A5	04	BASE PLATE 25X1440X2500	2-80-468-15642	NU	NO	PLATE 25MM - ASMESAIS2062E250BR	ASMESAIS2062E250BR	C	410184926	150111640000	00	1.000	1,440.000	2,500.000	706.500
110	A5	05	MIDDLE PLATE 16X2000X2400	2-80-468-15642	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	1.000	2,000.000	2,400.000	602.880
110	A5	06	STIFFNER PLATE-1 16X662X1765	2-80-468-15642	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	1,765.000	293.402
110	A5	07	STIFFNER PLATE-2 16X662X1550	2-80-468-15642	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	1,550.000	257.732
110	A5	08	STIFFNER PLATE-3 16X662X1480	2-80-468-15642	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	1.000	662.000	1,480.000	123.088
110	A5	09	STIFFNER PLATE-4 16X662X1080	2-80-468-15642	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	1,080.000	179.608
110	A5	10	STIFFNER PLATE-5 16X662X860	2-80-468-15642	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	860.000	143.014
110	A5	11	STIFFNER PLATE-6 16X662X790	2-80-468-15642	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	790.000	131.372
110	A5	12	PIPE OD-114.3X4.78 L=150	2-80-468-15642	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184926	159389756000	00	10.000	150.000	0.000	19.360
110	A5	13	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184926	159421140000	00	10.000	230.000	230.000	53.000
110	A5	14	PIPE OD-88.9X3.96 L=150	2-80-468-15642	NU	NO	PIPE OD-88.9X3.96X6000-A53-GRB	A53-GRB	C	410184926	159389746000	00	4.000	150.000	0.000	4.976
110	A5	15	FLAT FACED FLANGE NB80 CL150	3-80-468-34835	01	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184926	159421140000	00	46.000	190.000	190.000	174.800
111	A2	04	90DEG MB2600 WITH B.S. & STUBS-3 (PU)-OG	2-80-468-15955	NU	NO			C			00	1.000	0.000	0.000	7,367.948
111	A6	01	90DEG MITREBEND NB2600	3-80-468-35361	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184926	159420380000	00	1.000	4,383.000	8,217.000	4,473.998
111	A6	02	PAD PLATE-1 12X1450X2000	2-80-468-15955	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111790000	00	1.000	1,450.000	2,000.000	273.180
111	A6	03	PAD PLATE-2 12X700X1900	2-80-468-15955	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111790000	00	1.000	700.000	1,900.000	125.286
111	A6	04	BASE PLATE 25X1440X2500	2-80-468-15955	NU	NO	PLATE 25MM - ASMESAIS2062E250BR	ASMESAIS2062E250BR	C	410184926	150111640000	00	1.000	1,440.000	2,500.000	706.500
111	A6	05	MIDDLE PLATE 16X2000X2400	2-80-468-15955	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	1.000	2,000.000	2,400.000	602.880
111	A6	06	STIFFNER PLATE-1 16X662X1765	2-80-468-15955	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	1,765.000	293.402
111	A6	07	STIFFNER PLATE-2 16X662X1550	2-80-468-15955	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	1,550.000	257.732
111	A6	08	STIFFNER PLATE-3 16X662X1480	2-80-468-15955	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	1.000	662.000	1,480.000	123.088
111	A6	09	STIFFNER PLATE-4 16X662X1080	2-80-468-15955	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	1,080.000	179.608
111	A6	10	STIFFNER PLATE-5 16X662X860	2-80-468-15955	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	860.000	143.014
111	A6	11	STIFFNER PLATE-6 16X662X790	2-80-468-15955	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	790.000	131.372
111	A6	12	PIPE OD-114.3X4.78 L=150	2-80-468-15955	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184926	159389756000	00	8.000	150.000	0.000	15.488
111	A6	13	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184926	159421140000	00	8.000	230.000	230.000	42.400
112	A2	05	90DEG MB2600 WITH B.S. & STUBS-4 (PU)-OG	2-80-468-15956	NU	NO			C			00	1.000	0.000	0.000	7,367.948
112	A7	01	90DEG MITREBEND NB2600	3-80-468-35361	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184926	159420380000	00	1.000	4,383.000	8,217.000	4,473.998
112	A7	02	PAD PLATE-1 12X1450X2000	2-80-468-15956	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111790000	00	1.000	1,450.000	2,000.000	273.180
112	A7	03	PAD PLATE-2 12X700X1900	2-80-468-15956	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111790000	00	1.000	700.000	1,900.000	125.286
112	A7	04	BASE PLATE 25X1440X2500	2-80-468-15956	NU	NO	PLATE 25MM - ASMESAIS2062E250BR	ASMESAIS2062E250BR	C	410184926	150111640000	00	1.000	1,440.000	2,500.000	706.500
112	A7	05	MIDDLE PLATE 16X2000X2400	2-80-468-15956	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	1.000	2,000.000	2,400.000	602.880
112	A7	06	STIFFNER PLATE-1 16X662X1765	2-80-468-15956	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	1,765.000	293.402
112	A7	07	STIFFNER PLATE-2 16X662X1550	2-80-468-15956	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	1,550.000	257.732
112	A7	08	STIFFNER PLATE-3 16X662X1480	2-80-468-15956	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	1.000	662.000	1,480.000	123.088
112	A7	09	STIFFNER PLATE-4 16X662X1080	2-80-468-15956	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	1,080.000	179.608
112	A7	10	STIFFNER PLATE-5 16X662X860	2-80-468-15956	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	860.000	143.014
112	A7	11	STIFFNER PLATE-6 16X662X790	2-80-468-15956	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	790.000	131.372
112	A7	12	PIPE OD-114.3X4.78 L=150	2-80-468-15956	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184926	159389756000	00	8.000	150.000	0.000	15.488
112	A7	13	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184926	159421140000	00	8.000	230.000	230.000	42.400
113	A2	06	53.5DEG MB2600 WITH STUBS-1 (PU)-OG	3-80-468-35356	NU	NO			C			00	1.000	0.000	0.000	2,063.141
113	A8	01	53.5DEG MITREBEND NB2600	3-80-468-35356	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184926	159420380000	00	1.000	1,982.000	8,217.000	2,012.489
113	A8	02	PIPE OD-114.3X4.78 L=150	3-80-468-35356	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184926	159389756000	00	7.000	150.000	0.000	13.552
113	A8	03	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184926	159421140000	00	7.000	230.000	230.000	37.100
114	A2	07	53.5DEG MB2600 WITH STUBS-2 (PU)-OG	3-80-468-35357	NU	NO			C			00	1.000	0.000	0.000	2,063.141
114	A9	01	53.5DEG MITREBEND NB2600	3-80-468-35357	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184926	159420380000	00	1.000	1,982.000	8,217.000	2,012.489
114	A9	02	PIPE OD-114.3X4.78 L=150	3-80-468-35357	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184926	159389756000	00	7.000	150.000	0.000	13.552
114	A9	03	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184926	159421140000	00	7.000	230.000	230.000	37.100
115	A2	08	53.5DEG MB2600 WITH STUBS-3 (PU)-OG	3-80-468-35358	NU	NO			C			00	1.000	0.000	0.000	2,113.793
115	B0	01	53.5DEG MITREBEND NB2600	3-80-468-35358	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184926	159420380000	00	1.000	1,982.000	8,217.000	2,012.489
115	B0	02	PIPE OD-114.3X4.78 L=150	3-80-468-35358	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184926	159389756000	00	14.000	150.000	0.000	27.104
115	B0	03	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184926	159421140000	00	14.000	230.000	230.000	74.200
116	A2	09	53.5DEG MB2600 WITH STUBS-4 (PU)-OG	3-80-468-35359	NU	NO			C			00	1.000	0.000	0.000	2,113.793
116	B1	01	53.5DEG MITREBEND NB2600	3-80-468-35359	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184926	159420380000	00	1.000	1,982.000	8,217.000	2,012.489
116	B1	02	PIPE OD-114.3X4.78 L=150	3-80-468-35359	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184926	159389756000	00	14.000	150.000	0.000	27.104
116	B1	03	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184926	159421140000	00	14.000	230.000	230.000	74.200
117	A2	10	90DEG MB2600 A.L-1950/1950 (PU)-OG	3-80-468-34516	NU	NO			C			00	1.000	0.000	0.000	3,235.490
117	B2	01	P.F.PIPE OD2632X16 L-3183	3-80-468-34507	01	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184926	159420380000	00	1.000	8,217.000	3,183.000	3,235.490
118	A2	11	90DEG MB2600 WITH SADDLE&DRNSTUB-(PU)-OG	2-80-468-15957	NU	NO			C			00	1.000	0.000	0.000	5,011.832
118	B3	01	90DEG MITREBEND NB2600 AL-1950/3094	3-80-468-35363	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184926	159420380000	00	1.000	4,327.000	8,217.000	4,416.222
118	B3	02	SADDLE SUPPORT FOR NB2600 H-1730	3-80-468-35280	NU	NO			C	410184926		01	1.000	0.000	0.000	585.263
118	B4	01	BOTTOM PLATE 25X450X2000	3-80-468-35280	NU	NO	PLATE 25MM - ASMESAIS2062E250BR	ASMESAIS2062E250BR	C	410184926	150111640000	01	1.000	450.000	2,000.000	176.625
118	B4	02	PAD PLATE 12X450X2470	3-80-468-35280	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111790000	01	1.000	450.000	2,470.000	104.750
118	B4	03	MIDDLE PLATE 16X777X1900	3-80-468-35280	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	01	1.000	777.000	1,900.000	185.386
118	B4	04	STIFFNER PLATE-1 16X192X610	3-80-468-35280	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	01	4.000	192.000	610.000	58.840
118	B4	05	STIFFNER PLATE-2 16X192X430	3-80-468-35280	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	01	4.000	192.000	430.000	41.480
118	B4	06	STIFFNER PLATE-3 16X192X377	3-80-468-35280	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	01	2.000	192.000	377.000	18.182
118	B3	03	PIPE OD-168.3X5.56 L=150	2-80-468-15957	NU	NO	PIPE OD-168.3X5.56X6000-A53-GRB	A53-GRB	C	410184926	159389766000	00	1.000	150.000	0.000	3.347
118	B3	04	FLAT FACED FLANGE NB150 CL150	3-80-468-34835	03	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410184926	159421990000	00	1.000	280.000	280.000	7.000
119	A2	12	90DEG MB2600 WIT B.S.L=1950/1950 (PU)-OG	2-80-468-15958	NU	NO			C			00	2.000	0.000	0.000	12,143.104
119	B5	01	90DEG MITREBEND NB2600 AL-1950/1950	3-80-468-34516	NU	NO			C	410184926		00	2.000	0.000	0.000	6,470.980
119	B2	01	P.F.PIPE OD2632X16 L-3183	3-80-468-34507	01	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184926	159420380000	00	2.000	8,217.000	3,183.000	6,470.980
119	B5	02	PAD PLATE-1 12X1450X2000	2-80-468-15958	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111790000	00	2.000	1,450.000	2,000.000	546.360
119	B5	03	PAD PLATE-2 12X700X1900	2-80-468-15958	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111790000	00	2.000	700.000	1,900.000	250.572
119	B5	04	BASE PLATE 25X1440X2500	2-80-468-15958	NU	NO	PLATE 25MM - ASMESAIS2062E250BR	ASMESAIS2062E250BR	C	410184926	150111640000	00	2.000	1,440.000	2,500.000	1,413.000
119	B5	05	MIDDLE PLATE 16X2000X2400	2-80-468-15958	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	2,000.000	2,400.000	1,205.760
119	B5	06	STIFFNER PLATE-1 16X662X1765	2-80-468-15958	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	4.000	662.000	1,765.000	586.804

119	B5	07	STIFFNER PLATE-2 16X662X1550	2-80-468-15958	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	4.000	662.000	1,550.000	515.464
119	B5	08	STIFFNER PLATE-3 16X662X1480	2-80-468-15958	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	2.000	662.000	1,480.000	246.176
119	B5	09	STIFFNER PLATE-4 16X662X1080	2-80-468-15958	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	4.000	662.000	1,080.000	359.216
119	B5	10	STIFFNER PLATE-5 16X662X860	2-80-468-15958	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	4.000	662.000	860.000	286.028
119	B5	11	STIFFNER PLATE-6 16X662X790	2-80-468-15958	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184926	150111800000	00	4.000	662.000	790.000	262.744
120	A2	13	PIPE NB2600 WITH MANHOLE L=2783 (PU)-OG	2-80-468-15959	NU	NO			C			00	2.000	0.000	0.000	6,482.888
120	B6	01	P.F.PIPE OD2632X16THK L=2783	3-80-468-34507	30	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184926	159420380000	00	2.000	8,217.000	2,783.000	5,670.000
120	B6	02	P.F.PIPE OD610X10THKL=504	2-80-468-15959	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410184926	159420400000	00	2.000	1,885.000	504.000	149.150
120	B6	03	PAD PLATE OD1000 IDS96 T-10MM	2-80-468-15959	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410184926	159420400000	00	2.000	1,000.000	1,000.000	79.500
120	B6	04	FLAT FACE FLANGE NB600 SA515GR70	3-80-468-34666	02	NO	PLATE 50.0 MM - SA515GR70	SA515GR70	C	410184926	159421190000	00	2.000	10.000	10.000	156.200
120	B6	05	BLANK FLANGE NB600 WITH HANDLE	3-80-468-23148	00	NO				410184926		00	2.000	0.000	0.000	378.200
120	B7	01	BLANK FLANGE NB600 DIA815	3-80-468-23148	00	NO	PLATE 50.0 MM - IS2062E250B(Fe410W)	IS2062E250GRBR	C	410184926	150111060000	00	2.000	815.000	815.000	366.200
120	B7	02	HANDLE DIA32X480	3-80-468-23148	00	NO	DIA 32mm-SA105	SA105	C	410184926	153391400000	00	4.000	480.000	0.000	12.000
120	B6	06	HINGE PL. (OUTER) 370X240X12THK	2-80-468-15959	NU	NO	PLATE-12X2500X5000-SA515GR60	SA515GR60	C	410184926	159420390000	00	4.000	370.000	240.000	20.000
120	B6	07	HINGE PL. (INNER) 370X240X12THK SA515GR6	2-80-468-15959	NU	NO	PLATE-12X2500X5000-SA515GR60	SA515GR60	C	410184926	159420390000	00	4.000	473.000	140.000	12.400
120	B6	08	STUD M24X340 LONG	2-80-468-15959	NU	NO	DIA 25mm-SA105	SA105	C	410184926	153391390000	00	2.000	340.000	0.000	2.618
120	B6	09	PUNCHED WASHER A24	2-80-468-15959	NU	NO	PUN WASHER-M24 -IS2016-A	IS-2016	C	410184926	414080002400	00	4.000	0.000	0.000	0.120
120	B6	10	HEX NUT M24	2-80-468-15959	NU	NO	HEX NUT M24-10 IS:1364(P-3)/LATEST	IS:1364(P-3)	C	410184926	413220002400	00	4.000	0.000	0.000	0.440
120	B6	11	SPLIT PIN DIA4X45	2-80-468-15959	NU	NO	SPLIT PIN 4X45MM IS:549	IS:549	C	410184926	417044004500	00	4.000	0.000	0.000	0.020
120	B6	12	HEX BOLT M33X140	2-80-468-15959	NU	NO	HEX BOLT M33X3.5X140 PCL 6.8 GR A STEEL	STEEL	C	410184926	412153314000	00	8.000	0.000	0.000	10.000
120	B6	13	HEX NUT M33	2-80-468-15959	NU	NO	NUT -M33x3.5 -CL4-IS1363P3	IS-1363(P-3)	C	410184926	413040003300	00	8.000	0.000	0.000	2.240
120	B6	16	NON ASBESTOS OD780XID617X3THK	2-80-468-15959	NU	NO	NON-ASBESTOS JOINTING SHEET 3.0MM	NON-ASBESTOS	C	410184926	220210300000	00	2.000	780.000	780.000	2.000
121	A2	14	65DEG MB NB2600 A.L-2321/2626 (PU)-OG	3-80-468-35360	NU	NO			C			00	2.000	0.000	0.000	9,024.360
121	B8	01	P.F.PIPE NB2600 L=4372	3-80-468-34507	31	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184926	159420380000	00	2.000	4,372.000	8,217.000	9,024.360

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
*			MAIN CIRCULATION WATER PIPING										1.000	0.000	0.000	1,79,251.641
*	A2		BOM FOR CW INSIDE TG HALL-PU COATING		NU							00	1.000	0.000	0.000	79,917.930
*	93		ACW PIPING INSIDE TG4		NU							00	1.000	0.000	0.000	6,404.132
*	87		ACW PIPING INSIDE TG3		NU							00	1.000	0.000	0.000	4,373.205
*	69		ACW PIPING INSIDE TG2		NU							00	1.000	0.000	0.000	13,025.531
*	45		ACW PIPING INSIDE TG1		NU							00	1.000	0.000	0.000	18,229.476
*	44		DUPLEX SS BOM		00	NO						00	1.000	0.000	0.000	11,337.250
*	39		FITTINGS FOR ACW INSIDE TG4		00							00	1.000	0.000	0.000	6,227.715
*	34		FITTINGS FOR ACW INSIDE TG3		00							00	1.000	0.000	0.000	2,449.955
*	22		FITTINGS FOR ACW INSIDE TG2		00							00	1.000	0.000	0.000	6,094.178
*	04		FITTINGS FOR ACW INSIDE TG1		00							00	1.000	0.000	0.000	9,153.549
*	01		PUDDLE FLANGE NB2600- OG- (PU COATING)		NU							00	1.000	0.000	0.000	22,038.720
001	01	01	PUDDLE FLANGE OD2632X16 OG (PU COATING)	3-80-468-34322	NU	NO			C	410179624		02	2.000	0.000	0.000	9,418.872
001	02	01	P.F.PIPE OD 2632 X 16 L=2250	3-80-468-34340	NU	NO	PLATE 16.0 MM - SA515GR70	SA515GR70	C		159421120000	00	2.000	2,250.000	8,216.000	4,643.684
001	02	02	SLEEVE PAD 16 X 4158X 1000	3-80-468-34322	NU	NO	PLATE 16.0 MM - SA515GR70	SA515GR70	C		159421120000	02	4.000	4,158.000	1,000.000	2,088.980
001	02	03	PUDDLE FLANGE PLATE 20X3200X3200	3-80-468-34322	NU	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C	410179624	159421130000	02	2.000	3,200.000	3,200.000	1,470.400
001	02	04	RIB PL-1 20 X 440 X 875	3-80-468-34322	NU	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C		159421130000	02	16.000	440.000	875.000	967.120
001	02	05	RIB PL-2 20 X 440 X 225	3-80-468-34322	NU	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C		159421130000	02	16.000	440.000	225.000	248.688
002	01	02	PUDDLE FLANGE OD2332X16 OG (PU COATING)	3-80-468-34549	NU	NO			C	410179485		01	4.000	0.000	0.000	12,619.848
002	03	01	PLATE FORMED PIPE OD2332 X 16;L=1500	3-80-468-34549	NU	NO	PLATE 16.0 MM - SA515GR70	SA515GR70	C	410176467	159421120000	01	4.000	7,274.000	1,500.000	5,481.688
002	03	02	SLEEVE PAD 16 X 3686X 1000	3-80-468-34549	NU	NO	PLATE 16.0 MM - SA515GR70	SA515GR70	C	410176416	159421120000	01	8.000	3,686.000	1,000.000	3,703.696
002	03	03	PUDDLE FLANGE PLATE 20 X 2800 X 2800	3-80-468-34549	NU	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C	410179624	159421130000	01	4.000	2,800.000	2,800.000	2,167.104
002	03	04	RIB PLATE-1 20 X 440X 750	3-80-468-34549	NU	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C	410176416	159421130000	01	32.000	440.000	750.000	972.160
002	03	05	RIB PLATE-2 20 X 440X 200	3-80-468-34549	NU	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C	410176416	159421130000	01	32.000	440.000	200.000	295.200
003	04	01	90D ELB NB450 WITH FL (R/L) A-1015	3-80-468-35130	00	NO			C			00	1.000	0.000	0.000	262.990
003	05	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35130	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182888	995043070000	00	1.000	0.000	0.000	113.370
003	05	02	PIPE OD-457X9.53 L=312	3-80-468-35130	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	312.000	0.000	32.810
003	05	03	PIPE OD-457X9.53 L=312	3-80-468-35130	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	312.000	0.000	32.810
003	05	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	84.000
004	04	02	90D ELB NB450 WITH FL (R/L) A-800	3-80-468-35131	00	NO			C			00	4.000	0.000	0.000	871.088
004	06	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35131	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182888	995043070000	00	4.000	0.000	0.000	453.480
004	06	02	PIPE OD-457X9.53 L=97	3-80-468-35131	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	4.000	97.000	0.000	40.804
004	06	03	PIPE OD-457X9.53 L=97	3-80-468-35131	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	4.000	97.000	0.000	40.804
004	06	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	8.000	10.000	10.000	336.000
005	04	03	90D ELB NB450 WITH FL (R/L) A-916	3-80-468-35132	00	NO			C			00	1.000	0.000	0.000	242.168
005	07	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35132	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182888	995043070000	00	1.000	0.000	0.000	113.370
005	07	02	PIPE OD-457X9.53 L=213	3-80-468-35132	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	213.000	0.000	22.399
005	07	03	PIPE OD-457X9.53 L=213	3-80-468-35132	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	213.000	0.000	22.399
005	07	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	84.000
006	04	04	90D ELB NB450 WITH FL (R/L) A-964	3-80-468-35133	00	NO			C			00	1.000	0.000	0.000	252.264
006	08	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35133	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182888	995043070000	00	1.000	0.000	0.000	113.370
006	08	02	PIPE OD-457X9.53 L=261	3-80-468-35133	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	261.000	0.000	27.447
006	08	03	PIPE OD-457X9.53 L=261	3-80-468-35133	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	261.000	0.000	27.447
006	08	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	84.000
007	04	05	90D ELB NB450 WIT FL(R/L) A-923/686 HOLD	3-80-468-35134	00	NO			C			00	1.000	0.000	0.000	270.456
007	09	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35134	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182888	995043070000	00	1.000	0.000	0.000	113.370
007	09	02	PIPE OD-457X9.53 L=246	3-80-468-35134	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	246.000	0.000	25.869
007	09	03	PIPE OD-457X9.53 L=449	3-80-468-35134	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	449.000	0.000	47.217
007	09	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	84.000
008	04	06	90D SR ELB NB450 WITH FL (R/L) A-826	3-80-468-35136	00	NO			C			00	1.000	0.000	0.000	233.562
008	10	01	BW SR 90DEG ELL OD457.2X9.53	3-80-468-35136	00	NO	BW SR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182888	925042930000	00	1.000	0.000	0.000	75.530
008	10	02	PIPE OD-457X9.53 L=352	3-80-468-35136	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	352.000	0.000	37.016
008	10	03	PIPE OD-457X9.53 L=352	3-80-468-35136	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	352.000	0.000	37.016
008	10	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	84.000
009	04	07	45D ELB NB450 WITH FL (R/L) A-386	3-80-468-35137	00	NO			C			00	1.000	0.000	0.000	146.538
009	11	01	BW LR 45DEG ELL OD457.2X9.53	3-80-468-35137	00	NO	BW LR 45DEG ELL OD406.4X9.53 SA234WPB	SA234WPB	C	410182888	995043060000	00	1.000	0.000	0.000	44.660
009	11	02	PIPE OD-457X9.53 L=85	3-80-468-35137	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	85.000	0.000	8.939
009	11	03	PIPE OD-457X9.53 L=85	3-80-468-35137	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	85.000	0.000	8.939
009	11	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	84.000
010	04	08	45D ELB NB450 WITH FL (R/L) A-360	3-80-468-35138	00	NO			C			00	1.000	0.000	0.000	154.155
010	12	01	BW SR 45DEG ELL OD457.2X9.53	3-80-468-35138	00	NO	BW SR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182888	925042930000	00	1.000	0.000	0.000	37.765
010	12	02	PIPE OD-457X9.53 L=154	3-80-468-35138	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	154.000	0.000	16.195
010	12	03	PIPE OD-457X9.53 L=154	3-80-468-35138	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	154.000	0.000	16.195
010	12	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	84.000
011	04	09	90D ELB NB500 WITH FL (R/L) A-876	3-80-468-35145	00	NO			C			00	2.000	0.000	0.000	541.912
011	13	01	BW LR 90DEG ELL OD508X9.53	3-80-468-35145	00	NO	BW LR 90DEG ELL OD508X9.53 SA234WPB	SA234WPB	C	410182888	995043270000	00	2.000	0.000	0.000	280.460
011	13	02	PIPE OD-508X9.53 L=97	3-80-468-35145	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389936000	00	2.000	97.000	0.000	22.726
011	13	03	PIPE OD-508X9.53 L=97	3-80-468-35145	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389936000	00	2.000	97.000	0.000	22.726
011	13	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182888	159421180000	00	4.000	10.000	10.000	216.000
012	04	10	90D ELB NB500 WITH FL (R/L) A-1054	3-80-468-35146	00	NO			C			00	2.000	0.000	0.000	625.316
012	14	01	BW LR 90DEG ELL OD508X9.53	3-80-468-35146	00	NO	BW LR 90DEG ELL OD508X9.53 SA234WPB	SA234WPB	C	410182888	995043270000	00	2.000	0.000	0.000	280.460
012	14	02	PIPE OD-508X9.53 L=275	3-80-468-35146	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389936000	00	2.000	275.000	0.000	64.428
012	14	03	PIPE OD-508X9.53 L=275	3-80-468-35146	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389936000	00	2.000	275.000	0.000	64.428
012	14	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182888	159421180000	00	4.000	10.000	10.000	216.000
013	04	11	90D SR ELB NB600 WITH FL (R/L) A-610	3-80-468-35154	00	NO			C			00	3.000	0.000	0.000	580.545
013	15	01	90D SR MB NB600 WITH FL A-610	3-80-468-35154	00	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389946000	00	3.000	674.000	0.000	272.625
013	15	02	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182888	159421160000	00	6.000	10.000	10.000	307.920
014	04	12	RED NB600/350 WITH FL (R/L) A-511	3-80-468-35171	00	NO			C			00	3.000	0.000	0.000	430.323
014	16	01	P.F.RED NB600/350	4-80-468-82848	00	NO	PLATE 10.0 MM - SA515GR70	SA515GR70	C	410182888	159421090000	00	3.000	1,470.000	640.000	122.880
014	16	02	PIPE OD610X9.53 L=91	3-80-468-35171	00	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389946000	00	3.000	91.000	0.000	38.523
014	16	03	PIPE OD355.6X9.53 L=90	3-80-468-35171	00	NO	PIPE OD-355.6X9.53X6000-A53-GRB	A53-GRB	C	410182888	159389606000	00	3.000	90.000	0.000	21.960
014	16	04	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182888	159421160000	00	3.000	10.000	10.000	153.960
014	16	05	F.F.FLANGE NB350 CL-150	3-80-468-34835	08	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182888	159421160000	00	3.000	10.000	10.000	93.000
015	04	13	BLANK FLANGE NB800 CL-D	3-80-468-35172	00	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C		159421170000	00	2.000	1,060.000	1,060.000	530.000
016	04	14	90D SR ELB NB800 WITH FL (R/L) A-826	3-80-468-35157	00	NO			C			00	1.000	0.000	0.000	457.882
016	17	01	90D SR MB OD813X9.53 AL-811	3-80-468-35157	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	1,418.000	0.000	262.082
016	17	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	195.800
017	04	15	90D SR ELB NB800 WITH FL (R/L) A-826/106	3-80-468-35158	00	NO			C			00	1.000	0.000	0.000	507.542
017	18	01	90D SR MB OD813X9.53AL-811/1045	3-80-468-35158	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	1,681.000	0.000	311.742
017	18	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	195.800
018	04	16	UEQT NB800/600 WITH FL (R/L) L-1220/800	3-80-468-35162	00	NO			C			00	3.000	0.000	0.000	1,563.894
018	19	01	PIPE OD813X9.53 L=1190	3-80-468-35162	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	3.000	1,190.000	0.000	609.600
018	19	02	PIPE OD610X9.53 L=503	3-80-468-35162	00	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389946000	00	3.000	503.000	0.000	212.934
018	19	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	6.000	10.000	10.000	587.400
018	19	04	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182888	159421160000	00	3.000	10.000	10.000	153.960
019	04	17	UEQT NB800/450 WITH FL (R/L) L-1220/577	3-80-468-35163	00	NO			C			00	1.000	0.000	0.000	473.820
019	20	01	PIPE OD813X9.53 L=1190	3-80-468-35163	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	1,190.000	0.000	213.200
019	20	02	PIPE OD457X9.53 L=217	3-80-468-35163	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	217.000	0.000	22.820
019	20	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	195.800
019	20	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	1.000	10.000	10.000	42.000
020	04	18	UEQT NB800/500 WITH FL (R/L) L-1220/724	3-80-468-35164	00	NO			C			00	2.000	0.000	0.000	1,009.094
020	21	01	PIPE OD813X9.53 L=1190	3-80-468-35164	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	2.000	1,190.000	0.000	420.000
020	21	02	PIPE OD508X9.53 L=382	3-80-468-35164	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389936000	00	2.000	382.000	0.000	89.494
020	21	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	4.000	10.000	10.000	391.600
020	21	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182888	159421180000	00	2.000	10.000	10.000	108.000
021	22	01	90D ELB NB450 WITH FL (R/L) A-800	3-80-468-35131	00	NO			C			00	5.000	0.000	0.000	1,088.860
021	06	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35131	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182888	995043070000	00	5.000	0.000	0.000	566.850
021	06	02	PIPE OD-457X9.53 L=97	3-80-468-35131	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	5.000	97.000	0.000	51.005
021	06	03	PIPE OD-457X9.53 L=97	3-80-468-35131	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	5.000	97.000	0.000	51.005
021	06	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	10.000	10.000	10.000	420.000
022	22	02	90D ELB NB450 WITH FL (R/L) A-916	3-80-468-35132	00	NO			C			00	1.000	0.000	0.000	242.168
022	07	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35132	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182888	995043070000	00	1.000	0.000	0.000	113.370
022	07	02	PIPE OD-457X9.53 L=213	3-80-468-35132	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	213.000	0.000	22.399
022	07	03	PIPE OD-457X9.53 L=213	3-80-468-35132	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	213.000	0.000	22.399
022	07	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	84.000
023	22	03	90D ELB NB450 WITH FL (R/L) A-976/800	3-80-468-35135	00	NO			C			00	1.000	0.000	0.000	236.280
023	23	01	BW LR 90DEG ELL OD457.2X9.53	3-80-468-35135	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182888	995043070000	00	1.000	0.000	0.000	113.370
023	23	02	PIPE OD-457X9.53 L=97	3-80-468-35135	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	97.000	0.000	10.201
023	23	03	PIPE OD-457X9.53 L=273	3-80-468-35135	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	273.000	0.000	28.709
023	23	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	84.000
024	22	04	60D ELB NB450 WITH FL (R/L) A-500/1269	3-80-468-35139	00	NO			C			00	1.000	0.000	0.000	254.746
024	24	01	BW LR 60DEG ELL OD457.2X9.53	3-80-468-35139	00	NO	BW LR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182888	995043070000	00	1.000	0.000	0.000	75.580
024	24	02	PIPE OD-457X9.53 L=85	3-80-468-35139	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	85.000	0.000	8.939
024	24	03	PIPE OD-457X9.53 L=858	3-80-468-35139	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	858.000	0.000	90.227
024	24	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	80.000
025	22	05	60D ELB NB450 WITH FL (R/L) A-452/1269	3-80-468-35140	00	NO			C			00	1.000	0.000	0.000	256.230
025	25	01	BW SR 60DEG ELL OD457.2X9.53	3-80-468-35140	00	NO	BW SR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182888	925042930000	00	1.000	0.000	0.000	50.350
025	25	02	PIPE OD-457X9.53 L=171	3-80-468-35140	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	171.000	0.000	17.982
025	25	03	PIPE OD-457X9.53 L=988	3-80-468-35140	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	988.000	0.000	103.898
025	25	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	84.000
026	22	06	60D ELB NB450 WITH FL (R/L) A-452/951	3-80-468-35141	00	NO			C			00	2.000	0.000	0.000	445.578
026	26	01	BW SR 60DEG ELL OD457.2X9.53	3-80-468-35141	00	NO	BW SR 90DEG ELL OD457.2X9.53 SA234WPB	SA234WPB	C	410182888	925042930000	00	2.000	0.000	0.000	100.700
026	26	02	PIPE OD-457X9.53 L=171	3-80-468-35141	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	2.000	171.000	0.000	35.964
026	26	03	PIPE OD-457X9.53 L=670	3-80-468-35141	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	2.000	670.000	0.000	140.914
026	26	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	4.000	10.000	10.000	168.000
027	22	07	45D ELB NB450 WITH FL (R/L) A-386/866	3-80-468-35142	00	NO			C			00	1.000	0.000	0.000	197.014

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
027	27	01	BW LR 45DEG ELL OD457.2X9.53	3-80-468-35142	00	NO	BW LR 45DEG ELL OD406.4X9.53 SA234WPB	SA234WPB	C	410182888	995043060000	00	1.000	0.000	0.000	44.660
027	27	02	PIPE OD-457X9.53 L=85	3-80-468-35142	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	85.000	0.000	8.939
027	27	03	PIPE OD-457X9.53 L=565	3-80-468-35142	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	565.000	0.000	59.415
027	27	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	84.000
028	22	08	45D ELB NB450 WITH FL (R/L) A-502/1100	3-80-468-35143	00	NO			C			00	1.000	0.000	0.000	233.820
028	28	01	BW LR 45DEG ELL OD457.2X9.53	3-80-468-35143	00	NO	BW LR 45DEG ELL OD406.4X9.53 SA234WPB	SA234WPB	C	410182888	995043060000	00	1.000	0.000	0.000	44.660
028	28	02	PIPE OD-457X9.53 L=799	3-80-468-35143	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	799.000	0.000	84.023
028	28	03	PIPE OD-457X9.53 L=201	3-80-468-35143	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	201.000	0.000	21.137
028	28	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	84.000
029	22	09	30D ELB NB450 WITH FL (R/L) A-400/800	3-80-468-35144	00	NO			C			00	1.000	0.000	0.000	205.998
029	29	01	BW LR 30DEG ELL OD457.2X9.53	3-80-468-35144	00	NO	BW LR 45DEG ELL OD406.4X9.53 SA234WPB	SA234WPB	C	410182888	995043060000	00	1.000	0.000	0.000	37.660
029	29	02	PIPE OD-457X9.53 L=601	3-80-468-35144	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	601.000	0.000	63.201
029	29	03	PIPE OD-457X9.53 L=201	3-80-468-35144	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389926000	00	1.000	201.000	0.000	21.137
029	29	04	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	84.000
030	22	10	90D SR ELB NB500 WITH FL (R/L) A-820	3-80-468-35147	00	NO			C			00	2.000	0.000	0.000	541.184
030	30	01	BW SR 90DEG ELL OD508X9.53	3-80-468-35147	00	NO	BW SR 90DEG ELL OD508X9.53 SA234WPB	SA234WPB	C	410182888	925242860000	00	2.000	0.000	0.000	186.960
030	30	02	PIPE OD-508X9.53 L=295	3-80-468-35147	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389936000	00	2.000	295.000	0.000	69.112
030	30	03	PIPE OD-508X9.53 L=295	3-80-468-35147	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389936000	00	2.000	295.000	0.000	69.112
030	30	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182888	159421180000	00	4.000	10.000	10.000	216.000
031	22	11	60D ELB NB500 WITH FL (R/L) A-615/496	3-80-468-35149	00	NO			C			00	1.000	0.000	0.000	227.602
031	31	01	BW SR 60DEG ELL OD508X9.53	3-80-468-35149	00	NO	BW LR 90DEG ELL OD508X9.53 SA234WPB	SA234WPB	C	410182888	995043270000	00	1.000	0.000	0.000	62.320
031	31	02	PIPE OD-508X9.53 L=185	3-80-468-35149	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389936000	00	1.000	185.000	0.000	21.671
031	31	03	PIPE OD-508X9.53 L=304	3-80-468-35149	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389936000	00	1.000	304.000	0.000	35.611
031	31	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182888	159421180000	00	2.000	10.000	10.000	108.000
032	22	12	60D ELB NB500 WITH FL (R/L) A-615/615	3-80-468-35150	00	NO			C			00	2.000	0.000	0.000	477.032
032	32	01	BW LR 60DEG ELL OD508X9.53	3-80-468-35150	00	NO	BW LR 90DEG ELL OD508X9.53 SA234WPB	SA234WPB	C	410182888	995043270000	00	2.000	0.000	0.000	187.000
032	32	02	PIPE OD-508X9.53 L=158	3-80-468-35150	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389936000	00	2.000	158.000	0.000	37.016
032	32	03	PIPE OD-508X9.53 L=158	3-80-468-35150	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389936000	00	2.000	158.000	0.000	37.016
032	32	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182888	159421180000	00	4.000	10.000	10.000	216.000
033	22	13	60D ELB NB500 WITH FL (R/L) A-556/496	3-80-468-35151	00	NO			C			00	1.000	0.000	0.000	220.690
033	33	01	BW SR 60DEG ELL OD508X9.53	3-80-468-35151	00	NO	BW SR 90DEG ELL OD508X9.53 SA234WPB	SA234WPB	C	410182888	925242860000	00	1.000	0.000	0.000	62.320
033	33	02	PIPE OD-508X9.53 L=185	3-80-468-35151	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389936000	00	1.000	185.000	0.000	21.671
033	33	03	PIPE OD-508X9.53 L=245	3-80-468-35151	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389936000	00	1.000	245.000	0.000	28.699
033	33	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182888	159421180000	00	2.000	10.000	10.000	108.000
034	22	14	90D SR ELB NB800 WITH FL (R/L) A-826	3-80-468-35157	00	NO			C			00	1.000	0.000	0.000	457.882
034	17	01	90D SR MB OD813X9.53 AL-811	3-80-468-35157	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	1,418.000	0.000	262.082
034	17	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	195.800
035	22	15	UEQT NB800/500 WITH FL (R/L) L-1220/724	3-80-468-35164	00	NO			C			00	2.000	0.000	0.000	1,009.094
035	21	01	PIPE OD813X9.53 L=1190	3-80-468-35164	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	2.000	1,190.000	0.000	420.000
035	21	02	PIPE OD508X9.53 L=382	3-80-468-35164	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182888	159389936000	00	2.000	382.000	0.000	89.494
035	21	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	4.000	10.000	10.000	391.600
035	21	04	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182888	159421180000	00	2.000	10.000	10.000	108.000
036	34	01	90D SR ELB NB800 WITH FL (R/L) A-826	3-80-468-35155	00	NO			C			00	2.000	0.000	0.000	884.798
036	35	01	90D SR MB OD813X9.53AL-811 (R=1D)	3-80-468-35155	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	2.000	1,336.000	0.000	493.198
036	35	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	4.000	10.000	10.000	391.600
037	34	02	90D SR ELB NB800 WITSTUBS&FL(R/L) A-813	3-80-468-35159	00	NO			C			00	1.000	0.000	0.000	473.046
037	36	01	90D SR MB OD813X9.53AL-811 (R=0.75D)	3-80-468-35159	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	1,392.000	0.000	257.173
037	36	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	195.800
037	36	03	PIPE OD-114.3X4.78 L=100	3-80-468-35159	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410182888	159389756000	00	3.000	100.000	0.000	3.873
037	36	04	F.F.FLANGE NB1000 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410182888	159421140000	00	3.000	10.000	10.000	16.200
038	34	03	90D SR ELB NB800 WITSTUBS&FL (R/L) A-838	3-80-468-35173	00	NO			C			00	1.000	0.000	0.000	482.487
038	37	01	90D SR MB OD813X9.53AL-823 (R=0.75D)	3-80-468-35173	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	1,442.000	0.000	266.614
038	37	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	195.800
038	37	03	PIPE OD-114.3X4.78 L=100	3-80-468-35173	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410182888	159389756000	00	3.000	100.000	0.000	3.873
038	37	04	F.F.FLANGE NB1000 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410182888	159421140000	00	3.000	10.000	10.000	16.200
039	34	04	EQT NB800 WITH FL (R/L) L-1220/800	3-80-468-35165	00	NO			C			00	1.000	0.000	0.000	609.624
039	38	01	PIPE OD813X9.53 L=1190	3-80-468-35165	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	1,190.000	0.000	185.827
039	38	02	PIPE OD813X9.53 L=689	3-80-468-35165	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	689.000	0.000	130.097
039	38	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	195.800
039	38	04	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	1.000	10.000	10.000	97.900
040	39	01	90D LR ELB NB800 WITH FL (R/L) A-826	3-80-468-35155	00	NO			C			00	5.000	0.000	0.000	2,211.995
040	35	01	90D SR MB OD813X9.53AL-811 (R=1D)	3-80-468-35155	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	5.000	1,336.000	0.000	1,232.995
040	35	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	10.000	10.000	10.000	979.000
041	39	02	90D LR ELB NB800 WITH FL (R/L) A-826/887	3-80-468-35156	00	NO			C			00	1.000	0.000	0.000	453.917
041	40	01	90D SR MB OD813X9.53AL-811/872 (R=1D)	3-80-468-35156	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	1,397.000	0.000	258.117
041	40	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	195.800
042	39	03	90D SR ELB NB800 WITH STUBS&FL(R/L)A-813	3-80-468-35159	00	NO			C			00	3.000	0.000	0.000	1,419.138
042	36	01	90D SR MB OD813X9.53AL-811 (R=0.75D)	3-80-468-35159	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	3.000	1,392.000	0.000	771.519
042	36	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	6.000	10.000	10.000	587.400
042	36	03	PIPE OD-114.3X4.78 L=100	3-80-468-35159	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410182888	159389756000	00	9.000	100.000	0.000	11.619
042	36	04	F.F.FLANGE NB1000 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410182888	159421140000	00	9.000	10.000	10.000	48.600
043	39	04	EQT NB800 WITH FL (R/L) L-610/772/1534	3-80-468-35166	00	NO			C			00	1.000	0.000	0.000	779.176
043	41	01	PIPE OD813X9.53 L=1352	3-80-468-35166	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	1,352.000	0.000	216.785
043	41	02	PIPE OD813X9.53 L=1423	3-80-468-35166	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	1,423.000	0.000	268.691
043	41	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	195.800
043	41	04	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	1.000	10.000	10.000	97.900
044	39	05	EQT NB800 WITH FL (R/L) L-610/972/1000	3-80-468-35167	00	NO			C			00	1.000	0.000	0.000	716.101
044	42	01	PIPE OD813X9.53 L=1552	3-80-468-35167	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	1,552.000	0.000	254.540
044	42	02	PIPE OD813X9.53 L=889	3-80-468-35167	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	889.000	0.000	167.861
044	42	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	195.800
044	42	04	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	1.000	10.000	10.000	97.900
045	39	06	EQT NB800 WITH FL (R/L) L-610/610/1000	3-80-468-35168	00	NO			C			00	1.000	0.000	0.000	647.388
045	43	01	PIPE OD813X9.53 L=1190	3-80-468-35168	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	1,190.000	0.000	185.827
045	43	02	PIPE OD813X9.53 L=889	3-80-468-35168	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182888	159389898000	00	1.000	889.000	0.000	167.861
045	43	03	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	2.000	10.000	10.000	195.800
045	43	04	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182888	159421170000	00	1.000	10.000	10.000	97.900
046	44	01	PIPEOD 219.1 X 3.76X 6000 - SA790-S32205		00	M	PIPEOD 219.1 X 3.76X 6000 - SA790-S32205	SA790-S32205	C		154550016000	00	200.000	0.000	0.000	3,994.000
047	44	02	PIPEOD 168.3 X 3.40X6000 - SA790-S32205		00	M	PIPEOD 168.3 X 3.40X 6000 - SA790-S32205	SA790-S32205	C		154550026000	00	50.000	0.000	0.000	691.500
048	44	03	PIPEOD 114.3 X 3.05X6000 - SA790-S32205		00	M	PIPEOD 114.3 X 3.05X 6000 - SA790-S32205	SA790-S32205	C		154550036000	00	100.000	0.000	0.000	837.000
049	44	04	PIPEOD 323.9 X 4.57X6000 - SA790-S32205		00	M	PIPEOD 323.9 X 4.57X 6000 - SA790-S32205	SA790-S32205	C		154550056000	00	100.000	0.000	0.000	3,650.000
050	44	05	PIPE OD-273X4.19X6000-SA790-S32205		00	M	PIPE OD-273X4.19X6000-SA790-S32205	SA790-S32205	C		154550136000	00	50.000	0.000	0.000	1,388.750
051	44	06	PIPEOD 60.3 X 3.91X 6000 - SA790-S32205		00	M	PIPEOD 60.3 X 3.91X 6000 - SA790-S32205	SA790-S32205	C		154550076000	00	50.000	0.000	0.000	272.000
052	44	07	PIPEOD 33.4 X 3.38X 6000 - SA790-S32205		00	M	PIPEOD 33.4 X 3.38X 6000 - SA790-S32205	SA790-S32205	C		154550086000	00	100.000	0.000	0.000	250.000
053	44	08	PIPEOD 21.3 X 2.77X 6000 - SA790-S32205		00	M	PIPEOD 21.3 X 2.77X 6000 - SA790-S32205	SA790-S32205	C		154550046000	00	200.000	0.000	0.000	254.000
054	45	01	PIPE NB450 WITH FLANGES R/L L-6000	3-80-468-35080	01	NO			C			00	2.000	6,000.000	0.000	1,423.610
054	46	01	PIPE OD-457X9.53 L=5970	3-80-468-35080	01	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389926000	00	2.000	5,970.000	0.000	1,255.610
054	46	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	4.000	10.000	10.000	168.000
055	45	02	PIPE NB450 WITH FLANGES R/L L-3893	3-80-468-35080	02	NO			C			00	1.000	3,893.000	0.000	490.233
055	47	01	PIPE OD-457X9.53 L=3863	3-80-468-35080	02	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389926000	00	1.000	3,863.000	0.000	406.233
055	47	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	84.000
056	45	03	PIPE NB450 WITH FLANGES R/L L-5532	3-80-468-35080	03	NO			C			00	1.000	5,532.000	0.000	662.590
056	48	01	PIPE OD-457X9.53 L=5502	3-80-468-35080	03	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389926000	00	1.000	5,502.000	0.000	578.590
056	48	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	84.000
057	45	04	PIPE NB450 WITH FLANGES R/L L-4901	3-80-468-35080	04	NO			C			00	1.000	4,901.000	0.000	596.234
057	49	01	PIPE OD-457X9.53 L=4871	3-80-468-35080	04	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389926000	00	1.000	4,871.000	0.000	512.234
057	49	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	84.000
058	45	05	PIPE NB450 WITH FL R/L L-2094 (VAL)HOLD	3-80-468-35081	00	NO			C			00	1.000	2,094.000	0.000	301.050
058	50	01	PIPE OD-457X9.53 L=2064	3-80-468-35081	00	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389926000	00	1.000	2,064.000	0.000	217.050
058	50	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	1.000	10.000	10.000	42.000
058	50	03	FLANGE NB450 (VALVE END)	3-80-468-35081	00	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	1.000	10.000	10.000	42.000
059	45	06	PIPE NB500 WITH FL R/L L-3118 (VAL)HOLD	3-80-468-35083	03	NO			C			00	2.000	3,118.000	0.000	939.456
059	51	01	PIPE OD-508X9.53 L=3088	3-80-468-35083	03	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389936000	00	2.000	3,088.000	0.000	723.456
059	51	02	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410183193	159421180000	00	2.000	10.000	10.000	108.000
059	51	03	FLANGE NB500 (VALVE END)	3-80-468-35083	03	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	2.000	10.000	10.000	108.000
060	45	07	PIPE NB500 WITH STUBS&FL R/L L-1475	3-80-468-35087	00	NO			C			00	1.000	1,475.000	0.000	303.631
060	52	01	PIPE OD-508X9.53 L=1445	3-80-468-35087	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389936000	00	1.000	1,445.000	0.000	169.267
060	52	02	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410183193	159421180000	00	2.000	10.000	10.000	108.000
060	52	03	PIPE OD-114.3X4.78 L=100	3-80-468-35087	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183193	159389756000	00	4.000	100.000	0.000	5.164
060	52	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183193	159421140000	00	4.000	10.000	10.000	21.200
061	45	08	PIPE NB600 WITH FL R/L L-1464 (VAL)HOLD	3-80-468-35091	02	NO			C			00	2.000	1,464.000	0.000	609.984
061	53	01	PIPE OD-610X9.53 L=1434	3-80-468-35091	02	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389946000	00	2.000	1,434.000	0.000	404.704
061	53	02	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183193	159421160000	00	2.000	10.000	10.000	102.640
061	53	03	FLANGE NB600 (VALVE)) HOLD	3-80-468-35091	02	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	2.000	10.000	10.000	102.640
062	45	09	PIPE NB600 WITH FL R/L L-922 (VAL) HOLD	3-80-468-35091	03	NO			C			00	1.000	922.000	0.000	228.510
062	54	01	PIPE OD-610X9.53 L=892	3-80-468-35091	03	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389946000	00	1.000	892.000	0.000	125.870
062	54	02	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183193	159421160000	00	1.000	10.000	10.000	51.320
062	54	03	FLANGE NB600 (VALVE)) HOLD	3-80-468-35091	03	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	1.000	10.000	10.000	51.320
063	45	10	PIPE NB600 WITH FL R/L L-555 (VAL) HOLD	3-80-468-35092	01	NO			C			00	3.000	0.000	0.000	530.169
063	55	01	PIPE OD-610X9.53 L=525	3-80-468-35092	01	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389946000	00	3.000	525.000	0.000	222.249
063	55	02	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183193	159421160000	00	3.000	10.000	10.000	153.960
063	55	03	FLANGE NB600 (VALVE)) HOLD	3-80-468-35092	01	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	3.000	10.000	10.000	153.960
064	45	11	PIPE NB600 WITH FL R/L L-922 (VAL) HOLD	3-80-468-35092	02	NO			C			00	1.000	922.000	0.000	228.510
064	56	01	PIPE OD-610X9.53 L=892	3-80-468-35092	02	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389946000	00	1.000	892.000	0.000	125.870
064	56	02	FLANGE NB600 (VALVE1) HOLD	3-80-468-35092	02	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	1.000	10.000	10.000	51.320
064	56	03	FLANGE NB600 (VALVE2) HOLD	3-80-468-35092	02	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	1.000	10.000	10.000	51.320
065	45	12	PIPE NB600 WITH STUB&FL R/L L-348(TPHOLD	3-80-468-35096	00	NO			C			00	3.000	348.000	0.000	2,427.639

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
065	57	01	PIPE OD-610X9.53 L=4865	3-80-468-35096	00	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389946000	00	3.000	4,865.000	0.000	2,059.500
065	57	02	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183193	159421160000	00	3.000	10.000	10.000	153.960
065	57	03	PIPE OD-114.3X4.78 L=100	3-80-468-35096	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183193	159389756000	00	9.000	100.000	0.000	11.619
065	57	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183193	159421140000	00	9.000	230.000	230.000	48.600
065	57	05	FLANGE NB600 (TP END)	3-80-468-35096	00	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	3.000	10.000	10.000	153.960
066	45	13	PIPE NB800 WITH FLANGES R/L L-3474	3-80-468-35097	01	NO			C			00	1.000	3,474.000	0.000	846.096
066	58	01	PIPE OD-813X9.53 L=3444	3-80-468-35097	01	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	3,444.000	0.000	650.296
066	58	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
067	45	14	PIPE NB800 WITH FLANGES R/L L-3477	3-80-468-35097	02	NO			C			00	1.000	3,477.000	0.000	846.663
067	59	01	PIPE OD-813X9.53 L=3447	3-80-468-35097	02	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	3,447.000	0.000	650.863
067	59	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
068	45	15	PIPE NB800 WITH FLANGES R/L L-4345	3-80-468-35097	03	NO			C			00	1.000	4,345.000	0.000	1,010.558
068	60	01	PIPE OD-813X9.53 L=4315	3-80-468-35097	03	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	4,315.000	0.000	814.758
068	60	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
069	45	16	PIPE NB800 WITH FLANGES R/L L-860	3-80-468-35097	04	NO			C			00	1.000	860.000	0.000	352.521
069	61	01	PIPE OD-813X9.53 L= 830	3-80-468-35097	04	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	830.000	0.000	156.721
069	61	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
070	45	17	PIPE NB800 WITH FLANGES R/L L-5182	3-80-468-35097	05	NO			C			00	1.000	5,182.000	0.000	1,168.601
070	62	01	PIPE OD-813X9.53 L=5152	3-80-468-35097	05	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	5,152.000	0.000	972.801
070	62	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
071	45	18	PIPE NB800 WITH FLANGES R/L L-800	3-80-468-35097	06	NO			C			00	1.000	800.000	0.000	341.191
071	63	01	PIPE OD-813X9.53 L= 770	3-80-468-35097	06	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	770.000	0.000	145.391
071	63	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
072	45	19	PIPE NB800 WITH NB300BR&FL R/L L-941	3-80-468-35099	00	NO			C			00	1.000	941.000	0.000	428.591
072	64	01	PIPE OD-813X9.53 L= 911	3-80-468-35099	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	911.000	0.000	172.015
072	64	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
072	64	03	PIPE OD-323.9X9.53 L=200	3-80-468-35099	00	NO	PIPE OD-323.9X9.53X6000-A53-GRB	A53-GRB	C	410183193	159389616000	00	1.000	200.000	0.000	14.776
072	64	04	F.F.FLANGE NB300 CL-150	3-80-468-34835	07	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183193	159421160000	00	2.000	10.000	10.000	46.000
073	45	20	PIPE NB800 WIT FE,STUBS&FL R/L L-6M(HOLD	3-80-468-35100	00	NO			C			00	1.000	6,000.000	0.000	1,329.646
073	65	01	PIPE OD-813X9.53 L=5970	3-80-468-35100	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	5,970.000	0.000	1,127.255
073	65	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	1.000	10.000	10.000	97.900
073	65	03	PIPE OD-114.3X4.78 L=100	3-80-468-35100	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183193	159389756000	00	1.000	100.000	0.000	1.291
073	65	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183193	159421140000	00	1.000	10.000	10.000	5.300
073	65	05	FLANGE NB800 (FE) HOLD	3-80-468-35100	00	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	1.000	10.000	10.000	97.900
074	45	21	PIPE NB800 WITH STUBS&FL R/L L-3905	3-80-468-35101	00	NO			C			00	1.000	3,905.000	0.000	947.251
074	66	01	PIPE OD-813X9.53 L=3875	3-80-468-35101	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	3,875.000	0.000	731.678
074	66	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
074	66	03	PIPE OD-114.3X4.78 L=100	3-80-468-35101	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183193	159389756000	00	3.000	100.000	0.000	3.873
074	66	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183193	159421140000	00	3.000	10.000	10.000	15.900
075	45	22	PIPE NB800 WITH NB300 BR&FL R/L L-6M	3-80-468-35103	00	NO			C			00	1.000	6,000.000	0.000	1,398.607
075	67	01	PIPE OD-813X9.53 L= 5970	3-80-468-35103	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	5,970.000	0.000	1,127.255
075	67	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
075	67	03	PIPE OD-323.9X9.53 L=200	3-80-468-35103	00	NO	PIPE OD-323.9X9.53X6000-A53-GRB	A53-GRB	C	410183193	159389616000	00	2.000	200.000	0.000	29.552
075	67	04	F.F.FLANGE NB300 CL-150	3-80-468-34835	07	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183193	159421160000	00	2.000	10.000	10.000	46.000
076	45	23	PIPE NB800 WITH BR&FL R/L L-3234	3-80-468-35104	00	NO			C			00	1.000	3,234.000	0.000	818.135
076	68	01	PIPE OD-813X9.53 L=3204	3-80-468-35104	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	3,204.000	0.000	604.979
076	68	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
076	68	03	PIPE OD-219.1X5.56 L=200	3-80-468-35104	00	NO	PIPE OD-219.1X5.56X6000-A53-GRB	A53-GRB	C	410183193	159389776000	00	1.000	200.000	0.000	5.856
076	68	04	F.F.FLANGE NB200 CL-150	3-80-468-34835	05	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410183193	159421990000	00	1.000	10.000	10.000	11.500
077	69	01	PIPE NB450 WITH FLANGES R/L L-3575	3-80-468-35080	05	NO			C			00	1.000	3,575.000	0.000	456.792
077	70	01	PIPE OD-457X9.53 L=3545	3-80-468-35080	05	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389926000	00	1.000	3,545.000	0.000	372.792
077	70	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	84.000
078	69	02	PIPE NB450 WITH FLANGES R/L L-6000	3-80-468-35080	01	NO			C			00	2.000	6,000.000	0.000	1,423.610
078	46	01	PIPE OD-457X9.53 L=5970	3-80-468-35080	01	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389926000	00	2.000	5,970.000	0.000	1,255.610
078	46	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	4.000	10.000	10.000	168.000
079	69	03	PIPE NB450 WITH FLANGES R/L L-2447	3-80-468-35080	06	NO			C			00	1.000	2,447.000	0.000	338.172
079	71	01	PIPE OD-457X9.53 L=2417	3-80-468-35080	06	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389926000	00	1.000	2,417.000	0.000	254.172
079	71	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	84.000
080	69	04	PIPE NB450 WITH FLANGES R/L L-696	3-80-468-35080	07	NO			C			00	1.000	696.000	0.000	154.037
080	72	01	PIPE OD-457X9.53 L=666	3-80-468-35080	07	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389926000	00	1.000	666.000	0.000	70.037
080	72	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	84.000
081	69	05	PIPE NB450 WITH FLANGES R/L L-5010	3-80-468-35080	08	NO			C			00	1.000	5,010.000	0.000	607.697
081	73	01	PIPE OD-457X9.53 L=4980	3-80-468-35080	08	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389926000	00	1.000	4,980.000	0.000	523.697
081	73	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	84.000
082	69	06	PIPE NB450 WITH FLANGES R/L L-5896	3-80-468-35080	09	NO			C			00	1.000	5,896.000	0.000	700.869
082	74	01	PIPE OD-457X9.53 L=5866	3-80-468-35080	09	NO	PIPE OD-457X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389926000	00	1.000	5,866.000	0.000	616.869
082	74	02	F.F.FLANGE NB450 CL-150	3-80-468-34835	10	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	84.000
083	69	07	PIPE NB500 WITH FLANGES R/L L-1740	3-80-468-35082	02	NO			C			00	2.000	1,740.000	0.000	623.648
083	75	01	PIPE OD-508X9.53 L=1740	3-80-468-35082	02	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389936000	00	2.000	1,740.000	0.000	407.648
083	75	02	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410183193	159421180000	00	4.000	10.000	10.000	216.000
084	69	08	PIPE NB500 WIT STUB&FL R/L L-684(VALHOLD	3-80-468-35088	00	NO			C			00	1.000	684.000	0.000	210.974
084	76	01	PIPE OD-508X9.53 L=654	3-80-468-35088	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389936000	00	1.000	654.000	0.000	76.610
084	76	02	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410183193	159421180000	00	1.000	10.000	10.000	54.000
084	76	03	PIPE OD-114.3X4.78 L=100	3-80-468-35088	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183193	159389756000	00	4.000	100.000	0.000	5.164
084	76	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183193	159421140000	00	4.000	10.000	10.000	21.200
084	76	05	FLANGE NB500 (VALVE) HOLD	3-80-468-35088	00	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	1.000	10.000	10.000	54.000
085	69	09	PIPE NB500 WIT STUB&FL R/L L-713(VALHOLD	3-80-468-35089	00	NO			C			00	1.000	713.000	0.000	214.371
085	77	01	PIPE OD-508X9.53 L=683	3-80-468-35089	00	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410183193	159389936000	00	1.000	683.000	0.000	80.007
085	77	02	F.F.FLANGE NB500 CL-150	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410183193	159421180000	00	1.000	10.000	10.000	54.000
085	77	03	PIPE OD-114.3X4.78 L=100	3-80-468-35089	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183193	159389756000	00	4.000	100.000	0.000	5.164
085	77	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183193	159421140000	00	4.000	10.000	10.000	21.200
085	77	05	FLANGE NB500 (VALVE) HOLD	3-80-468-35089	00	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	1.000	10.000	10.000	54.000
086	69	10	PIPE NB800 WITH FLANGES R/L L-4022	3-80-468-35097	08	NO			C			00	1.000	4,022.000	0.000	949.569
086	78	01	PIPE OD-813X9.53 L=3992	3-80-468-35097	08	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	3,992.000	0.000	753.769
086	78	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
087	69	11	PIPE NB800 WITH FLANGES R/L L-3106	3-80-468-35097	09	NO			C			00	1.000	3,106.000	0.000	776.610
087	79	01	PIPE OD-813X9.53 L=3076	3-80-468-35097	09	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	3,076.000	0.000	580.810
087	79	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
088	69	12	PIPE NB800 WITH FLANGES R/L L-3185	3-80-468-35097	10	NO			C			00	1.000	3,185.000	0.000	791.527
088	80	01	PIPE OD-813X9.53 L=3155	3-80-468-35097	10	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	3,155.000	0.000	595.727
088	80	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
089	69	13	PIPE NB800 WITH FLANGES R/L L-1475	3-80-468-35097	11	NO			C			00	1.000	1,475.000	0.000	468.645
089	81	01	PIPE OD-813X9.53 L=1445	3-80-468-35097	11	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	1,445.000	0.000	272.845
089	81	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
090	69	14	PIPE NB800 WITH FL RL L-1738 (VAL)HOLD	3-80-468-35098	01	NO			C			00	1.000	1,738.000	0.000	518.305
090	82	01	PIPE OD-813X9.53 L=1708	3-80-468-35098	01	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	1,708.000	0.000	322.505
090	82	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	1.000	10.000	10.000	97.900
090	82	03	FLANGE NB800 (VALVE) HOLD	3-80-468-35098	01	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	1.000	10.000	10.000	97.900
091	69	15	PIPE NB800 WITH FL R/L L-3817 (VAL)HOLD	3-80-468-35098	02	NO			C			00	1.000	3,817.000	0.000	910.861
091	83	01	PIPE OD-813X9.53 L=3787	3-80-468-35098	02	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	3,787.000	0.000	715.061
091	83	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	1.000	10.000	10.000	97.900
091	83	03	FLANGE NB800 (VALVE) HOLD	3-80-468-35098	02	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	1.000	10.000	10.000	97.900
092	69	16	PIPE NB800 WITH NB200 BR&FL R/L L-6M	3-80-468-35105	00	NO			C			00	1.000	6,000.000	0.000	1,340.411
092	84	01	PIPE OD-813X9.53 L=5970	3-80-468-35105	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	5,970.000	0.000	1,127.255
092	84	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
092	84	03	PIPE OD-219.1X5.56 L=200	3-80-468-35105	00	NO	PIPE OD-219.1X5.56X6000-A53-GRB	A53-GRB	C	410183193	159389776000	00	1.000	200.000	0.000	5.856
092	84	04	F.F.FLANGE NB200 CL-150	3-80-468-34835	05	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410183193	159421990000	00	1.000	10.000	10.000	11.500
093	69	17	PIPE NB800 WITH NB300 BR&FL R/L L-5500	3-80-468-35106	00	NO			C			00	1.000	5,500.000	0.000	1,266.421
093	85	01	PIPE OD-813X9.53 L= 5470	3-80-468-35106	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	5,470.000	0.000	1,032.845
093	85	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
093	85	03	PIPE OD-323.9X9.53 L=200	3-80-468-35106	00	NO	PIPE OD-323.9X9.53X6000-A53-GRB	A53-GRB	C	410183193	159389616000	00	1.000	200.000	0.000	14.776
093	85	04	F.F.FLANGE NB300 CL-150	3-80-468-34835	07	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183193	159421160000	00	1.000	10.000	10.000	23.000
094	69	18	PIPE NB800 WIT 300BR&STUB&FL R/L L-3142	3-80-468-35107	00	NO			C			00	1.000	2,187.000	0.000	1,273.012
094	86	01	PIPE OD-813X9.53 L= 2157	3-80-468-35107	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	5,470.000	0.000	1,032.845
094	86	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
094	86	03	PIPE OD-323.9X9.53 L=200	3-80-468-35107	00	NO	PIPE OD-323.9X9.53X6000-A53-GRB	A53-GRB	C	410183193	159389616000	00	1.000	200.000	0.000	14.776
094	86	04	F.F.FLANGE NB300 CL-150	3-80-468-34835	07	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183193	159421160000	00	1.000	10.000	10.000	23.000
094	86	05	PIPE OD-114.3X4.78 L=100	3-80-468-35107	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183193	159389756000	00	1.000	100.000	0.000	1.291
094	86	06	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183193	159421140000	00	1.000	10.000	10.000	5.300
095	87	01	PIPE NB800 WITH FLANGES R/L L-5062	3-80-468-35097	12	NO			C			00	1.000	5,062.000	0.000	1,145.942
095	88	01	PIPE OD-813X9.53 L=5032	3-80-468-35097	12	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	5,032.000	0.000	950.142
095	88	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
096	87	02	PIPE NB800 WITH FLANGES R/L L-3695	3-80-468-35097	13	NO			C			00	1.000	3,695.000	0.000	887.825
096	89	01	PIPE OD-813X9.53 L=3665	3-80-468-35097	13	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	3,665.000	0.000	692.025
096	89	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
097	87	03	PIPE NB800 WITH FLANGES R/L L-1759	3-80-468-35097	14	NO			C			00	1.000	1,759.000	0.000	522.270
097	90	01	PIPE OD-813X9.53 L=1729	3-80-468-35097	14	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	1,729.000	0.000	326.470
097	90	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
098	87	04	PIPE NB800 WITH STUB&FL R/L L-1660	3-80-468-35108	00	NO			C			00	1.000	1,660.000	0.000	510.168
098	91	01	PIPE OD-813X9.53 L= 1630	3-80-468-35108	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	1,630.000	0.000	307.777
098	91	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
098	91	03	PIPE OD-114.3X4.78 L=100	3-80-468-35108	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183193	159389756000	00	1.000	100.000	0.000	1.291
098	91	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183193	159421140000	00	1.000	10.000	10.000	5.300
099	87	05	PIPE NB800 WITH FL R/L L-2454 (VAL)HOLD	3-80-468-35098	03	NO			C			00	2.000	2,454.000	0.000	1,307.000
099	92	01	PIPE OD-813X9.53 L=2424	3-80-468-35098	03	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	2.000	2,424.000	0.000	915.400
099	92	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
099	92	03	FLANGE NB800 (VALVE) HOLD	3-80-468-35098	03	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	2.000	10.000	10.000	195.800
100	93	01	PIPE NB800 WITH FL R/L L-335 (TP)HOLD	3-80-468-35109	00	NO			C			00	2.000	335.000	0.000	506.780
100	94	01	PIPE OD-813X9.53 L=305	3-80-468-35109	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	2.000	305.000	0.000	115.180
100	94	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
100	94	03	FLANGE NB800 (TP) HOLD	3-80-468-35109	00	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	2.000	10.000	10.000	195.800
101	93	02	PIPE NB800 WITH FL R/L L-1941 (VAL)HOLD	3-80-468-35098	04	NO			C			00	2.000	1,941.000	0.000	1,113.270
101	95	01	PIPE OD-813X9.53 L=1911	3-80-468-35098	04	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	2.000	1,911.000	0.000	721.670
101	95	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
101	95	03	FLANGE NB800 (VALVE) HOLD	3-80-468-35098	04	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	2.000	10.000	10.000	195.800
102	93	03	PIPE NB800 WITH FL R/L L-1617 (VAL)HOLD	3-80-468-35098	05	NO			C			00	1.000	1,617.000	0.000	495.457
102	96	01	PIPE OD-813X9.53 L=1587	3-80-468-35098	05	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	1,587.000	0.000	299.657
102	96	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	1.000	10.000	10.000	97.900
102	96	03	FLANGE NB800 (VALVE) HOLD	3-80-468-35098	05	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	1.000	10.000	10.000	97.900
103	93	04	PIPE NB800 WITH FL R/L L-1443 (VAL)HOLD	3-80-468-35098	07	NO			C			00	2.000	1,443.000	0.000	925.206
103	97	01	PIPE OD-813X9.53 L=1413	3-80-468-35098	07	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	2.000	1,413.000	0.000	533.606
103	97	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
103	97	03	FLANGE NB800 (VALVE) HOLD	3-80-468-35098	07	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	2.000	10.000	10.000	195.800
104	93	05	PIPE NB800 WITH FLANGES R/L L-3476	3-80-468-35097	15	NO			C			00	1.000	3,476.000	0.000	846.474
104	98	01	PIPE OD-813X9.53 L= 3446	3-80-468-35097	15	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	3,446.000	0.000	650.674
104	98	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
105	93	06	PIPE NB800 WITH BR&STUB&FL R/L L-3142	3-80-468-35110	00	NO			C			00	1.000	3,142.000	0.000	827.775
105	99	01	PIPE OD-813X9.53 L= 3112	3-80-468-35110	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	3,112.000	0.000	587.608
105	99	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
105	99	03	PIPE OD-323.9X9.53 L=200	3-80-468-35110	00	NO	PIPE OD-323.9X9.53X6000-A53-GRB	A53-GRB	C	410183193	159389616000	00	1.000	200.000	0.000	14.776
105	99	04	F.F.FLANGE NB300 CL-150	3-80-468-34835	07	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410183193	159421160000	00	1.000	10.000	10.000	23.000
105	99	05	PIPE OD-114.3X4.78 L=100	3-80-468-35110	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183193	159389756000	00	1.000	100.000	0.000	1.291
105	99	06	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183193	159421140000	00	1.000	10.000	10.000	5.300
106	93	07	PIPE NB800 WITH STUB&FL R/L L-3261	3-80-468-35111	00	NO			C			00	1.000	3,261.000	0.000	812.468
106	A0	01	PIPE OD-813X9.53 L= 3231	3-80-468-35111	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	1.000	3,231.000	0.000	610.077
106	A0	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	2.000	10.000	10.000	195.800
106	A0	03	PIPE OD-114.3X4.78 L=100	3-80-468-35111	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183193	159389756000	00	1.000	100.000	0.000	1.291
106	A0	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183193	159421140000	00	1.000	10.000	10.000	5.300
107	93	08	PIPE NB800 WIT STUB&FL R/L L-436(VALHOLD	3-80-468-35112	00	NO			C			00	3.000	436.000	0.000	876.702
107	A1	01	PIPE OD-813X9.53 L= 406	3-80-468-35112	00	NO	PIPE OD-813X9.53X8000-A134-A283GRD	A134-A283GRD	C	410183193	159389898000	00	3.000	406.000	0.000	229.983
107	A1	02	F.F.FLANGE NB800 CL-D	3-80-468-34836	03	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410183193	159421170000	00	3.000	10.000	10.000	293.700
107	A1	03	PIPE OD-114.3X4.78 L=100	3-80-468-35112	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410183193	159389756000	00	9.000	100.000	0.000	11.619
107	A1	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410183193	159421140000	00	9.000	10.000	10.000	47.700
107	A1	05	FLANGE NB800 (VALVE) HOLD	3-80-468-35112	00	NO	Dummy Material	DUMMY MATERIAL	C	410183193	DUMMYKG	00	3.000	10.000	10.000	293.700
108	A2	01	PIPE NB2600 WITH DRN STUB L=1397 (PU)-OG	3-80-468-35355	NU	NO			C			00	4.000	0.000	0.000	5,806.100
108	A3	01	P.F.PIPE NB2600 L=1397 OG	3-80-468-34507	26	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184927	159420380000	00	4.000	1,397.000	8,217.000	5,767.048
108	A3	02	PIPE OD-168.3X5.56 L=200	3-80-468-35355	NU	NO	PIPE OD-168.3X5.56X6000-A53-GRB	A53-GRB	C	410184927	159389766000	00	4.000	200.000	0.000	17.852
108	A3	03	F.F.FLANGE NB150 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184927	159421140000	00	4.000	230.000	230.000	21.200
109	A2	02	90DEG MB2600 WITH B.S. & STUBS-1 (PU)-OG	2-80-468-15641	NU	NO			C			00	1.000	0.000	0.000	7,562.196
109	A4	01	90DEG MITREBEND NB2600	3-80-468-35361	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184927	159420380000	00	1.000	4,383.000	8,217.000	4,473.998
109	A4	02	PAD PLATE-1 12X1450X2000	2-80-468-15641	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111790000	00	1.000	1,450.000	2,000.000	273.180
109	A4	03	PAD PLATE-2 12X700X1900	2-80-468-15641	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111790000	00	1.000	700.000	1,900.000	125.286
109	A4	04	BASE PLATE 25X1440X2500	2-80-468-15641	NU	NO	PLATE 25MM - ASMESAIS2062E250BR	ASMESAIS2062E250BR	C	410184927	150111640000	00	1.000	1,440.000	2,500.000	706.500
109	A4	05	MIDDLE PLATE 16X2000X2400	2-80-468-15641	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	1.000	2,000.000	2,400.000	602.880
109	A4	06	STIFFNER PLATE-1 16X662X1765	2-80-468-15641	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	1,765.000	293.402
109	A4	07	STIFFNER PLATE-2 16X662X1550	2-80-468-15641	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	1,550.000	257.732
109	A4	08	STIFFNER PLATE-3 16X662X1480	2-80-468-15641	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	1.000	662.000	1,480.000	123.088
109	A4	09	STIFFNER PLATE-4 16X662X1080	2-80-468-15641	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	1,080.000	179.608
109	A4	10	STIFFNER PLATE-5 16X662X860	2-80-468-15641	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	860.000	143.014
109	A4	11	STIFFNER PLATE-6 16X662X790	2-80-468-15641	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	790.000	131.372
109	A4	12	PIPE OD-114.3X4.78 L=150	2-80-468-15641	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184927	159389756000	00	10.000	150.000	0.000	19.360
109	A4	13	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184927	159421140000	00	10.000	230.000	230.000	53.000
109	A4	14	PIPE OD-88.9X3.96 L=150	2-80-468-15641	NU	NO	PIPE OD-88.9X3.96X6000-A53-GRB	A53-GRB	C	410184927	159389746000	00	4.000	150.000	0.000	4.976
109	A4	15	FLAT FACED FLANGE NB80 CL150	3-80-468-34835	01	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184927	159421140000	00	46.000	190.000	190.000	174.800
110	A2	03	90DEG MB2600 WITH B.S. & STUBS-2 (PU)-OG	2-80-468-15642	NU	NO			C			00	1.000	0.000	0.000	7,562.196
110	A5	01	90DEG MITREBEND NB2600	3-80-468-35361	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184927	159420380000	00	1.000	4,383.000	8,217.000	4,473.998
110	A5	02	PAD PLATE-1 12X1450X2000	2-80-468-15642	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111790000	00	1.000	1,450.000	2,000.000	273.180
110	A5	03	PAD PLATE-2 12X700X1900	2-80-468-15642	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111790000	00	1.000	700.000	1,900.000	125.286
110	A5	04	BASE PLATE 25X1440X2500	2-80-468-15642	NU	NO	PLATE 25MM - ASMESAIS2062E250BR	ASMESAIS2062E250BR	C	410184927	150111640000	00	1.000	1,440.000	2,500.000	706.500
110	A5	05	MIDDLE PLATE 16X2000X2400	2-80-468-15642	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	1.000	2,000.000	2,400.000	602.880
110	A5	06	STIFFNER PLATE-1 16X662X1765	2-80-468-15642	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	1,765.000	293.402
110	A5	07	STIFFNER PLATE-2 16X662X1550	2-80-468-15642	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	1,550.000	257.732
110	A5	08	STIFFNER PLATE-3 16X662X1480	2-80-468-15642	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	1.000	662.000	1,480.000	123.088
110	A5	09	STIFFNER PLATE-4 16X662X1080	2-80-468-15642	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	1,080.000	179.608
110	A5	10	STIFFNER PLATE-5 16X662X860	2-80-468-15642	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	860.000	143.014
110	A5	11	STIFFNER PLATE-6 16X662X790	2-80-468-15642	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	790.000	131.372
110	A5	12	PIPE OD-114.3X4.78 L=150	2-80-468-15642	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184927	159389756000	00	10.000	150.000	0.000	19.360
110	A5	13	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184927	159421140000	00	10.000	230.000	230.000	53.000
110	A5	14	PIPE OD-88.9X3.96 L=150	2-80-468-15642	NU	NO	PIPE OD-88.9X3.96X6000-A53-GRB	A53-GRB	C	410184927	159389746000	00	4.000	150.000	0.000	4.976
110	A5	15	FLAT FACED FLANGE NB80 CL150	3-80-468-34835	01	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184927	159421140000	00	46.000	190.000	190.000	174.800
111	A2	04	90DEG MB2600 WITH B.S. & STUBS-3 (PU)-OG	2-80-468-15955	NU	NO			C			00	1.000	0.000	0.000	7,367.948
111	A6	01	90DEG MITREBEND NB2600	3-80-468-35361	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184927	159420380000	00	1.000	4,383.000	8,217.000	4,473.998
111	A6	02	PAD PLATE-1 12X1450X2000	2-80-468-15955	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111790000	00	1.000	1,450.000	2,000.000	273.180
111	A6	03	PAD PLATE-2 12X700X1900	2-80-468-15955	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111790000	00	1.000	700.000	1,900.000	125.286
111	A6	04	BASE PLATE 25X1440X2500	2-80-468-15955	NU	NO	PLATE 25MM - ASMESAIS2062E250BR	ASMESAIS2062E250BR	C	410184927	150111640000	00	1.000	1,440.000	2,500.000	706.500
111	A6	05	MIDDLE PLATE 16X2000X2400	2-80-468-15955	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	1.000	2,000.000	2,400.000	602.880
111	A6	06	STIFFNER PLATE-1 16X662X1765	2-80-468-15955	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	1,765.000	293.402
111	A6	07	STIFFNER PLATE-2 16X662X1550	2-80-468-15955	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	1,550.000	257.732
111	A6	08	STIFFNER PLATE-3 16X662X1480	2-80-468-15955	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	1.000	662.000	1,480.000	123.088
111	A6	09	STIFFNER PLATE-4 16X662X1080	2-80-468-15955	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	1,080.000	179.608
111	A6	10	STIFFNER PLATE-5 16X662X860	2-80-468-15955	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	860.000	143.014
111	A6	11	STIFFNER PLATE-6 16X662X790	2-80-468-15955	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	790.000	131.372
111	A6	12	PIPE OD-114.3X4.78 L=150	2-80-468-15955	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184927	159389756000	00	8.000	150.000	0.000	15.488
111	A6	13	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184927	159421140000	00	8.000	230.000	230.000	42.400
112	A2	05	90DEG MB2600 WITH B.S. & STUBS-4 (PU)-OG	2-80-468-15956	NU	NO			C			00	1.000	0.000	0.000	7,367.948
112	A7	01	90DEG MITREBEND NB2600	3-80-468-35361	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184927	159420380000	00	1.000	4,383.000	8,217.000	4,473.998
112	A7	02	PAD PLATE-1 12X1450X2000	2-80-468-15956	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111790000	00	1.000	1,450.000	2,000.000	273.180
112	A7	03	PAD PLATE-2 12X700X1900	2-80-468-15956	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111790000	00	1.000	700.000	1,900.000	125.286
112	A7	04	BASE PLATE 25X1440X2500	2-80-468-15956	NU	NO	PLATE 25MM - ASMESAIS2062E250BR	ASMESAIS2062E250BR	C	410184927	150111640000	00	1.000	1,440.000	2,500.000	706.500
112	A7	05	MIDDLE PLATE 16X2000X2400	2-80-468-15956	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	1.000	2,000.000	2,400.000	602.880
112	A7	06	STIFFNER PLATE-1 16X662X1765	2-80-468-15956	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	1,765.000	293.402
112	A7	07	STIFFNER PLATE-2 16X662X1550	2-80-468-15956	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	1,550.000	257.732
112	A7	08	STIFFNER PLATE-3 16X662X1480	2-80-468-15956	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	1.000	662.000	1,480.000	123.088
112	A7	09	STIFFNER PLATE-4 16X662X1080	2-80-468-15956	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	1,080.000	179.608
112	A7	10	STIFFNER PLATE-5 16X662X860	2-80-468-15956	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	860.000	143.014
112	A7	11	STIFFNER PLATE-6 16X662X790	2-80-468-15956	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	790.000	131.372
112	A7	12	PIPE OD-114.3X4.78 L=150	2-80-468-15956	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184927	159389756000	00	8.000	150.000	0.000	15.488
112	A7	13	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184927	159421140000	00	8.000	230.000	230.000	42.400
113	A2	06	53.5DEG MB2600 WITH STUBS-1 (PU)-OG	3-80-468-35356	NU	NO			C			00	1.000	0.000	0.000	2,063.141
113	A8	01	53.5DEG MITREBEND NB2600	3-80-468-35356	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184927	159420380000	00	1.000	1,982.000	8,217.000	2,012.489
113	A8	02	PIPE OD-114.3X4.78 L=150	3-80-468-35356	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184927	159389756000	00	7.000	150.000	0.000	13.552
113	A8	03	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184927	159421140000	00	7.000	230.000	230.000	37.100
114	A2	07	53.5DEG MB2600 WITH STUBS-2 (PU)-OG	3-80-468-35357	NU	NO			C			00	1.000	0.000	0.000	2,063.141
114	A9	01	53.5DEG MITREBEND NB2600	3-80-468-35357	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184927	159420380000	00	1.000	1,982.000	8,217.000	2,012.489
114	A9	02	PIPE OD-114.3X4.78 L=150	3-80-468-35357	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184927	159389756000	00	7.000	150.000	0.000	13.552
114	A9	03	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184927	159421140000	00	7.000	230.000	230.000	37.100
115	A2	08	53.5DEG MB2600 WITH STUBS-3 (PU)-OG	3-80-468-35358	NU	NO			C			00	1.000	0.000	0.000	2,113.793
115	B0	01	53.5DEG MITREBEND NB2600	3-80-468-35358	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184927	159420380000	00	1.000	1,982.000	8,217.000	2,012.489
115	B0	02	PIPE OD-114.3X4.78 L=150	3-80-468-35358	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184927	159389756000	00	14.000	150.000	0.000	27.104
115	B0	03	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184927	159421140000	00	14.000	230.000	230.000	74.200
116	A2	09	53.5DEG MB2600 WITH STUBS-4 (PU)-OG	3-80-468-35359	NU	NO			C			00	1.000	0.000	0.000	2,113.793
116	B1	01	53.5DEG MITREBEND NB2600	3-80-468-35359	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184927	159420380000	00	1.000	1,982.000	8,217.000	2,012.489
116	B1	02	PIPE OD-114.3X4.78 L=150	3-80-468-35359	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410184927	159389756000	00	14.000	150.000	0.000	27.104
116	B1	03	FLAT FACED FLANGE NB100 CL150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410184927	159421140000	00	14.000	230.000	230.000	74.200
117	A2	10	90DEG MB2600 A.L-1950/1950 (PU)-OG	3-80-468-34516	NU	NO			C			00	1.000	0.000	0.000	3,235.490
117	B2	01	P.F.PIPE OD2632X16 L-3183	3-80-468-34507	01	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184927	159420380000	00	1.000	8,217.000	3,183.000	3,235.490
118	A2	11	90DEG MB2600 WITH SADDLE&DRNSTUB-(PU)-OG	2-80-468-15957	NU	NO			C			00	1.000	0.000	0.000	5,011.832
118	B3	01	90DEG MITREBEND NB2600 AL-1950/3094	3-80-468-35363	NU	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184927	159420380000	00	1.000	4,327.000	8,217.000	4,416.222
118	B3	02	SADDLE SUPPORT FOR NB2600 H-1730	3-80-468-35280	NU	NO			C	410184927		01	1.000	0.000	0.000	585.263
118	B4	01	BOTTOM PLATE 25X450X2000	3-80-468-35280	NU	NO	PLATE 25MM - ASMESAIS2062E250BR	ASMESAIS2062E250BR	C	410184927	150111640000	01	1.000	450.000	2,000.000	176.625
118	B4	02	PAD PLATE 12X450X2470	3-80-468-35280	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111790000	01	1.000	450.000	2,470.000	104.750
118	B4	03	MIDDLE PLATE 16X777X1900	3-80-468-35280	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	01	1.000	777.000	1,900.000	185.386
118	B4	04	STIFFNER PLATE-1 16X192X610	3-80-468-35280	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	01	4.000	192.000	610.000	58.840
118	B4	05	STIFFNER PLATE-2 16X192X430	3-80-468-35280	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	01	4.000	192.000	430.000	41.480
118	B4	06	STIFFNER PLATE-3 16X192X377	3-80-468-35280	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	01	2.000	192.000	377.000	18.182
118	B3	03	PIPE OD-168.3X5.56 L=150	2-80-468-15957	NU	NO	PIPE OD-168.3X5.56X6000-A53-GRB	A53-GRB	C	410184927	159389766000	00	1.000	150.000	0.000	3.347
118	B3	04	FLAT FACED FLANGE NB150 CL150	3-80-468-34835	03	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410184927	159421990000	00	1.000	280.000	280.000	7.000
119	A2	12	90DEG MB2600 WIT B.S.L=1950/1950 (PU)-OG	2-80-468-15958	NU	NO			C			00	2.000	0.000	0.000	12,143.104
119	B5	01	90DEG MITREBEND NB2600 AL-1950/1950	3-80-468-34516	NU	NO			C	410184927		00	2.000	0.000	0.000	6,470.980
119	B2	01	P.F.PIPE OD2632X16 L-3183	3-80-468-34507	01	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184927	159420380000	00	2.000	8,217.000	3,183.000	6,470.980
119	B5	02	PAD PLATE-1 12X1450X2000	2-80-468-15958	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111790000	00	2.000	1,450.000	2,000.000	546.360
119	B5	03	PAD PLATE-2 12X700X1900	2-80-468-15958	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111790000	00	2.000	700.000	1,900.000	250.572

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
119	B5	04	BASE PLATE 25X1440X2500	2-80-468-15958	NU	NO	PLATE 25MM - ASMESAIS2062E250BR	ASMESAIS2062E250BR	C	410184927	150111640000	00	2.000	1,440.000	2,500.000	1,413.000
119	B5	05	MIDDLE PLATE 16X2000X2400	2-80-468-15958	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	2,000.000	2,400.000	1,205.760
119	B5	06	STIFFNER PLATE-1 16X662X1765	2-80-468-15958	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	4.000	662.000	1,765.000	586.804
119	B5	07	STIFFNER PLATE-2 16X662X1550	2-80-468-15958	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	4.000	662.000	1,550.000	515.464
119	B5	08	STIFFNER PLATE-3 16X662X1480	2-80-468-15958	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	2.000	662.000	1,480.000	246.176
119	B5	09	STIFFNER PLATE-4 16X662X1080	2-80-468-15958	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	4.000	662.000	1,080.000	359.216
119	B5	10	STIFFNER PLATE-5 16X662X860	2-80-468-15958	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	4.000	662.000	860.000	286.028
119	B5	11	STIFFNER PLATE-6 16X662X790	2-80-468-15958	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410184927	150111800000	00	4.000	662.000	790.000	262.744
120	A2	13	PIPE NB2600 WITH MANHOLE L=2783 (PU)-OG	2-80-468-15959	NU	NO			C			00	2.000	0.000	0.000	6,482.888
120	B6	01	P.F.PIPE OD2632X16THK L=2783	3-80-468-34507	30	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184927	159420380000	00	2.000	8,217.000	2,783.000	5,670.000
120	B6	02	P.F.PIPE OD610X10THKL=504	2-80-468-15959	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410184927	159420400000	00	2.000	1,885.000	504.000	149.150
120	B6	03	PAD PLATE OD1000 ID596 T-10MM	2-80-468-15959	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410184927	159420400000	00	2.000	1,000.000	1,000.000	79.500
120	B6	04	FLAT FACE FLANGE NB600 SA515GR70	3-80-468-34666	02	NO	PLATE 50.0 MM - SA515GR70	SA515GR70	C	410184927	159421190000	00	2.000	10.000	10.000	156.200
120	B6	05	BLANK FLANGE NB600 WITH HANDLE	3-80-468-23148	00	NO				410184927		00	2.000	0.000	0.000	378.200
120	B7	01	BLANK FLANGE NB600 DIA815	3-80-468-23148	00	NO	PLATE 50.0 MM - IS2062E250B(Fe410W)	IS2062E250GRBR	C	410184927	150111060000	00	2.000	815.000	815.000	366.200
120	B7	02	HANDLE DIA32X480	3-80-468-23148	00	NO	DIA 32mm-SA105	SA105	C	410184927	153391400000	00	4.000	480.000	0.000	12.000
120	B6	06	HINGE PL. (OUTER) 370X240X12THK	2-80-468-15959	NU	NO	PLATE-12X2500X5000-SA515GR60	SA515GR60	C	410184927	159420390000	00	4.000	370.000	240.000	20.000
120	B6	07	HINGE PL. (INNER) 370X240X12THK SA515GR6	2-80-468-15959	NU	NO	PLATE-12X2500X5000-SA515GR60	SA515GR60	C	410184927	159420390000	00	4.000	473.000	140.000	12.400
120	B6	08	STUD M24X340 LONG	2-80-468-15959	NU	NO	DIA 25mm-SA105	SA105	C	410184927	153391390000	00	2.000	340.000	0.000	2.618
120	B6	09	PUNCHED WASHER A24	2-80-468-15959	NU	NO	PUN WASHER-M24 -IS2016-A	IS-2016	C	410184927	414080002400	00	4.000	0.000	0.000	0.120
120	B6	10	HEX NUT M24	2-80-468-15959	NU	NO	HEX NUT M24-10 IS:1364(P-3)/LATEST	IS:1364(P-3)	C	410184927	413220002400	00	4.000	0.000	0.000	0.440
120	B6	11	SPLIT PIN DIA4X45	2-80-468-15959	NU	NO	SPLIT PIN 4X45MM IS:549	IS:549	C	410184927	417044004500	00	4.000	0.000	0.000	0.020
120	B6	12	HEX BOLT M33X140	2-80-468-15959	NU	NO	HEX BOLT M33X3.5X140 PCL 6.8 GR A STEEL	STEEL	C	410184927	412153314000	00	8.000	0.000	0.000	10.000
120	B6	13	HEX NUT M33	2-80-468-15959	NU	NO	NUT -M33x3.5 -CL4-IS1363P3	IS-1363(P-3)	C	410184927	413040003300	00	8.000	0.000	0.000	2.240
120	B6	16	NON ASBESTOS OD780XID617X3THK	2-80-468-15959	NU	NO	NON-ASBESTOS JOINTING SHEET 3.0MM	NON-ASBESTOS	C	410184927	220210300000	00	2.000	780.000	780.000	2.000
121	A2	14	65DEG MB NB2600 A.L-2321/2626 (PU)-OG	3-80-468-35360	NU	NO			C			00	2.000	0.000	0.000	9,024.360
121	B8	01	P.F.PIPE NB2600 L=4372	3-80-468-34507	31	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184927	159420380000	00	2.000	4,372.000	8,217.000	9,024.360

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
*			MAIN CIRCULATION WATER PIPING										1.000	0.000	0.000	35,85,001.967
*	N1		INTAKE WATER PH PIPES- NB1200		NU							00	1.000	0.000	0.000	0.000
*	L8		PRETREATED PH PIPES-NB1400		NU							00	1.000	0.000	0.000	22,466.600
*	L7		BOM FOR DUPLEX SS PIPING		NU	NO						00	1.000	0.000	0.000	27,026.750
*	L0		BOM FOR ACW OUTSIDE TG R/L		NU							00	1.000	0.000	0.000	4,381.971
*	J8		BOM FOR PRETREATED PH-RL		NU							00	1.000	0.000	0.000	15,828.132
*	H2		BOM FOR BLOWDOWND SYSTEM-R/L		NU							00	1.000	0.000	0.000	25,006.180
*	G8		NB1400 MB & PUDDLE FLANGE INTAKE & ETP		NU							00	1.000	0.000	0.000	6,918.630
*	92		NB700 PIPING FOR INTAKE WATER SYS		NU							00	1.000	0.000	0.000	70,548.958
*	66		NB900 PIPING FOR PRE TREATED PH SYSTEM		NU							00	1.000	0.000	0.000	25,633.580
*	58		NB900 PIPING FOR INTAKE WATER SYSTEM		NU							00	1.000	0.000	0.000	7,692.733
*	51		BALANCE PIPE FOR 0-80-468-07350		NU							00	1.000	0.000	0.000	60,349.896
*	50		BALANCE PIPE FOR 0-80-468-07349		NU							00	1.000	0.000	0.000	32,261.411
*	49		BALANCE PIPE FOR 0-80-468-07348		NU							00	1.000	0.000	0.000	22,610.669
*	48		BALANCE PIPE FOR 0-80-468-07347		NU							00	1.000	0.000	0.000	22,757.920
*	47		BALANCE FITTING BY SPLITTING P1&P2		NU							00	1.000	0.000	0.000	6,037.776
*	46		PIPES FOR PRIORITY 2 0-80-468-07349		NU							00	1.000	0.000	0.000	654.298
*	45		PIPES FOR PRIORITY 2 0-80-468-07348		NU							00	1.000	0.000	0.000	26,956.867
*	44		PIPES FOR PRIORITY 2 0-80-468-07347		NU							00	1.000	0.000	0.000	16,295.578
*	43		FITTINGS FOR PRIORITY 2		NU							00	1.000	0.000	0.000	77,301.816
*	42		DUS FOR PRIORITY-01 CW S-1 & R-1		NU							00	1.000	0.000	0.000	32,369.990
*	23		TEES FOR CW PIPING		NU							00	1.000	0.000	0.000	1,70,613.288
*	22		P.F.PIPES FOR CW DRG NO-0-80-468-07350		NU							00	1.000	0.000	0.000	28,508.079
*	21		P.F.PIPES FOR CW DRG NO-0-80-468-07349		NU							00	1.000	0.000	0.000	30,181.837
*	20		P.F.PIPES FOR CW DRG NO-0-80-468-07348		NU							00	1.000	0.000	0.000	59,705.844
*	19		P.F.PIPES FOR CW DRG NO-0-80-468-07347		NU							00	1.000	0.000	0.000	69,400.642
*	15		RUBBER LINING PIPES FOR OUTSIDE TG		NU							00	1.000	0.000	0.000	3,92,402.436
*	02		PU COATED MITRE BENDS FOR CW PIPING		NU							00	1.000	0.000	0.000	94,402.006
*	01		PU COATED PIPES FOR CW PIPING		NU	NO						00	1.000	0.000	0.000	22,36,688.080
001	01	01	PIPE OD-3336X18-A134-A283GRD-UG-PU COAT		NU	M	PIPE OD-3336X18X10000-A134-A283GRD	A134-A283GRD	C		159389990001	00	800.000	0.000	0.000	11,77,000.000
002	01	02	PIPE OD-2632X16-A134-A283GRD-UG-PU COAT		NU	M	PIPE OD-2632X16X8000-A134-A283GRD	A134-A283GRD	C		159389988000	00	480.000	0.000	0.000	4,95,000.000
003	01	03	PIPE OD1626X9.53-A134-A283GRD-UG-PU COAT		NU	M	PIPE OD-1626X9.53X8000-A134-A283GRD	A134-A283GRD	C		159389968000	00	130.000	0.000	0.000	49,384.400
004	01	04	PIPE OD1422X9.53-A134-A283GRD-UG-PU COAT		NU	M	PIPE OD-1422X9.53X8000-A134-A283GRD	A134-A283GRD	C		159389958000	00	1,472.000	0.000	0.000	4,88,615.680
005	01	05	PIPE OD1219X9.53-A134-A283GRD-OG-PU COAT		NU	M	PIPE OD-1219X9.53X8000-A134-A283GRD	A134-A283GRD	C		159389858000	00	72.000	0.000	0.000	20,016.000
006	01	06	PIPE OD1219X9.53-A134-A283GRD-UG-PU COAT		NU	M	PIPE OD-1219X9.53X8000-A134-A283GRD	A134-A283GRD	C		159389858000	00	24.000	0.000	0.000	6,672.000
007	02	01	MITRE BEND 90DEG OD3336X18-UG-PU COATING	3-80-468-34513	00	NO			C			00	2.000	0.000	0.000	11,716.232
007	03	01	P.F.PIPE OD3336X18 L-4032 SA515GR60	2-80-468-15562	02	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	2.000	10,422.000	4,032.000	11,716.232
008	02	02	MITRE BEND 45DEG OD3336X18-UG-PU COATING	3-80-468-34512	00	NO			C			00	6.000	0.000	0.000	18,113.328
008	04	01	P.F.PIPE OD3336X18 L-2068 SA515GR60	2-80-468-15562	03	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	6.000	10,422.000	2,068.000	18,113.328
009	02	03	MITRE BEND 30DEG NB3300-UG-PU COATING	3-80-468-34511	00	NO			C	410180157		01	4.000	0.000	0.000	8,672.860
009	05	01	P.F.PIPE OD3336X20 L-1344 SA515GR70	2-80-468-15562	04	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C	410180157	159421130000	02	4.000	10,415.000	1,344.000	8,672.860
010	02	04	MITRE BEND 90DEG OD2632X16-UG-PU COATING	3-80-468-34516	00	NO			C			00	1.000	0.000	0.000	3,235.490
010	06	01	P.F.PIPE OD2632X16 L-3183 SA515GR60	3-80-468-34507	01	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	3,183.000	3,235.490
011	02	05	MITREBEND 60DEG NB2600-UG-PU COATING	3-80-468-34514	00	NO			C	410180157		01	4.000	0.000	0.000	22,340.000
011	07	01	P.F.PIPE OD2632X20 L-4372 SA515GR70	3-80-468-34507	02	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C	410180157	159421130000	01	4.000	8,204.000	4,372.000	22,340.000
012	02	06	MITRE BEND 46DEG OD2632X16-UG-PU COATING	3-80-468-34518	00	NO			C			00	3.000	0.000	0.000	5,124.150
012	08	01	P.F.PIPE OD2632X16 L-1671 SA515GR60	3-80-468-34507	03	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	3.000	8,217.000	1,671.000	5,124.150
013	02	07	MITRE BEND 44DEG OD2632X16-UG-PU COATING	3-80-468-34517	00	NO			C			00	1.000	0.000	0.000	1,626.510
013	09	01	P.F.PIPE OD2632X16 L-1592 SA515GR60	3-80-468-34507	04	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	1,592.000	1,626.510
014	02	08	MITRE BEND 30DEG OD2632X16-UG-PU COATING	3-80-468-34515	00	NO			C			00	8.000	0.000	0.000	8,627.920
014	10	01	P.F.PIPE OD2632X16 L-1061 SA515GR60	3-80-468-34507	05	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	8.000	8,217.000	1,061.000	8,627.920
015	02	09	MITRE BEND 90DEG OD1626X10-UG-PU COATING	3-80-468-34520	00	NO			C			00	6.000	0.000	0.000	4,610.880
015	11	01	P.F.PIPE OD1626X10 L-1959 SA515GR60	3-80-468-34509	01	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	6.000	5,075.000	1,959.000	4,610.880
016	02	10	MITRE BEND 45DEG OD1626X10-UG-PU COATING	3-80-468-34521	00	NO			C			00	4.000	0.000	0.000	1,583.960
016	12	01	P.F.PIPE OD1626X10 L-1004 SA515GR60	3-80-468-34509	02	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	4.000	5,075.000	1,004.000	1,583.960
017	02	11	MITRE BEND 90DEG OD1219X10-UG-PU COATING	3-80-468-34523	00	NO			C			00	4.000	0.000	0.000	1,714.840
017	13	01	P.F.PIPE OD1219X10 L-1479 SA515GR60	3-80-468-34510	01	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	01	4.000	3,796.000	1,479.000	1,714.840
018	02	12	MITRE BEND 45DEG OD1219X10-UG-PU COATING	3-80-468-34522	00	NO			C			00	4.000	0.000	0.000	887.996
018	14	01	P.F.PIPE OD1219X10 L-755 SA515GR60	3-80-468-34510	02	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	01	4.000	3,796.000	755.000	887.996
019	02	13	MITRE BEND 90DEG OD1626X10-OG-PU COATING	3-80-468-34520	00	NO			C			00	8.000	0.000	0.000	6,147.840
019	11	01	P.F.PIPE OD1626X10 L-1959 SA515GR60	3-80-468-34509	01	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	8.000	5,075.000	1,959.000	6,147.840
020	15	01	FL.PIPE NB900 WITH SADDLE (R/L) L-6M-O.G	2-80-468-15580	NU	NO			C	410183482		01	36.000	0.000	0.000	60,273.936
020	16	01	PIPE OD-914X9.53X5970-A134-A283GRD	2-80-468-15580	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410177244	159389888000	01	36.000	5,970.000	0.000	45,681.264
020	16	02	F.F.FLANGE NB900 SA515GR70	2-80-468-15580	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410177244	159421180000	01	72.000	1,168.000	1,168.000	8,651.664
020	16	03	BOTTOM PLATE 20X300X900 IS2062	2-80-468-15580	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410177244	150111500000	01	36.000	300.000	900.000	1,526.040
020	16	04	PAD PLATE 10X600X1042 IS2062	2-80-468-15580	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410177244	152110980000	01	36.000	600.000	1,042.000	1,766.268
020	16	05	MIDDLE PLATE 16X490X800 IS2062	2-80-468-15580	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410177244	150110260000	01	36.000	490.000	800.000	1,772.460
020	16	06	STIFFNER PL-1 10X120X372 IS2062	2-80-468-15580	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410177244	152110980000	01	144.000	120.000	372.000	504.576
020	16	07	STIFFNER PL-2 10X120X274 IS2062	2-80-468-15580	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410177244	152110980000	01	144.000	120.000	274.000	371.664
021	15	02	PIPE OD711X9.53 L-6MWITH FL (R/L)-O.G	2-80-468-15581	NU	NO			C	410183482		01	115.000	0.000	0.000	1,28,261.570
021	17	01	PIPE OD-711X9.53X5970-A134-A283GRD	2-80-468-15581	NU	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410177244	159389906000	01	115.000	5,970.000	0.000	1,13,177.710
021	17	02	F.F.FLANGE NB700 SA515GR70	2-80-468-15581	NU	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410177244	159421160000	01	230.000	928.000	928.000	15,083.860
022	15	03	PIPE OD610X9.53 L-6MWITH FL (R/L)-O.G	2-80-468-15584	NU	NO			C	410184091		02	80.000	0.000	0.000	75,605.360
022	18	01	PIPE OD-610X9.53X5970-A134-A283GRD	2-80-468-15584	NU	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410177244	159389946000	02	80.000	5,970.000	0.000	67,394.160
022	18	02	F.F.FLANGE NB600 CL-D SA515GR70	2-80-468-15584	NU	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410184091	159421160000	02	160.000	813.000	813.000	8,211.200
023	19	03	P.F.PIPE OD3336X18 L-1989- UG-PU COATED	2-80-468-15562	06	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	1,989.000	2,929.008
024	19	04	P.F.PIPE OD3336X18 L-2270- UG-PU COATED	2-80-468-15562	07	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	2,270.000	3,342.875
025	19	05	P.F.PIPE OD3336X18 L-9063- UG-PU COATED	2-80-468-15562	08	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	9,063.000	13,346.492
026	19	07	P.F.PIPE OD3336X18 L-4836- UG-PU COATED	2-80-468-15562	09	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	4,836.000	7,121.661
027	19	10	P.F.PIPE NB3300 L -1640- UG-PU COATED	2-80-468-15562	10	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C		159421130000	02	1.000	10,415.000	1,640.000	2,681.717
028	19	11	P.F.PIPE NB3300 L -2270- UG-PU COATED	2-80-468-15562	07	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C		159421130000	02	2.000	10,415.000	2,270.000	7,423.588
029	19	12	P.F.PIPE NB3300 L -9063- UG-PU COATED	2-80-468-15562	12	NO	PLATE 22.0 MM - SA515GR70	SA515GR70	C		159422620000	02	1.000	10,409.000	9,063.000	16,292.000
030	19	20	P.F.PIPE OD1219X10 L-6023- UG-PU COATED	3-80-468-34510	03	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	01	1.000	3,796.000	6,023.000	1,794.746
031	19	32	P.F.PIPE OD3336X18 L-9825- UG-PU COATED	2-80-468-15562	13	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	9,825.000	14,468.555
032	20	02	P.F.PIPE OD3336X18 L-2270- UG-PU COATED	2-80-468-15562	14	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	2,270.000	3,342.875
033	20	04	P.F.PIPE OD3336X18 L-9842- UG-PU COATED	2-80-468-15562	15	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	9,842.000	14,493.565
034	20	06	P.F.PIPE OD3336X18 L-9825- UG-PU COATED	2-80-468-15562	16	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	9,825.000	14,468.555
035	20	07	P.F.PIPE OD3336X18 L-6575- UG-PU COATED	2-80-468-15562	17	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	6,575.000	9,682.583
036	20	15	P.F.PIPE OD2632X16 L-2550- UG-PU COATED	3-80-468-34507	06	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	2,550.000	2,631.697
037	20	17	P.F.PIPE OD2632X16 L-2950- UG-PU COATED	3-80-468-34507	07	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	2,950.000	3,044.544
038	20	19	P.F.PIPE OD2632X16 L-7935- UG-PU COATED	3-80-468-34507	08	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	7,935.000	8,189.371
039	20	20	P.F.PIPE OD2632X16 L-3733- UG-PU COATED	3-80-468-34507	09	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	3,733.000	3,852.654
040	21	02	P.F.PIPE OD3336X18 L-2270- UG-PU COATED	2-80-468-15562	07	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	2,270.000	3,342.875
041	21	04	P.F.PIPE OD3336X18 L-9842- UG-PU COATED	2-80-468-15562	19	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	9,842.000	14,493.565
042	21	11	P.F.PIPE OD2632X16 L-2550- UG-PU COATED	3-80-468-34507	10	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	2,550.000	2,631.697
043	21	13	P.F.PIPE OD2632X16 L-3950- UG-PU COATED	3-80-468-34507	11	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	3,950.000	4,076.599
044	21	16	P.F.PIPE OD2632X16 L-3723- UG-PU COATED	3-80-468-34507	12	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	3,723.000	3,842.355
045	21	17	P.F.PIPE OD1219X10 L-6023- UG-PU COATED	3-80-468-34510	04	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	01	1.000	3,796.000	6,023.000	1,794.746
046	22	04	P.F.PIPE OD3336X18 L-3900- UG-PU COATED	2-80-468-15562	20	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	3,900.000	5,743.280
047	22	08	P.F.PIPE OD2332X16 L=3371- OG-PU COATED	3-80-468-34508	06	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	00	1.000	7,274.000	3,371.000	3,079.838
048	22	12	P.F.PIPE OD2332X16 L=3371- OG-PU COATED	3-80-468-34508	00	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	00	1.000	7,274.000	3,371.000	3,079.838
049	22	23	P.F.PIPE OD2332X16 L=3371- OG-PU COATED	3-80-468-34508	00	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	00	1.000	7,274.000	3,371.000	3,079.838
050	22	27	P.F.PIPE OD2332X16 L=3371- OG-PU COATED	3-80-468-34508	00	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	00	1.000	7,274.000	3,371.000	3,079.838
051	22	29	P.F.PIPE OD1626X10 L-1896- UG-PU COATED	3-80-468-34509	04	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	1.000	5,075.000	1,896.000	755.327
052	22	32	P.F.PIPE OD1626X10 L-1496- UG-PU COATED	3-80-468-34509	05	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	1.000	5,075.000	1,496.000	595.972
053	22	35	P.F.PIPE OD1626X10 L-1861- UG-PU COATED	3-80-468-34509	06	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	1.000	5,075.000	1,861.000	741.433
054	22	37	P.F.PIPE OD1626X10 L-1896- UG-PU COATED	3-80-468-34509	07	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	1.000	5,075.000	1,896.000	755.327
055	22	40	P.F.PIPE OD1626X10 L-1496- UG-PU COATED	3-80-468-34509	08	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	1.000	5,075.000	1,496.000	595.972
056	22	44	P.F.PIPE OD1626X10 L-1861- UG-PU COATED	3-80-468-34509	09	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	1.000	5,075.000	1,861.000	741.433
057	22	54	P.F.PIPE OD3336X18 L-2868- UG-PU COATED	2-80-468-15562	21	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	2,868.000	4,223.457
058	22	83	P.F.PIPE OD1626X10 L-5112- UG-PU COATED	3-80-468-34509	10	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	1.000	5,075.000	5,112.000	2,036.526
059	23	01	WELDED TEE NB3300/NB2600 L-4038/1000(UG)	3-80-468-34527	NU	NO			C	410179219		00	4.000	0.000	0.000	31,885.804
059	24	01	P.F.PIPE NB3300 L=4038 SA515GR70	2-80-468-15562	23	NO	PLATE 22.0 MM - SA515GR70	SA515GR70	C	410184555	159422620000	02	4.000	10,409.000	4,038.000	25,368.000
059	24	02	P.F.PIPE NB2600 L=1000 SA515GR70	3-80-468-34507	14	NO	PLATE 22.0 MM - SA515GR70	SA515GR70	C	410184555	159422620000	01	4.000	8,204.000	1,000.000	5,667.324
059	24	03	PAD PLATE OD3200,ID2606 T-10MM	3-80-468-34527	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410180157	159420400000	00	4.000	3,200.000	3,200.000	850.480
060	23	02	WELDED TEE NB3300/NB2600 L-4017/1000(UG)	3-80-468-34633	NU	NO			C			00	2.000	0.000	0.000	12,825.350
060	25	01	P.F.PIPE OD3336X18THK L=4017 SA515GR60	2-80-468-15562	24	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C	410180965	159420370000	02	2.000	10,422.000	4,017.000	10,336.000
060	25	02	P.F.PIPE OD2632X16THK L=1000 SA515GR60	3-80-468-34507	15	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410178710	159420380000	01	2.000	8,217.000	1,000.000	2,064.110
060	25	03	PAD PLATE OD3200,ID2606 T-10MM SA515GR60	3-80-468-34633	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	2.000	3,200.000	3,200.000	425.240
061	23	03	WELDED TEE NB3300/NB2600 L-3996/1000(UG)	3-80-468-34636	NU	NO			C			00	1.000	0.000	0.000	6,381.675
061	26	01	P.F.PIPE OD3336X18THK L=3996 SA515GR60	2-80-468-15562	25	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C	410180965	159420370000	02	1.000	10,422.000	3,996.000	5,137.000
061	26	02	P.F.PIPE OD2632X16THK L=1000 SA515GR60	3-80-468-34507	16	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410178710	159420380000	01	1.000	8,217.000	1,000.000	1,032.055
061	26	03	PAD PLATE OD3200,ID2606 T-10MM SA515GR60	3-80-468-34636	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	3,200.000	3,200.000	212.620
062	23	04	WELDED TEE NB3300/NB2600 L-5033/1000(UG)	3-80-468-34637	NU	NO			C			00	1.000	0.000	0.000	7,909.675
062	27	01	P.F.PIPE OD3336X18THK L=5033 SA515GR60	2-80-468-15562	26	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C	410180965	159420370000	02	1.000	10,422.000	5,033.000	6,665.000
062	27	02	P.F.PIPE OD2632X16THK L=1000 SA515GR60	3-80-468-34507	17	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410178710	159420380000	01	1.000	8,217.000	1,000.000	1,032.055
062	27	03	PAD PLATE OD3200,ID2606 T-10MM SA515GR60	3-80-468-34637	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	3,200.000	3,200.000	212.620
063	23	05	WELDED TEE NB3300/NB1600 L-3000/1035(UG)	3-80-468-34528	NU	NO			C			00	2.000	0.000	0.000	9,316.238
063	28	01	P.F.PIPE OD3336X18THK L=3000 SA515GR60	2-80-468-15562	28	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C	410180965	159420370000	02	2.000	10,422.000	3,000.000	8,268.000
063	28	02	P.F.PIPE OD1626X10THK L=1035 SA515GR60	3-80-468-34509	12	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410180965	159420400000	00	2.000	5,076.000	1,035.000	824.878
063	28	03	PAD PLATE OD2100,ID1612 T-10MM SA515GR60	3-80-468-34528	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	2.000	2,100.000	2,100.000	223.360
064	23	06	WELDED TEE NB3300/NB1200 L-3000/940 (UG)	3-80-468-34529	NU	NO			C			01	4.000	0.000	0.000	20,147.636
064	29	01	P.F.PIPE OD3336X18THK L=3000 SA515GR60	2-80-468-15562	29	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C	410180965	159420370000	02	4.000	10,422.000	3,000.000	17,040.800
064	29	02	P.F.PIPE OD1219X10THK L=2309 SA515GR60	3-80-468-34509	12	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410184091	159420400000	00	4.000	3,796.000	2,309.000	2,752.212
064	29	03	PAD PLATE OD1700,ID1205 T-10MM SA515GR60	3-80-468-34529	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	01	4.000	1,700.000	1,700.000	354.624
065	23	07	WELDED TEE NB3300/NB900 L-3546/1100 (UG)	3-80-468-34530	NU	NO			C			00	1.000	0.000	0.000	4,893.191

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
065	30	01	P.F.PIPE OD3336X18THK L=3546 SA515GR60	2-80-468-15562	30	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C	410180965	159420370000	02	1.000	10,422.000	3,546.000	4,474.000
065	30	02	P.F.PIPE OD914X10THK L=1100 SA515GR60	3-80-468-34530	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	2,831.000	1,100.000	244.449
065	30	03	PAD PLATE OD1300,ID897 T-10MM SA515GR60	3-80-468-34530	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	1,300.000	1,300.000	54.580
065	30	04	FLANGE NB900 CLD	4-80-468-82668	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410180965	159421180000	00	1.000	1,168.000	1,168.000	120.162
066	23	08	WELDED TEE NB3300/NB900 L-4562/1100 (UG)	3-80-468-34638	NU	NO			C			00	1.000	0.000	0.000	7,050.866
066	31	01	P.F.PIPE OD3336X18THK L=4562 SA515GR60	3-80-468-15562	31	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C	410180965	159420370000	01	1.000	10,422.000	4,562.000	6,632.000
066	31	02	P.F.PIPE OD914X10THK L=1100 SA515GR60	3-80-468-34638	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	2,831.000	1,100.000	244.449
066	31	03	PAD PLATE OD1300,ID900 T-10MM SA515GR60	3-80-468-34638	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	1,300.000	1,300.000	54.255
066	31	04	FLANGE NB900 CLD	4-80-468-82668	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410180965	159421180000	00	1.000	1,168.000	1,168.000	120.162
067	23	09	WELDED TEE NB3300/NB900 L-3000/1100 (UG)	3-80-468-34639	NU	NO			C			00	1.000	0.000	0.000	4,749.866
067	32	01	P.F.PIPE OD3336X18THK L=3000 SA515GR60	2-80-468-15562	32	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C	410180965	159420370000	02	1.000	10,422.000	3,000.000	4,331.000
067	32	02	P.F.PIPE OD914X10THK L=1100 SA515GR60	3-80-468-34639	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	2,831.000	1,100.000	244.449
067	32	03	PAD PLATE OD1300,ID900 T-10MM SA515GR60	3-80-468-34639	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	1,300.000	1,300.000	54.255
067	32	04	FLANGE NB900 CLD	4-80-468-82668	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410180965	159421180000	00	1.000	1,168.000	1,168.000	120.162
068	23	10	WELDED TEE NB3300/NB900 L-3288/1100 (UG)	3-80-468-34640	NU	NO			C			00	1.000	0.000	0.000	5,171.866
068	33	01	P.F.PIPE OD3336X18THK L=3288 SA515GR60	2-80-468-15562	32	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C	410183444	159420370000	02	1.000	10,422.000	3,288.000	4,753.000
068	33	02	P.F.PIPE OD914X10THK L=1100 SA515GR60	3-80-468-34640	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410183444	159420400000	00	1.000	2,831.000	1,100.000	244.449
068	33	03	PAD PLATE OD1300,ID900 T-10MM SA515GR60	3-80-468-34640	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410183444	159420400000	00	1.000	1,300.000	1,300.000	54.255
068	33	04	FLANGE NB900 CLD	4-80-468-82668	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410183444	159421180000	00	1.000	1,168.000	1,168.000	120.162
069	23	11	PIPE NB3300 WITH MANHOLE L-2000 (UG)	2-80-468-15620	NU	NO			C	410184598		02	2.000	0.000	0.000	6,657.708
069	34	01	P.F.PIPE NB3300 L=2000 SA515GR70	2-80-468-15562	22	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C	410184598	159421130000	02	2.000	10,415.000	2,000.000	6,450.000
069	34	02	P.F.PIPE OD610X10THKL=250	2-80-468-15620	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410184598	159420400000	02	2.000	1,885.000	250.000	73.948
069	34	03	PAD PLATE OD1200,ID596 T-10MM	2-80-468-15620	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410180157	159420400000	02	2.000	1,200.000	1,200.000	133.760
070	23	12	PIPE NB2600 WITH MANHOLE L-4000 (UG)	2-80-468-15623	NU	NO			C			00	1.000	0.000	0.000	4,996.071
070	35	01	P.F.PIPE OD2632X16THK L=4000 SA515GR60	3-80-468-34507	13	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410180965	159420380000	01	1.000	8,217.000	4,000.000	4,096.000
070	35	02	P.F.PIPE OD610X10THKL=3704 SA515GR60	2-80-468-15623	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	1,885.000	3,704.000	548.087
070	35	03	PAD PLATE OD1000,ID596 T-10MM SA515GR60	2-80-468-15623	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	1,000.000	1,000.000	39.750
070	35	04	FLAT FACE FLANGE NB600	3-80-468-34666	02	NO	PLATE 50.0 MM - SA515GR70	SA515GR70	C	410178710	159421190000	00	1.000	10.000	10.000	78.100
070	35	05	BLANK FLANGE NB600 WITH STUB NB200	3-80-468-34534	00	NO			C	410178710		00	1.000	10.000	10.000	205.724
070	36	01	BLANK FLANGE NB600 PL;T-50;SA515GR70	3-80-468-34534	00	NO	PLATE 50.0 MM - SA515GR70	SA515GR70	C	410178710	159421190000	00	1.000	10.000	10.000	183.100
070	36	02	PIPE DIA 219.1 X 6.35 X 242 - SA106GRB	3-80-468-34534	00	NO	PIPE DIA 219.1 X 6.35 X 6500 - SA106GRB	SA106GRB	C	410178710	150822916500	00	1.000	242.000	0.000	8.124
070	36	03	FLANGE NB200, CL150- SA515GR70	3-80-468-34534	00	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410178710	159421990000	00	1.000	10.000	10.000	11.500
070	36	04	HANDLE; ROD DIA 32X480	3-80-468-34534	00	NO	DIA 32mm-SA105	SA105	C	410178710	153391400000	00	1.000	480.000	0.000	3.000
070	35	06	HINJE PLATE(OUTER)370X240X12THK	2-80-468-15623	NU	NO	PLATE-12X2500X5000-SA515GR60	SA515GR60	C	410178710	159420390000	00	2.000	370.000	240.000	10.000
070	35	07	HINJE PLATE(INNER)473X140X12THK	2-80-468-15623	NU	NO	PLATE-12X2500X5000-SA515GR60	SA515GR60	C	410178710	159420390000	00	2.000	473.000	140.000	10.000
070	35	08	STUD M24X340 LONG	4-80-468-63081	NU	NO	DIA 25mm-SA105	SA105	C	410180965	153391390000	00	1.000	340.000	0.000	1.000
070	35	09	PUNCHED WASHER A24	2-80-468-15623	NU	NO	PUN WASHER-M24 -IS2016-A	IS-2016	C	410180965	414080002400	00	2.000	0.000	0.000	0.060
070	35	10	HEX NUT M24	2-80-468-15623	NU	NO	HEX NUT M24-10 IS:1364(P-3)/LATEST	IS:1364(P-3)	C	410180965	413220002400	00	2.000	0.000	0.000	0.220
070	35	11	SPLIT PIN DIA 4X45	2-80-468-15623	NU	NO	SPLIT PIN 4X45MM IS:549	IS:549	C	410180965	417044004500	00	2.000	0.000	0.000	0.010
070	35	12	HEX BOLT M33X140	2-80-468-15623	NU	NO	HEX BOLT M33X3.5X140 PCL 6.8 GR A STEEL	STEEL	C	410180965	412153314000	00	4.000	0.000	0.000	5.000
070	35	13	HEX NUT M33	2-80-468-15623	NU	NO	NUT -M33x3.5 -CL4-IS1363P3	IS-1363(P-3)	C	410180965	413040003300	00	4.000	0.000	0.000	1.120
070	35	14	NON ASBESTOS SHEET OD780XID617X3THK	2-80-468-15623	NU	NO	NON-ASBESTOS JOINTING SHEET 3.0MM	NON-ASBESTOS	C	410180965	220210300000	00	1.000	780.000	780.000	1.000
071	23	13	PIPE NB1600 WITH MANHOLE L-1800 (OG)	2-80-468-15624	NU	NO			C			00	2.000	0.000	0.000	1,758.264
071	37	01	P.F.PIPE OD1626X10THK L=1800 SA515GR60	3-80-468-34509	11	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410180965	159420400000	00	2.000	5,075.000	1,800.000	953.666
071	37	02	P.F.PIPE OD610X10THK L=479 SA515GR60	2-80-468-15624	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	2.000	1,885.000	479.000	141.772
071	37	03	PAD PLATE OD900,ID596 T-10MM SA515GR60	2-80-468-15624	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	2.000	900.000	900.000	56.078
071	37	04	FLAT FACE FLANGE NB600	3-80-468-34666	02	NO	PLATE 50.0 MM - SA515GR70	SA515GR70	C	410178710	159421190000	00	2.000	10.000	10.000	156.200
071	37	05	BLANK FL. OD610X10 WITH STUB150NB	3-80-468-34688	00	NO			C	410178710		00	2.000	10.000	10.000	401.328
071	38	01	BLANK FLANGE NB600 PL;T=50;DIA 815	3-80-468-34688	00	NO	PLATE 50.0 MM - SA515GR70	SA515GR70	C	410178710	159421190000	00	2.000	10.000	10.000	366.200
071	38	02	PIPE DIA 168.3 X 7.11 L=242	3-80-468-34688	00	NO	PIPE DIA 168.3 X 7.11 SA106GRB	SA106GRB	C	410178710	150824110000	00	2.000	242.000	0.000	13.678
071	38	03	FLANGE NB 150 CL150	3-80-468-34666	03	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410178710	159421990000	00	2.000	10.000	10.000	15.450
071	38	04	HANDLE , ROD DIA 32 X480	3-80-468-34688	00	NO	DIA 32mm-SA105	SA105	C	410178710	153391400000	00	2.000	480.000	0.000	6.000
071	37	06	HINJE PLATE(OUTER)370X240X12THK	2-80-468-15624	NU	NO	PLATE-12X2500X5000-SA515GR60	SA515GR60	C	410178710	159420390000	00	4.000	370.000	240.000	20.000
071	37	07	HINJE PLATE(INNER)473X140X12THK	2-80-468-15624	NU	NO	PLATE-12X2500X5000-SA515GR60	SA515GR60	C	410178710	159420390000	00	4.000	473.000	140.000	12.400
071	37	08	STUD M24X340 LONG	4-80-468-63081	NU	NO	DIA 25mm-SA105	SA105	C	410180965	153391390000	00	2.000	340.000	0.000	2.000
071	37	09	PUNCHED WASHER A24	2-80-468-15624	NU	NO	PUN WASHER-M24 -IS2016-A	IS-2016	C	410180965	414080002400	00	4.000	0.000	0.000	0.120
071	37	10	HEX NUT M24	2-80-468-15624	NU	NO	HEX NUT M24-10 IS:1364(P-3)/LATEST	IS:1364(P-3)	C	410180965	413220002400	00	4.000	0.000	0.000	0.440
071	37	11	SPLIT PIN DIA 4X45	2-80-468-15624	NU	NO	SPLIT PIN 4X45MM IS:549	IS:549	C	410180965	417044004500	00	4.000	0.000	0.000	0.020
071	37	12	HEX BOLT M33X140	2-80-468-15624	NU	NO	HEX BOLT M33X3.5X140 PCL 6.8 GR A STEEL	STEEL	C	410180965	412153314000	00	8.000	0.000	0.000	10.000
071	37	13	HEX NUT M33	2-80-468-15624	NU	NO	NUT -M33x3.5 -CL4-IS1363P3	IS-1363(P-3)	C	410180965	413040003300	00	8.000	0.000	0.000	2.240
071	37	14	NON ASBESTOS SHEET OD780XID617X3THK	2-80-468-15624	NU	NO	NON-ASBESTOS JOINTING SHEET 3.0MM	NON-ASBESTOS	C	410180965	220210300000	00	2.000	780.000	780.000	2.000
072	23	14	WELDED TEE NB3300/NB2300 L-4000 (UG)	3-80-468-34531	NU	NO			C			00	6.000	0.000	0.000	38,862.108
072	39	01	P.F.PIPE OD3336X18THK L=4000 SA515GR60	3-80-468-34531	NU	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C	410180965	159420370000	00	6.000	10,422.000	4,000.000	30,858.000
072	39	02	P.F.PIPE OD2332X16THK L=1290 SA515GR60	3-80-468-34508	01	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410178710	159420380000	00	6.000	7,274.000	1,290.000	7,071.030
072	39	03	PAD PLATE OD2800 ID2306	3-80-468-34531	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	6.000	2,800.000	2,800.000	933.078
073	23	16	PIPE NB2300 WITH MANHOLE (OG)	2-80-468-15622	NU	NO			C			00	3.000	0.000	0.000	3,797.823
073	40	01	P.F.PIPE OD2332X16THK L=971 SA515GR60	3-80-468-34508	03	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410180965	159420380000	00	3.000	7,274.000	971.000	2,559.750
073	40	02	P.F.PIPE OD610X10THK L=513 SA515GR60	2-80-468-15622	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	3.000	1,885.000	513.000	227.727
073	40	03	PAD PLATE OD900 ID596 T-10MM	2-80-468-15622	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	3.000	900.000	900.000	84.117
073	40	04	FLAT FACE FLANGE NB600 SA515GR70	3-80-468-34666	02	NO	PLATE 50.0 MM - SA515GR70	SA515GR70	C	410178710	159421190000	00	3.000	10.000	10.000	234.300
073	40	05	BLANK FLANGE NB600 PL;T=50;DIA 815	3-80-468-34534	00	NO				410178710		00	3.000	0.000	0.000	617.172
073	36	01	BLANK FLANGE NB600 PL;T-50;SA515GR70	3-80-468-34534	00	NO	PLATE 50.0 MM - SA515GR70	SA515GR70	C	410178710	159421190000	00	3.000	10.000	10.000	549.300
073	36	02	PIPE DIA 219.1 X 6.35 X 242 - SA106GRB	3-80-468-34534	00	NO	PIPE DIA 219.1 X 6.35 X 6500 - SA106GRB	SA106GRB	C	410178710	150822916500	00	3.000	242.000	0.000	24.372
073	36	03	FLANGE NB200, CL150- SA515GR70	3-80-468-34534	00	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410178710	159421990000	00	3.000	10.000	10.000	34.500
073	36	04	HANDLE; ROD DIA 32X480	3-80-468-34534	00	NO	DIA 32mm-SA105	SA105	C	410178710	153391400000	00	3.000	480.000	0.000	9.000
073	40	06	HINGE PL. (OUTER) 370X240X12THK	2-80-468-15622	NU	NO	PLATE-12X2500X5000-SA515GR60	SA515GR60	C	410178710	159420390000	00	6.000	370.000	240.000	30.000
073	40	07	HINGE PL. (INNER) 370X240X12THK SA515GR6	2-80-468-15622	NU	NO	PLATE-12X2500X5000-SA515GR60	SA515GR60	C	410178710	159420390000	00	6.000	473.000	140.000	18.600
073	40	08	STUD M24X340 LONG	2-80-468-15622	NU	NO	DIA 25mm-SA105	SA105	C	410180965	153391390000	00	3.000	340.000	0.000	3.927
073	40	09	PUNCHED WASHER A24	2-80-468-15622	NU	NO	PUN WASHER-M24 -IS2016-A	IS-2016	C	410180965	414080002400	00	6.000	0.000	0.000	0.180
073	40	10	HEX NUT M24	2-80-468-15622	NU	NO	HEX NUT M24-10 IS:1364(P-3)/LATEST	IS:1364(P-3)	C	410180965	413220002400	00	6.000	0.000	0.000	0.660
073	40	11	SPLIT PIN DIA4X45	2-80-468-15622	NU	NO	SPLIT PIN 4X45MM IS:549	IS:549	C	410180965	417044004500	00	6.000	0.000	0.000	0.030
073	40	12	HEX BOLT M33X140	2-80-468-15622	NU	NO	HEX BOLT M33X3.5X140 PCL 6.8 GR A STEEL	STEEL	C	410180965	412153314000	00	12.000	0.000	0.000	15.000
073	40	13	HEX NUT M33	2-80-468-15622	NU	NO	NUT -M33x3.5 -CL4-IS1363P3	IS-1363(P-3)	C	410180965	413040003300	00	12.000	0.000	0.000	3.360
073	40	16	NON ASBESTOS OD780XID617X3THK	2-80-468-15622	NU	NO	NON-ASBESTOS JOINTING SHEET 3.0MM	NON-ASBESTOS	C	410180965	220210300000	00	3.000	780.000	780.000	3.000
074	23	17	WELDED EQT NB 2300 L-3000 (UG)	3-80-468-34532	NU	NO			C			01	1.000	0.000	0.000	4,209.147
074	41	01	P.F.PIPE OD2332X16THK L=3000 SA515GR60	3-80-468-34508	05	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410180965	159420380000	00	1.000	7,274.000	3,000.000	2,220.000
074	41	02	P.F.PIPE OD2332X16THK L=2007 SA515GR60	3-80-468-34508	04	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410184091	159420380000	00	1.000	7,274.000	2,007.000	1,833.634
074	41	03	PAD PLATE OD2800 ID2306 T-10MM SA515GR60	3-80-468-34532	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	01	1.000	2,800.000	2,800.000	155.513
075	42	31	TORI SPH DISHED END-NB3300-UG-PU COATING	4-80-468-82499	00	NO	PLATE 22.0 MM - SA515GR70	SA515GR70	C		159422620000	01	2.000	10.000	10.000	4,580.000
076	42	34	P.F.PIPE OD2632X16 L-6980-OG-PU COAT-TG1	3-80-468-34507	19	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	2.000	10.000	10.000	15,605.480
077	42	45	P.F.PIPE OD2632X16 L-2750-OG-PU COAT-TG1	3-80-468-34507	18	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	2.000	10.000	10.000	5,680.000
078	42	46	P.F.PIPE NB3300 L-1989-UG-PU COATING	2-80-468-15562	35	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C		159421130000	02	2.000	10,415.000	1,989.000	6,504.510
079	43	01	PIPE WITH MANHOLE NB3300 L-2000-UG-PU CO	2-80-468-15620	NU	NO				410179030		02	4.000	0.000	0.000	13,315.416
079	34	01	P.F.PIPE NB3300 L=2000 SA515GR70	2-80-468-15562	22	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C	410184598	159421130000	02	4.000	10,415.000	2,000.000	12,900.000
079	34	02	P.F.PIPE OD610X10THKL=250	2-80-468-15620	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410184598	159420400000	02	4.000	1,885.000	250.000	147.896
079	34	03	PAD PLATE OD1200,ID596 T-10MM	2-80-468-15620	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410180157	159420400000	02	4.000	1,200.000	1,200.000	267.520
080	43	02	MITRE BEND 30DEG OD3336X18-UG-PG COATING	3-80-468-34511	00	NO				410179030		01	4.000	0.000	0.000	8,672.860
080	05	01	P.F.PIPE OD3336X20 L-1344 SA515GR70	2-80-468-15562	04	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C	410180157	159421130000	02	4.000	10,415.000	1,344.000	8,672.860
081	43	03	WELDED TEE NB3300/NB2600 L-4038/1000(UG)	3-80-468-34527	NU	NO				410179030		00	3.000	0.000	0.000	23,914.353
081	24	01	P.F.PIPE NB3300 L=4038 SA515GR70	2-80-468-15562	23	NO	PLATE 22.0 MM - SA515GR70	SA515GR70	C	410184555	159422620000	02	3.000	10,409.000	4,038.000	19,026.000
081	24	02	P.F.PIPE NB2600 L=1000 SA515GR70	3-80-468-34507	14	NO	PLATE 22.0 MM - SA515GR70	SA515GR70	C	410184555	159422620000	01	3.000	8,204.000	1,000.000	4,250.493
081	24	03	PAD PLATE OD3200,ID2606 T-10MM	3-80-468-34527	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410180157	159420400000	00	3.000	3,200.000	3,200.000	637.860
082	43	04	WELDED TEE NB3300/NB2600 L-4017/1000(UG)	3-80-468-34636	NU	NO				410179030		00	1.000	0.000	0.000	6,381.675
082	26	01	P.F.PIPE OD3336X18THK L=3996 SA515GR60	2-80-468-15562	25	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C	410180965	159420370000	02	1.000	10,422.000	3,996.000	5,137.000
082	26	02	P.F.PIPE OD2632X16THK L=1000 SA515GR60	3-80-468-34507	16	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410178710	159420380000	01	1.000	8,217.000	1,000.000	1,032.055
082	26	03	PAD PLATE OD3200,ID2606 T-10MM SA515GR60	3-80-468-34636	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	3,200.000	3,200.000	212.620
083	43	05	MITRE BEND 60DEG OD2632X16-UG-PU COATING	3-80-468-34516	00	NO				410179030		00	4.000	0.000	0.000	12,941.960
083	06	01	P.F.PIPE OD2632X16 L-3183 SA515GR60	3-80-468-34507	01	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	4.000	8,217.000	3,183.000	12,941.960
085	43	07	MITRE BEND 45DEG OD3336X18-UG-PU COATING	3-80-468-34512	00	NO				410179030		00	4.000	0.000	0.000	12,075.552
085	04	01	P.F.PIPE OD3336X18 L-2068 SA515GR60	2-80-468-15562	03	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	4.000	10,422.000	2,068.000	12,075.552
086	44	08	P.F.PIPE OD3336X18 L-1038-UG-PU COATING	2-80-468-15562	37	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	1,038.000	1,528.583
087	44	09	P.F.PIPE OD3336X16 L-1640-UG-PU COATING	2-80-468-15562	11	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	1,640.000	2,415.100
088	44	19	P.F.PIPE OD1219X10 L-996 -OG-PU COATING	3-80-468-34510	07	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	01	1.000	3,796.000	996.000	296.809
089	44	21	P.F.PIPE OD1219X10 L-996 -OG-PU COATING	3-80-468-34510	07	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	01	1.000	3,796.000	996.000	296.809
090	44	30	P.F.REDUCER NB1200/NB800 -OG-PU COATING	4-80-468-82511	00	NO	PLATE 10.0 MM - SA515GR70	SA515GR70	C		159421090000	00	1.000	3,450.000	1,320.000	357.489
091	44	31	TORI SPH DISHED END-NB3300-UG-PU COATING	4-80-468-82499	00	NO	PLATE 22.0 MM - SA515GR70	SA515GR70	C		159422620000	01	1.000	4,200.000	4,200.000	2,290.000
092	44	36	P.F.REDUCER NB1200/NB800 -OG-PU COATING	4-80-468-82511	00	NO	PLATE 10.0 MM - SA515GR70	SA515GR70	C		159421090000	00	1.000	3,450.000	1,320.000	357.489
093	45	03	P.F.PIPE OD3336X18 L-1989-UG-PU COATING	2-80-468-15562	06	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	1,989.000	2,929.008
094	45	05	P.F.PIPE OD3336X18 L-1098-UG-PU COATING	2-80-468-15562	35	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	1,098.000	1,616.896
095	45	08	P.F.PIPE OD3336X18 L-2986-UG-PU COATING	2-80-468-15562	36	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	2,986.000	4,397.256
096	45	22	P.F.PIPE OD1219X10 L-2221-UG-PU COATING	3-80-468-34510	06	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	01	1.000	3,796.000	2,221.000	661.833
097	45	23	P.F.PIPE OD1219X10 L-996-OG-PU COATING	3-80-468-34510	07	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	01	1.000	3,796.000	996.000	296.809
098	45	39	P.F.REDUCER NB1200/NB800-OG-PU COATING	4-80-468-82511	00	NO	PLATE 10.0 MM - SA515GR70	SA515GR70	C		159421090000	00	1.000	3,450.000	1,320.000	357.489
099	45	40	TORI SPH DISHED END NB3300-UG-PU COATING	4-80-468-82499	00	NO	PLATE 22.0 MM - SA515GR70	SA515GR70	C		159422620000	01	1.000	4,200.000	4,200.000	2,290.000
100	46	18	P.F.PIPE OD1219X10 L-996 -UG-PU COATING	3-80-468-34510	07	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	01	1.000	3,796.000	996.000	296.809
101	46	36	P.F.REDUCER NB1200/NB800-OG-PU COATING	4-80-468-82511	00	NO	PLATE 10.0 MM - SA515GR70	SA515GR70	C		159421090000	00	1.000	3,450.000	1,320.000	357.489
102	47	01	MITRE BEND 45DEG OD3336X18-UG-PU COATING	3-80-468-34512	00	NO				410179030		00	2.000	0.000	0.000	6,037.776
102	04	01	P.F.PIPE OD3336X18 L-2068 SA515GR60	2-80-468-15562	03	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	2.000	10,422.000	2,068.000	6,037.776
103	44	02	P.F.PIPE OD3336X18 L-1640-UG-PU COATING	2-80-468-15562	11	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	1,640.000	2,415.100
104	44	15	P.F.PIPE OD2632X16 L-2750-UG-PU COATING	3-80-468-34507	18	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	2,750.000	2,838.183
105	44	16	P.F.PIPE OD2632X16 L-2750-UG-PU COATING	3-80-468-34507	18	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	2,750.000	2,838.183
106	44	18	P.F.PIPE OD1219X10 L-2221-UG-PU COATING	3-80-468-34510	06	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	01	1.000	3,796.000	2,221.000	661.833
107	45	12	P.F.PIPE OD2632X16 L-6980-OG-PU COATING	3-80-468-34507	19	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	6,980.000	7,203.788
108	45	13	P.F.PIPE OD2632X16 L-6980-OG-PU COATING	3-80-468-34507	19	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	6,980.000	7,203.788
109	48	06	P.F.PIPE OD3336X18 L-6745-UG-PU COATED	2-80-468-15562	39	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	6,745.000	9,932.825
110	48	33	P.F.PIPE OD3336X18 L-8709-UG-PU COATED	2-80-468-15562	40	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	8,709.000	12,825.095

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
111	49	09	P.F.PIPE OD3336X18 L-1226-UG-PU COATED	2-80-468-15562	00	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	1,226.000	1,805.390
112	49	10	P.F.PIPE OD3336X18 L-3964-UG-PU COATED	2-80-468-15562	00	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	3,964.000	5,837.527
113	49	14	P.F.PIPE OD2632X16 L-2145-UG-PU COATED	3-80-468-34507	00	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	2,145.000	2,213.700
114	49	16	P.F.PIPE OD2632X16 L-4452-UG-PU COATED	3-80-468-34507	00	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	4,452.000	4,594.699
115	49	18	P.F.PIPE OD2632X16 L-3942-UG-PU COATED	3-80-468-34507	00	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	3,942.000	4,068.310
116	49	41	P.F.PIPE OD2632X16 L-3964-UG-PU COATED	3-80-468-34507	00	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	3,964.000	4,091.043
117	50	05	P.F.PIPE OF3336X18 L-3496 (UG)-PU COATED	2-80-468-15562	43	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	3,496.000	5,148.266
118	50	06	P.F.PIPE OD3336X18 L-2278 (UG)-PU COATED	2-80-468-15562	44	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	02	1.000	10,422.000	2,278.000	3,354.603
119	50	10	P.F.PIPE OD2632X16 L-5082 (UG)-PU COATED	3-80-468-34507	22	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	5,082.000	5,244.930
120	50	12	P.F.PIPE OD2632X16 L-4452 (UG)-PU COATED	3-80-468-34507	23	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	4,452.000	4,594.699
121	50	14	P.F.PIPE OD2632X16 L-3193 (UG)-PU COATED	3-80-468-34507	24	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	3,193.000	3,295.367
122	50	15	P.F.PIPE OD2632X16 L-4509 (UG)-PU COATED	3-80-468-34507	25	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C		159420380000	01	1.000	8,217.000	4,509.000	4,653.480
123	50	21	90DEG MITRE BEND NB3300 L=2513 UG-PU	3-80-468-34747	NU	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	00	1.000	10,422.000	4,108.000	5,970.066
124	51	01	P.F.PIPE NB3300 L=2296 WITH STUB (UG) PU	3-80-468-34830	NU	NO			C			00	1.000	10.000	0.000	4,145.283
124	52	01	P.F.PIPE OD3336X22THK L=2296	2-80-468-15562	46	NO	PLATE 22.0 MM - SA515GR70	SA515GR70	C	410183194	159422620000	02	1.000	10,415.000	2,296.000	4,125.000
124	52	02	PIPE OD-219.1X5.56 L=300	3-80-468-34830	NU	NO	PIPE OD-219.1X5.56X6000-A53-GRB	A53-GRB	C	410181523	159389776000	00	1.000	300.000	0.000	8.783
124	52	03	F.F.FLANGE NB200	3-80-468-34835	05	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410181523	159421990000	00	1.000	345.000	345.000	11.500
125	51	02	P.F.PIPE NB3300 L=2296 WITH STUB (UG) PU	3-80-468-34831	NU	NO			C			00	1.000	10.000	0.000	4,134.273
125	53	01	P.F.PIPE OD3336X22THK L=2296	2-80-468-15562	46	NO	PLATE 22.0 MM - SA515GR70	SA515GR70	C	410183194	159422620000	02	1.000	10,415.000	2,296.000	4,125.000
125	53	02	PIPE OD-114.3X4.78 L=300	3-80-468-34831	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410181523	159389756000	00	1.000	300.000	0.000	3.873
125	53	03	F.F.FLANGE NB100	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410181523	159421140000	00	1.000	230.000	230.000	5.400
126	51	03	P.F.PIPE NB3300 L=9220 WITH STUB (UG) PU	3-80-468-34829	NU	NO			C			00	1.000	10.000	0.000	16,646.489
126	54	01	P.F.PIPE OD3336X22THK L=9220	2-80-468-15562	47	NO	PLATE 22.0 MM - SA515GR70	SA515GR70	C	410183194	159422620000	02	1.000	10,415.000	9,220.000	16,550.690
126	54	02	PIPE OD-114.3X4.78 L=300	3-80-468-34829	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410181523	159389756000	00	3.000	300.000	0.000	11.619
126	54	03	F.F.FLANGE NB100	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410181523	159421140000	00	3.000	230.000	230.000	16.200
126	54	04	PIPE OD-406.4X9.53 L=300	3-80-468-34829	NU	NO	PIPE OD-406.4X9.53X6000-A53-GRB	A53-GRB	C	410181523	159389596000	00	1.000	300.000	0.000	27.980
126	54	05	F.F.FLANGE NB400	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	1.000	595.000	595.000	40.000
127	51	30	P.F.PIPE OD1626X10 L-6035 (UG)-PU COATED	3-80-468-34509	18	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	1.000	5,075.000	6,035.000	2,404.298
128	51	31	PIPE WITH MAN HOLE OD1626X10 UG-PU COAT	2-80-468-15624	NU	NO						00	1.000	0.000	0.000	879.132
128	37	01	P.F.PIPE OD1626X10THK L=1800 SA515GR60	3-80-468-34509	11	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410180965	159420400000	00	1.000	5,075.000	1,800.000	476.833
128	37	02	P.F.PIPE OD610X10THK L=479 SA515GR60	2-80-468-15624	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	1,885.000	479.000	70.886
128	37	03	PAD PLATE OD900,ID596 T-10MM SA515GR60	2-80-468-15624	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	900.000	900.000	28.039
128	37	04	FLAT FACE FLANGE NB600	3-80-468-34666	02	NO	PLATE 50.0 MM - SA515GR70	SA515GR70	C	410178710	159421190000	00	1.000	10.000	10.000	78.100
128	37	05	BLANK FL. OD610X10 WITH STUB150NB	3-80-468-34688	00	NO			C	410178710		00	1.000	10.000	10.000	200.664
128	38	01	BLANK FLANGE NB600 PL;T=50;DIA 815	3-80-468-34688	00	NO	PLATE 50.0 MM - SA515GR70	SA515GR70	C	410178710	159421190000	00	1.000	10.000	10.000	183.100
128	38	02	PIPE DIA 168.3 X 7.11 L=242	3-80-468-34688	00	NO	PIPE DIA 168.3 X 7.11 SA106GRB	SA106GRB	C	410178710	150824110000	00	1.000	242.000	0.000	6.839
128	38	03	FLANGE NB 150 CL150	3-80-468-34666	03	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410178710	159421990000	00	1.000	10.000	10.000	7.725
128	38	04	HANDLE , ROD DIA 32 X480	3-80-468-34688	00	NO	DIA 32mm-SA105	SA105	C	410178710	153391400000	00	1.000	480.000	0.000	3.000
128	37	06	HINJE PLATE(OUTER)370X240X12THK	2-80-468-15624	NU	NO	PLATE-12X2500X5000-SA515GR60	SA515GR60	C	410178710	159420390000	00	2.000	370.000	240.000	10.000
128	37	07	HINJE PLATE(INNER)473X140X12THK	2-80-468-15624	NU	NO	PLATE-12X2500X5000-SA515GR60	SA515GR60	C	410178710	159420390000	00	2.000	473.000	140.000	6.200
128	37	08	STUD M24X340 LONG	4-80-468-63081	NU	NO	DIA 25mm-SA105	SA105	C	410180965	153391390000	00	1.000	340.000	0.000	1.000
128	37	09	PUNCHED WASHER A24	2-80-468-15624	NU	NO	PUN WASHER-M24 -IS2016-A	IS-2016	C	410180965	414080002400	00	2.000	0.000	0.000	0.060
128	37	10	HEX NUT M24	2-80-468-15624	NU	NO	HEX NUT M24-10 IS:1364(P-3)/LATEST	IS:1364(P-3)	C	410180965	413220002400	00	2.000	0.000	0.000	0.220
128	37	11	SPLIT PIN DIA 4X45	2-80-468-15624	NU	NO	SPLIT PIN 4X45MM IS:549	IS:549	C	410180965	417044004500	00	2.000	0.000	0.000	0.010
128	37	12	HEX BOLT M33X140	2-80-468-15624	NU	NO	HEX BOLT M33X3.5X140 PCL 6.8 GR A STEEL	STEEL	C	410180965	412153314000	00	4.000	0.000	0.000	5.000
128	37	13	HEX NUT M33	2-80-468-15624	NU	NO	NUT -M33x3.5 -CL4-IS1363P3	IS-1363(P-3)	C	410180965	413040003300	00	4.000	0.000	0.000	1.120
128	37	14	NON ASBESTOS SHEET OD780XID617X3THK	2-80-468-15624	NU	NO	NON-ASBESTOS JOINTING SHEET 3.0MM	NON-ASBESTOS	C	410180965	220210300000	00	1.000	780.000	780.000	1.000
129	51	34	P.F.PIPE OD1626X10 L-4622 (UG)-PU COATED	3-80-468-34509	14	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	1.000	5,075.000	4,622.000	1,841.375
130	51	38	P.F.PIPE OD1626X10 L-1835 (UG)-PU COATED	3-80-468-34509	17	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	1.000	5,075.000	1,835.000	731.071
131	51	39	PIPE WITH MAN HOLE OD1626X10 UG-PU COAT	2-80-468-15624	NU	NO						00	1.000	0.000	0.000	879.132
131	37	01	P.F.PIPE OD1626X10THK L=1800 SA515GR60	3-80-468-34509	11	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410180965	159420400000	00	1.000	5,075.000	1,800.000	476.833
131	37	02	P.F.PIPE OD610X10THK L=479 SA515GR60	2-80-468-15624	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	1,885.000	479.000	70.886
131	37	03	PAD PLATE OD900,ID596 T-10MM SA515GR60	2-80-468-15624	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410178710	159420400000	00	1.000	900.000	900.000	28.039
131	37	04	FLAT FACE FLANGE NB600	3-80-468-34666	02	NO	PLATE 50.0 MM - SA515GR70	SA515GR70	C	410178710	159421190000	00	1.000	10.000	10.000	78.100
131	37	05	BLANK FL. OD610X10 WITH STUB150NB	3-80-468-34688	00	NO			C	410178710		00	1.000	10.000	10.000	200.664
131	38	01	BLANK FLANGE NB600 PL;T=50;DIA 815	3-80-468-34688	00	NO	PLATE 50.0 MM - SA515GR70	SA515GR70	C	410178710	159421190000	00	1.000	10.000	10.000	183.100
131	38	02	PIPE DIA 168.3 X 7.11 L=242	3-80-468-34688	00	NO	PIPE DIA 168.3 X 7.11 SA106GRB	SA106GRB	C	410178710	150824110000	00	1.000	242.000	0.000	6.839
131	38	03	FLANGE NB 150 CL150	3-80-468-34666	03	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410178710	159421990000	00	1.000	10.000	10.000	7.725
131	38	04	HANDLE , ROD DIA 32 X480	3-80-468-34688	00	NO	DIA 32mm-SA105	SA105	C	410178710	153391400000	00	1.000	480.000	0.000	3.000
131	37	06	HINJE PLATE(OUTER)370X240X12THK	2-80-468-15624	NU	NO	PLATE-12X2500X5000-SA515GR60	SA515GR60	C	410178710	159420390000	00	2.000	370.000	240.000	10.000
131	37	07	HINJE PLATE(INNER)473X140X12THK	2-80-468-15624	NU	NO	PLATE-12X2500X5000-SA515GR60	SA515GR60	C	410178710	159420390000	00	2.000	473.000	140.000	6.200
131	37	08	STUD M24X340 LONG	4-80-468-63081	NU	NO	DIA 25mm-SA105	SA105	C	410180965	153391390000	00	1.000	340.000	0.000	1.000
131	37	09	PUNCHED WASHER A24	2-80-468-15624	NU	NO	PUN WASHER-M24 -IS2016-A	IS-2016	C	410180965	414080002400	00	2.000	0.000	0.000	0.060
131	37	10	HEX NUT M24	2-80-468-15624	NU	NO	HEX NUT M24-10 IS:1364(P-3)/LATEST	IS:1364(P-3)	C	410180965	413220002400	00	2.000	0.000	0.000	0.220
131	37	11	SPLIT PIN DIA 4X45	2-80-468-15624	NU	NO	SPLIT PIN 4X45MM IS:549	IS:549	C	410180965	417044004500	00	2.000	0.000	0.000	0.010
131	37	12	HEX BOLT M33X140	2-80-468-15624	NU	NO	HEX BOLT M33X3.5X140 PCL 6.8 GR A STEEL	STEEL	C	410180965	412153314000	00	4.000	0.000	0.000	5.000
131	37	13	HEX NUT M33	2-80-468-15624	NU	NO	NUT -M33x3.5 -CL4-IS1363P3	IS-1363(P-3)	C	410180965	413040003300	00	4.000	0.000	0.000	1.120
131	37	14	NON ASBESTOS SHEET OD780XID617X3THK	2-80-468-15624	NU	NO	NON-ASBESTOS JOINTING SHEET 3.0MM	NON-ASBESTOS	C	410180965	220210300000	00	1.000	780.000	780.000	1.000
132	51	40	P.F.PIPE OD1626X10 L-1496 (UG)-PU COATED	3-80-468-34509	16	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	1.000	5,075.000	1,496.000	595.972
133	51	41	P.F.PIPE OD1626X10 L-5005 (UG)-PU COATED	3-80-468-34509	15	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	1.000	5,075.000	5,005.000	1,993.900
134	51	43	P.F.PIPE OD1626X10 L-938 (UG)-PU COATED	3-80-468-34509	13	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C		159420400000	00	1.000	5,075.000	938.000	373.660
135	51	46	90DEG MITRE BEND NB3300 L=3297 UG-PU COA	3-80-468-34749	NU	NO	PLATE-18X2500X10500-SA515GR60	SA515GR60	C		159420370000	00	1.000	10,422.000	5,676.000	8,279.050
136	51	47	90DEG MITRE BEND NB2300 L=1725 OG-PU	3-80-468-34754	NU	NO			C			00	5.000	10.000	0.000	12,676.180
136	55	01	P.F.PIPE OD2332X16 L-2823	3-80-468-34508	07	NO	PLATE-16X2500X10500-SA515GR60	SA515GR60	C	410181523	159420380000	00	5.000	7,274.000	2,823.000	12,676.180
137	51	49	90DEG MITREBEND NB1600 L=1200/1599 UG-PU	3-80-468-34750	NU	NO			C			00	1.000	10.000	0.000	927.477
137	56	01	P.F.PIPE OD1626X10 L=2358	3-80-468-34509	03	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410181523	159420400000	00	1.000	2,358.000	5,075.000	927.477
138	51	52	P.F.PIPE NB3300 L=2296 WITBRANCHS(UG)-PU	3-80-468-34828	NU	NO			C			00	1.000	10.000	0.000	3,842.604
138	57	01	P.F.PIPE OD3336X20THK L=2296	2-80-468-15562	46	NO	PLATE 20.0 MM - SA515GR70	SA515GR70	C	410181523	159421130000	02	1.000	10,415.000	2,296.000	3,754.341
138	57	02	PIPE OD-219.1X5.56 L=300	3-80-468-34828	NU	NO	PIPE OD-219.1X5.56X6000-A53-GRB	A53-GRB	C	410181523	159389776000	00	1.000	300.000	0.000	8.783
138	57	03	F.F.FLANGE NB200	3-80-468-34835	05	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410181523	159421990000	00	1.000	345.000	345.000	11.500
138	57	04	PIPE OD-406.4X9.53 L=300	3-80-468-34828	NU	NO	PIPE OD-406.4X9.53X6000-A53-GRB	A53-GRB	C	410181523	159389596000	00	1.000	300.000	0.000	27.980
138	57	05	F.F.FLANGE NB400	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	1.000	595.000	595.000	40.000
139	51	53	P.F.PIPE NB3300 L=2296 WIT STUBS (UG) PU	3-80-468-34867	NU	NO			C			00	1.000	10.000	0.000	0.000
140	58	01	PIPE NB900 L=5116 WITH 2 SADDLES (R/L)	3-80-468-34837	NU	NO			C			00	1.000	10.000	0.000	1,651.409
140	59	01	PIPE OD-914X9.53X5086	3-80-468-34837	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	5,086.000	0.000	1,081.029
140	59	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
140	59	03	BOTTOM PLATE 20X300X900 SA/IS2062	3-80-468-34837	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	2.000	300.000	900.000	84.780
140	59	04	PAD PLATE 10X600X1042 SA/IS2062	3-80-468-34837	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	2.000	600.000	1,042.000	98.126
140	59	05	MIDDLE PLATE 16X490X800 SA/IS2062	3-80-468-34837	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	2.000	490.000	800.000	98.470
140	59	06	STIFFNER PL-1 10X120X372 SA/IS2062	3-80-468-34837	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	8.000	120.000	372.000	28.032
140	59	07	STIFFNER PL-2 10X120X274 SA/IS2062	3-80-468-34837	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	8.000	120.000	274.000	20.648
141	58	02	PIPE NB900 L=6000 WITH 2 SADDLES (R/L)	3-80-468-34838	NU	NO			C			00	1.000	10.000	0.000	1,839.304
141	60	01	PIPE OD-914X9.53X5970	3-80-468-34838	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	5,970.000	0.000	1,268.924
141	60	02	F.F.FLANGE NB900	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
141	60	03	BOTTOM PLATE 20X300X900 SA/IS2062	3-80-468-34838	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	2.000	300.000	900.000	84.780
141	60	04	PAD PLATE 10X600X1042 SA/IS2062	3-80-468-34838	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	2.000	600.000	1,042.000	98.126
141	60	05	MIDDLE PLATE 16X490X800 SA/IS2062	3-80-468-34838	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	2.000	490.000	800.000	98.470
141	60	06	STIFFNER PL-1 10X120X372 SA/IS2062	3-80-468-34838	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	8.000	120.000	372.000	28.032
141	60	07	STIFFNER PL-2 10X120X274 SA/IS2062	3-80-468-34838	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	8.000	120.000	274.000	20.648
142	58	03	PIPE NB900 L=6M WITH 2SADDLES&DRN (R/L)	3-80-468-34839	NU	NO			C			00	1.000	10.000	0.000	1,847.186
142	61	01	PIPE OD-914X9.53X5970	3-80-468-34839	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	5,970.000	0.000	1,268.924
142	61	02	F.F.FLANGE NB900	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
142	61	03	BOTTOM PLATE 20X300X900 SA/IS2062	3-80-468-34839	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	2.000	300.000	900.000	84.780
142	61	04	PAD PLATE 10X600X1042 SA/IS2062	3-80-468-34839	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	2.000	600.000	1,042.000	98.126
142	61	05	MIDDLE PLATE 16X490X800 SA/IS2062	3-80-468-34839	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	2.000	490.000	800.000	98.470
142	61	06	STIFFNER PL-1 10X120X372 SA/IS2062	3-80-468-34839	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	8.000	120.000	372.000	28.032
142	61	07	STIFFNER PL-2 10X120X274 SA/IS2062	3-80-468-34839	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	8.000	120.000	274.000	20.648
142	61	08	PIPE OD-114.3X4.78 L=200	3-80-468-34839	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410181523	159389756000	00	1.000	200.000	0.000	2.582
142	61	09	F.F.FLANGE NB100	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410181523	159421140000	00	1.000	230.000	230.000	5.300
143	58	04	PIPE NB900 L=2265 WITH SADDLE (R/L)	3-80-468-34840	NU	NO			C			00	1.000	10.000	0.000	886.778
143	62	01	PIPE OD-914X9.53X2265	3-80-468-34840	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	2,265.000	0.000	481.426
143	62	02	F.F.FLANGE NB900	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
143	62	03	BOTTOM PLATE 20X300X900 SA/IS2062	3-80-468-34840	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
143	62	04	PAD PLATE 10X600X1042 SA/IS2062	3-80-468-34840	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
143	62	05	MIDDLE PLATE 16X490X800 SA/IS2062	3-80-468-34840	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
143	62	06	STIFFNER PL-1 10X120X372 SA/IS2062	3-80-468-34840	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
143	62	07	STIFFNER PL-2 10X120X274 SA/IS2062	3-80-468-34840	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
144	58	05	90DEG MB NB900 L=750/750 R/L WIT FL.ENDS	3-80-468-34841	NU	NO			C			00	1.000	10.000	0.000	489.721
144	63	01	PIPE OD-914X9.53 L=1203	3-80-468-34841	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	1,203.000	0.000	249.321
144	63	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.400
145	58	06	UEQT NB900/700 R/L WITH FL ENDS	3-80-468-34842	NU	NO			C			00	1.000	10.000	0.000	606.878
145	64	01	PIPE OD-914X9.53 L=1442	3-80-468-34842	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	1,442.000	0.000	292.000
145	64	02	PIPE OD-711X9.53 L=783	3-80-468-34842	NU	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	783.000	0.000	129.078
145	64	03	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	1.000	1,168.000	1,168.000	120.200
145	64	04	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	1.000	928.000	928.000	65.600
146	58	07	REDUCER NB900/700 WITH FL ENDS	3-80-468-34843	NU	NO			C			00	1.000	0.000	0.000	371.457
146	65	01	P.F.REDUCER NB900/700	4-80-468-82718	NU	NO	PLATE 10.0 MM - SA515GR70	SA515GR70	C	410181523	159421090000	00	1.000	2,730.000	932.000	126.662
146	65	02	PIPE OD-914X9.53 L=100	3-80-468-34843	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	2.000	100.000	0.000	42.510
146	65	03	PIPE OD-711X9.53 L=100	3-80-468-34843	NU	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	100.000	0.000	16.485
146	65	04	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	1.000	1,168.000	1,168.000	120.200
146	65	05	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	1.000	928.000	928.000	65.600
147	66	01	PIPE NB900 L=6000 WITH R/L & FL ENDS	3-80-468-34846	NU	NO			C			00	1.000	0.000	0.000	1,509.248
147	67	01	PIPE OD-914X9.53X5970	3-80-468-34846	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	5,970.000	0.000	1,268.924
147	67	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
148	66	02	PIPE NB900 L=4500 WITH SADDLE (R/L & FL	3-80-468-34847	NU	NO			C			00	1.000	0.000	0.000	1,355.450
148	68	01	PIPE OD-914X9.53X4470	3-80-468-34847	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	4,470.000	0.000	950.098

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
148	68	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
148	68	03	BOTTOM PLATE 20X300X900	3-80-468-34847	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
148	68	04	PAD PLATE 10X600X1042	3-80-468-34847	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
148	68	05	MIDDLE PLATE 16X490X800	3-80-468-34847	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
148	68	06	STIFFNER PL-1 10X120X372	3-80-468-34847	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
148	68	07	STIFFNER PL-2 10X120X274	3-80-468-34847	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
149	66	03	PIPE NB900 L=2563 WITH SADDLE (R/L & FL	3-80-468-34848	NU	NO			C			00	1.000	0.000	0.000	943.741
149	69	01	PIPE OD-914X9.53X2533	3-80-468-34848	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	2,533.000	0.000	538.389
149	69	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
149	69	03	BOTTOM PLATE 20X300X900	3-80-468-34848	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
149	69	04	PAD PLATE 10X600X1042	3-80-468-34848	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
149	69	05	MIDDLE PLATE 16X490X800	3-80-468-34848	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
149	69	06	STIFFNER PL-1 10X120X372	3-80-468-34848	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
149	69	07	STIFFNER PL-2 10X120X274	3-80-468-34848	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
150	66	04	PIPE NB900 L=4813 WITH SADDLE (R/L & FL	3-80-468-34849	NU	NO			C			00	1.000	0.000	0.000	1,421.979
150	70	01	PIPE OD-914X9.53X4783	3-80-468-34849	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	4,783.000	0.000	1,016.627
150	70	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	1.000	1,168.000	1,168.000	120.162
150	70	03	BOTTOM PLATE 20X300X900	3-80-468-34849	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
150	70	04	PAD PLATE 10X600X1042	3-80-468-34849	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
150	70	05	MIDDLE PLATE 16X490X800	3-80-468-34849	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
150	70	06	STIFFNER PL-1 10X120X372	3-80-468-34849	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
150	70	07	STIFFNER PL-2 10X120X274	3-80-468-34849	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
150	70	08	NB900FLANGE AT VALAVE END (HOLD)	3-80-468-34849	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	1.000	10.000	10.000	120.162
151	66	05	PIPE NB900 L=882 WITH R/L & FL ENDS	3-80-468-34850	NU	NO			C			00	1.000	0.000	0.000	421.417
151	71	01	PIPE OD-914X9.53X852	3-80-468-34850	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	852.000	0.000	181.093
151	71	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	1.000	1,168.000	1,168.000	120.162
151	71	03	NB900FLANGE AT VALAVE END (HOLD)	3-80-468-34850	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	1.000	10.000	10.000	120.162
152	66	06	PIPE NB900 L=4813 WITH SADDLE (R/L & FL	3-80-468-34851	NU	NO			C			00	1.000	0.000	0.000	1,421.979
152	72	01	PIPE OD-914X9.53X4783	3-80-468-34851	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	4,783.000	0.000	1,016.627
152	72	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
152	72	03	BOTTOM PLATE 20X300X900	3-80-468-34851	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
152	72	04	PAD PLATE 10X600X1042	3-80-468-34851	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
152	72	05	MIDDLE PLATE 16X490X800	3-80-468-34851	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
152	72	06	STIFFNER PL-1 10X120X372	3-80-468-34851	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
152	72	07	STIFFNER PL-2 10X120X274	3-80-468-34851	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
153	66	07	PIPE NB900 L=882 WITH R/L & FL ENDS	3-80-468-34852	NU	NO			C			00	1.000	0.000	0.000	421.417
153	73	01	PIPE OD-914X9.53X852	3-80-468-34852	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	852.000	0.000	181.093
153	73	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	1.000	1,168.000	1,168.000	120.162
153	73	03	NB900FLANGE AT VALAVE END (HOLD)	3-80-468-34852	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	1.000	10.000	10.000	120.162
154	66	08	PIPE NB900 L=5567 WITH SADDLE (R/L & FL	3-80-468-34853	NU	NO			C			00	1.000	0.000	0.000	1,582.241
154	74	01	PIPE OD-914X9.53X5537	3-80-468-34853	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	5,537.000	0.000	1,176.889
154	74	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
154	74	03	BOTTOM PLATE 20X300X900	3-80-468-34853	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
154	74	04	PAD PLATE 10X600X1042	3-80-468-34853	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
154	74	05	MIDDLE PLATE 16X490X800	3-80-468-34853	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
154	74	06	STIFFNER PL-1 10X120X372	3-80-468-34853	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
154	74	07	STIFFNER PL-2 10X120X274	3-80-468-34853	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
155	66	09	PIPE NB900 L=4461 WITH SADDLE (R/L & FL	3-80-468-34854	NU	NO			C			00	1.000	0.000	0.000	1,347.161
155	75	01	PIPE OD-914X9.53X4431	3-80-468-34854	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	4,431.000	0.000	941.809
155	75	02	F.F.FLANGE NB900 CL-D	3-80-468-34854	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
155	75	03	BOTTOM PLATE 20X300X900	3-80-468-34854	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
155	75	04	PAD PLATE 10X600X1042	3-80-468-34854	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
155	75	05	MIDDLE PLATE 16X490X800	3-80-468-34854	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
155	75	06	STIFFNER PL-1 10X120X372	3-80-468-34854	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
155	75	07	STIFFNER PL-2 10X120X274	3-80-468-34854	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
156	66	10	PIPE NB900 L=2424 WITH SADDLE (R/L & FL	3-80-468-34855	NU	NO			C			00	1.000	0.000	0.000	914.197
156	76	01	PIPE OD-914X9.53X2394	3-80-468-34855	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	2,394.000	0.000	508.845
156	76	02	F.F.FLANGE NB900 CL-D	3-80-468-34855	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
156	76	03	BOTTOM PLATE 20X300X900	3-80-468-34855	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
156	76	04	PAD PLATE 10X600X1042	3-80-468-34855	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
156	76	05	MIDDLE PLATE 16X490X800	3-80-468-34855	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
156	76	06	STIFFNER PL-1 10X120X372	3-80-468-34855	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
156	76	07	STIFFNER PL-2 10X120X274	3-80-468-34855	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
157	66	11	PIPE NB900 L=2000 WITH SADDLE (R/L & FL	3-80-468-34856	NU	NO			C			00	1.000	0.000	0.000	824.076
157	77	01	PIPE OD-914X9.53X1970	3-80-468-34856	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	1,970.000	0.000	418.724
157	77	02	F.F.FLANGE NB900 CL-D	3-80-468-34856	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
157	77	03	BOTTOM PLATE 20X300X900	3-80-468-34856	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
157	77	04	PAD PLATE 10X600X1042	3-80-468-34856	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
157	77	05	MIDDLE PLATE 16X490X800	3-80-468-34856	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
157	77	06	STIFFNER PL-1 10X120X372	3-80-468-34856	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
157	77	07	STIFFNER PL-2 10X120X274	3-80-468-34856	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
158	66	12	PIPE NB900 L=1000 WITH R/L & FL ENDS	3-80-468-34857	NU	NO			C			00	1.000	0.000	0.000	446.498
158	78	01	PIPE OD-914X9.53X970	3-80-468-34857	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	970.000	0.000	206.174
158	78	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
159	66	13	PIPE NB900 L=3559 WITH SADDLE (R/L & FL	3-80-468-34858	NU	NO			C			00	1.000	0.000	0.000	1,155.441
159	79	01	PIPE OD-914X9.53X3529	3-80-468-34858	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	3,529.000	0.000	750.089
159	79	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
159	79	03	BOTTOM PLATE 20X300X900	3-80-468-34858	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
159	79	04	PAD PLATE 10X600X1042	3-80-468-34858	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
159	79	05	MIDDLE PLATE 16X490X800	3-80-468-34858	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
159	79	06	STIFFNER PL-1 10X120X372	3-80-468-34858	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
159	79	07	STIFFNER PL-2 10X120X274	3-80-468-34858	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
160	66	14	PIPE NB900 L=4408 WIT SADDLE&VENT(R/L&FL	3-80-468-34859	NU	NO			C			00	1.000	0.000	0.000	1,343.778
160	80	01	PIPE OD-914X9.53X4378	3-80-468-34859	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	4,378.000	0.000	930.544
160	80	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
160	80	03	BOTTOM PLATE 20X300X900	3-80-468-34859	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
160	80	04	PAD PLATE 10X600X1042	3-80-468-34859	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
160	80	05	MIDDLE PLATE 16X490X800	3-80-468-34859	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
160	80	06	STIFFNER PL-1 10X120X372	3-80-468-34859	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
160	80	07	STIFFNER PL-2 10X120X274	3-80-468-34859	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
160	80	08	PIPE OD-114.3X4.78 L=200	3-80-468-34859	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410181523	159389756000	00	1.000	200.000	0.000	2.582
160	80	09	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410181523	159421140000	00	1.000	230.000	230.000	5.300
161	66	15	PIPE NB900 L=5967 WIT SADDLE&VENT(R/L&FL	3-80-468-34860	NU	NO			C			00	1.000	0.000	0.000	1,675.143
161	81	01	PIPE OD-914X9.53X5937	3-80-468-34860	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	5,937.000	0.000	1,261.909
161	81	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
161	81	03	BOTTOM PLATE 20X300X900	3-80-468-34860	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
161	81	04	PAD PLATE 10X600X1042	3-80-468-34860	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
161	81	05	MIDDLE PLATE 16X490X800	3-80-468-34860	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
161	81	06	STIFFNER PL-1 10X120X372	3-80-468-34860	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
161	81	07	STIFFNER PL-2 10X120X274	3-80-468-34860	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
161	81	08	PIPE OD-114.3X4.78 L=200	3-80-468-34860	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410181523	159389756000	00	1.000	200.000	0.000	2.582
161	81	09	F.F.FLANGE NB100 CL-150	3-80-468-34835	NU	NO	PLATE 25 - SA515GR70	SA515GR70	C	410181523	159421140000	00	1.000	230.000	230.000	5.300
162	66	16	PIPE NB900 L=2259 WIT SADDLE&VENT(R/L&FL	3-80-468-34861	NU	NO			C			00	1.000	0.000	0.000	887.008
162	82	01	PIPE OD-914X9.53X2229	3-80-468-34861	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	2,229.000	0.000	473.774
162	82	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
162	82	03	BOTTOM PLATE 20X300X900	3-80-468-34861	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
162	82	04	PAD PLATE 10X600X1042	3-80-468-34861	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
162	82	05	MIDDLE PLATE 16X490X800	3-80-468-34861	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
162	82	06	STIFFNER PL-1 10X120X372	3-80-468-34861	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
162	82	07	STIFFNER PL-2 10X120X274	3-80-468-34861	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
162	82	08	PIPE OD-114.3X4.78 L=200	3-80-468-34861	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410181523	159389756000	00	1.000	200.000	0.000	2.582
162	82	09	F.F.FLANGE NB100 CL-150	3-80-468-34835	NU	NO	PLATE 25 - SA515GR70	SA515GR70	C	410181523	159421140000	00	1.000	230.000	230.000	5.300
163	66	17	PIPE NB900 L=3412 WIT SADDLE&VENT(R/L&FL	3-80-468-34862	NU	NO			C			00	1.000	0.000	0.000	1,132.078
163	83	01	PIPE OD-914X9.53X3382	3-80-468-34862	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	3,382.000	0.000	718.844
163	83	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	2.000	1,168.000	1,168.000	240.324
163	83	03	BOTTOM PLATE 20X300X900	3-80-468-34862	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
163	83	04	PAD PLATE 10X600X1042	3-80-468-34862	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
163	83	05	MIDDLE PLATE 16X490X800	3-80-468-34862	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
163	83	06	STIFFNER PL-1 10X120X372	3-80-468-34862	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
163	83	07	STIFFNER PL-2 10X120X274	3-80-468-34862	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
163	83	08	PIPE OD-114.3X4.78 L=200	3-80-468-34862	NU	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410181523	159389756000	00	1.000	200.000	0.000	2.582
163	83	09	F.F.FLANGE NB100 CL-150	3-80-468-34835	NU	NO	PLATE 25 - SA515GR70	SA515GR70	C	410181523	159421140000	00	1.000	230.000	230.000	5.300
164	66	18	PIPE NB900 L=6000 WITH SADDLE (R/L & FL	3-80-468-34863	NU	NO			C			00	1.000	0.000	0.000	1,674.276
164	84	01	PIPE OD-914X9.53X5970	3-80-468-34863	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	5,970.000	0.000	1,268.924
164	84	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410184091	159421180000	00	1.000	1,168.000	1,168.000	120.162
164	84	03	BOTTOM PLATE 20X300X900	3-80-468-34863	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
164	84	04	PAD PLATE 10X600X1042	3-80-468-34863	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
164	84	05	MIDDLE PLATE 16X490X800	3-80-468-34863	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
164	84	06	STIFFNER PL-1 10X120X372	3-80-468-34863	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
164	84	07	STIFFNER PL-2 10X120X274	3-80-468-34863	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
164	84	08	NB900FLANGE AT VALAVE END (HOLD)	3-80-468-34863	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	1.000	10.000	10.000	120.162
165	66	19	PIPE NB900 L=3347 WITH SADDLE (R/L & FL	3-80-468-34864	NU	NO			C			00	1.000	0.000	0.000	1,110.380
165	85	01	PIPE OD-914X9.53X3317	3-80-468-34864	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	3,317.000	0.000	705.028
165	85	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410184091	159421180000	00	1.000	1,168.000	1,168.000	120.162
165	85	03	BOTTOM PLATE 20X300X900	3-80-468-34864	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
165	85	04	PAD PLATE 10X600X1042	3-80-468-34864	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
165	85	05	MIDDLE PLATE 16X490X800	3-80-468-34864	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
165	85	06	STIFFNER PL-1 10X120X372	3-80-468-34864	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
165	85	07	STIFFNER PL-2 10X120X274	3-80-468-34864	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
165	85	08	NB900FLANGE AT VALAVE END (HOLD)	3-80-468-34864	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	1.000	10.000	10.000	120.162
166	66	20	PIPE NB900 L=3348 WITH SADDLE (R/L & FL	3-80-468-34865	NU	NO			C			00	1.000	0.000	0.000	1,110.593
166	86	01	PIPE OD-914X9.53X3318	3-80-468-34865	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	3,318.000	0.000	705.241
166	86	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410184091	159421180000	00	1.000	1,168.000	1,168.000	120.162
166	86	03	BOTTOM PLATE 20X300X900	3-80-468-34865	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
166	86	04	PAD PLATE 10X600X1042	3-80-468-34865	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
166	86	05	MIDDLE PLATE 16X490X800	3-80-468-34865	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
166	86	06	STIFFNER PL-1 10X120X372	3-80-468-34865	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
166	86	07	STIFFNER PL-2 10X120X274	3-80-468-34865	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
166	86	08	NB900FLANGE AT VALAVE END (HOLD)	3-80-468-34865	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	1.000	10.000	10.000	120.162
167	66	21	PIPE NB900 L=2348 WITH SADDLE (R/L & FL	3-80-468-34866	NU	NO			C			00	1.000	0.000	0.000	898.043
167	87	01	PIPE OD-914X9.53X2318	3-80-468-34866	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	2,318.000	0.000	492.691
167	87	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410184091	159421180000	00	1.000	1,168.000	1,168.000	120.162
167	87	03	BOTTOM PLATE 20X300X900	3-80-468-34866	NU	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150111500000	00	1.000	300.000	900.000	42.390
167	87	04	PAD PLATE 10X600X1042	3-80-468-34866	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	1.000	600.000	1,042.000	49.063
167	87	05	MIDDLE PLATE 16X490X800	3-80-468-34866	NU	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	150110260000	00	1.000	490.000	800.000	49.235
167	87	06	STIFFNER PL-1 10X120X372	3-80-468-34866	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	372.000	14.016
167	87	07	STIFFNER PL-2 10X120X274	3-80-468-34866	NU	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410181523	152110980000	00	4.000	120.000	274.000	10.324
167	87	08	NB900FLANGE AT VALAVE END (HOLD)	3-80-468-34866	NU	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	1.000	10.000	10.000	120.162
168	66	22	90DEG MITREBEND NB900 L-750/763 R/L&FL	3-80-468-34873	NU	NO			C			00	1.000	10.000	0.000	498.785
168	88	01	PIPE OD-914X9.53 L=1246	3-80-468-34873	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	1,246.000	0.000	258.461
168	88	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410184091	159421180000	00	2.000	1,168.000	1,168.000	240.324
169	66	23	90DEG MITREBEND NB900 L-700/750 R/L&FL	3-80-468-34874	NU	NO			C			00	1.000	10.000	0.000	485.394
169	89	01	PIPE OD-914X9.53 L=1183	3-80-468-34874	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	1,183.000	0.000	245.070
169	89	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410184091	159421180000	00	2.000	1,168.000	1,168.000	240.324
170	66	24	45DEG MITREBEND NB900 L-433/874 R/L&FL	3-80-468-34875	NU	NO			C			00	1.000	10.000	0.000	507.924
170	90	01	PIPE OD-914X9.53 L=1279	3-80-468-34875	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	1,279.000	0.000	267.600
170	90	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410184091	159421180000	00	2.000	1,168.000	1,168.000	240.324
171	66	25	45DEG MITREBEND NB900 L-433/1050 R/L&FL	3-80-468-34876	NU	NO			C			00	1.000	10.000	0.000	545.333
171	91	01	PIPE OD-914X9.53 L=1455	3-80-468-34876	NU	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410181523	159389888000	00	1.000	1,455.000	0.000	305.009
171	91	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410184091	159421180000	00	2.000	1,168.000	1,168.000	240.324
172	92	01	PIPE NB700 L=6000 WITH R/L & FL	2-80-468-15669	01	NO			C			00	5.000	0.000	0.000	5,576.770
172	93	01	PIPE OD-711X9.53 L=5970	2-80-468-15669	01	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	5.000	5,970.000	0.000	4,920.770
172	93	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	10.000	928.000	928.000	656.000
173	92	02	PIPE NB700 L=3856 WITH R/L & FL	2-80-468-15669	02	NO			C			00	1.000	0.000	0.000	761.916
173	94	01	PIPE OD-711X9.53 L=3826	2-80-468-15669	02	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,826.000	0.000	630.716
173	94	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
174	92	03	PIPE NB700 L=5500 WITH R/L & FL	2-80-468-15669	03	NO			C			00	1.000	0.000	0.000	1,032.929
174	95	01	PIPE OD-711X9.53 L=5470	2-80-468-15669	03	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,470.000	0.000	901.729
174	95	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
175	92	04	PIPE NB700 L=3000 WITH R/L & FL	2-80-468-15669	04	NO			C			00	1.000	0.000	0.000	620.805
175	96	01	PIPE OD-711X9.53 L=2970	2-80-468-15669	04	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	2,970.000	0.000	489.605
175	96	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
176	92	05	PIPE NB700 L=5083 WITH R/L & FL	2-80-468-15669	05	NO			C			00	1.000	0.000	0.000	964.187
176	97	01	PIPE OD-711X9.53 L=5053	2-80-468-15669	05	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,053.000	0.000	832.987
176	97	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
177	92	06	PIPE NB700 L=1162 WITH R/L & FL	2-80-468-15669	06	NO			C			00	1.000	0.000	0.000	317.810
177	98	01	PIPE OD-711X9.53 L=1132	2-80-468-15669	06	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	1,132.000	0.000	186.610
177	98	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
178	92	07	PIPE NB700 L=1079 WITH R/L & FL	2-80-468-15669	07	NO			C			00	1.000	0.000	0.000	304.128
178	99	01	PIPE OD-711X9.53 L=1049	2-80-468-15669	07	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	1,049.000	0.000	172.928
178	99	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
179	92	08	PIPE NB700 L=1508 WITH R/L & FL	2-80-468-15669	08	NO			C			00	1.000	0.000	0.000	374.848
179	A0	01	PIPE OD-711X9.53 L=1478	2-80-468-15669	08	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	1,478.000	0.000	243.648
179	A0	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
180	92	09	PIPE NB700 L=5480 WITH R/L & FL	2-80-468-15669	09	NO			C			00	1.000	0.000	0.000	1,029.633
180	A1	01	PIPE OD-711X9.53 L=5450	2-80-468-15669	09	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,450.000	0.000	898.433
180	A1	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
181	92	10	PIPE NB700 L=3481 WITH R/L & FL	2-80-468-15669	10	NO			C			00	1.000	0.000	0.000	700.097
181	A2	01	PIPE OD-711X9.53 L=3451	2-80-468-15669	10	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,451.000	0.000	568.897
181	A2	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
182	92	11	PIPE NB700 L=4953 WITH R/L & FL	2-80-468-15669	11	NO			C			00	1.000	0.000	0.000	942.757
182	A3	01	PIPE OD-711X9.53 L=4923	2-80-468-15669	11	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	4,923.000	0.000	811.557
182	A3	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
183	92	12	PIPE NB700 L=5953 WITH R/L & FL	2-80-468-15669	12	NO			C			00	1.000	0.000	0.000	1,107.607
183	A4	01	PIPE OD-711X9.53 L=5923	2-80-468-15669	12	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,923.000	0.000	976.407
183	A4	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
184	92	13	PIPE NB700 L=4000 WITH R/L & FL	2-80-468-15669	13	NO			C			00	1.000	0.000	0.000	785.655
184	A5	01	PIPE OD-711X9.53 L=3970	2-80-468-15669	13	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,970.000	0.000	654.455
184	A5	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
185	92	14	PIPE NB700 L=2000 WITH R/L & FL	2-80-468-15669	14	NO			C			00	1.000	0.000	0.000	455.955
185	A6	01	PIPE OD-711X9.53 L=1970	2-80-468-15669	14	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	1,970.000	0.000	324.755
185	A6	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
186	92	15	PIPE NB700 L=5000 WITH R/L & FL	2-80-468-15669	15	NO			C			00	1.000	0.000	0.000	950.504
186	A7	01	PIPE OD-711X9.53 L=4970	2-80-468-15669	15	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	4,970.000	0.000	819.304
186	A7	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
187	92	16	PIPE NB700 L=5000 WITH R/L & FL	2-80-468-15669	16	NO			C			00	1.000	0.000	0.000	950.504
187	A8	01	PIPE OD-711X9.53 L=4970	2-80-468-15669	16	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	4,970.000	0.000	819.304
187	A8	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
188	92	17	PIPE NB700 L=5186 WITH R/L & FL	2-80-468-15669	17	NO			C			00	1.000	0.000	0.000	981.167
188	A9	01	PIPE OD-711X9.53 L=5156	2-80-468-15669	17	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,156.000	0.000	849.967
188	A9	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
189	92	18	PIPE NB700 L=6186 WITH R/L & FL	2-80-468-15669	18	NO			C			00	1.000	0.000	0.000	1,146.017
189	B0	01	PIPE OD-711X9.53 L=6156	2-80-468-15669	18	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	6,156.000	0.000	1,014.817
189	B0	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
190	92	19	PIPE NB700 L=1043 WITH R/L & FL	2-80-468-15669	19	NO			C			00	1.000	0.000	0.000	298.193
190	B1	01	PIPE OD-711X9.53 L=1013	2-80-468-15669	19	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	1,013.000	0.000	166.993
190	B1	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
191	92	20	PIPE NB700 L=1508 WITH R/L & FL	2-80-468-15669	20	NO			C			00	1.000	0.000	0.000	374.683
191	B2	01	PIPE OD-711X9.53 L=1478	2-80-468-15669	20	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	1,478.000	0.000	243.483
191	B2	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
192	92	21	PIPE NB700 L=6145 WITH R/L & FL	2-80-468-15669	21	NO			C			00	1.000	0.000	0.000	1,139.258
192	B3	01	PIPE OD-711X9.53 L=6115	2-80-468-15669	21	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	6,115.000	0.000	1,008.058
192	B3	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
193	92	22	PIPE NB700 L=5470 WITH R/L & FL	2-80-468-15669	22	NO			C			00	1.000	0.000	0.000	1,027.984
193	B4	01	PIPE OD-711X9.53 L=5440	2-80-468-15669	22	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,440.000	0.000	896.784
193	B4	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
194	92	23	PIPE NB700 L=5948 WITH R/L & FL	2-80-468-15669	23	NO			C			00	1.000	0.000	0.000	1,106.782
194	B5	01	PIPE OD-711X9.53 L=5918	2-80-468-15669	23	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,918.000	0.000	975.582
194	B5	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
195	92	24	PIPE NB700 L=1844 WITH R/L & FL	2-80-468-15669	24	NO			C			00	1.000	0.000	0.000	430.238
195	B6	01	PIPE OD-711X9.53 L=1814	2-80-468-15669	24	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	1,814.000	0.000	299.038
195	B6	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
196	92	25	PIPE NB700 L=5000 WITH DRAIN (R/L & FL)	2-80-468-15669	25	NO			C			00	1.000	0.000	0.000	957.195
196	B7	01	PIPE OD-711X9.53 L=4970	2-80-468-15669	25	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	4,970.000	0.000	819.304
196	B7	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
196	B7	03	PIPE OD-114.3X4.78 L=100	2-80-468-15669	25	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410181523	159389756000	00	1.000	100.000	0.000	1.291
196	B7	04	F.F.FLANGE NB100	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410181523	159421140000	00	1.000	230.000	230.000	5.400
197	92	26	PIPE NB700 L=6000 WITH DRAIN (R/L & FL)	2-80-468-15669	26	NO			C			00	1.000	0.000	0.000	1,122.045
197	B8	01	PIPE OD-711X9.53 L=5970	2-80-468-15669	26	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,970.000	0.000	984.154
197	B8	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
197	B8	03	PIPE OD-114.3X4.78 L=100	2-80-468-15669	26	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410181523	159389756000	00	1.000	100.000	0.000	1.291
197	B8	04	F.F.FLANGE NB100	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410181523	159421140000	00	1.000	230.000	230.000	5.400
198	92	27	PIPE NB700 L=5000 WITH R/L & FL	2-80-468-15669	27	NO			C			00	1.000	0.000	0.000	950.504
198	B9	01	PIPE OD-711X9.53 L=4970	2-80-468-15669	27	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	4,970.000	0.000	819.304
198	B9	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
199	92	28	PIPE NB700 L=2202 WITH R/L & FL	2-80-468-15669	28	NO			C			00	1.000	0.000	0.000	488.924
199	C0	01	PIPE OD-711X9.53 L=2170	2-80-468-15669	28	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	2,170.000	0.000	357.724
199	C0	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
200	92	29	PIPE NB700 L=3725 WITH R/L & FL	2-80-468-15669	29	NO			C			00	1.000	0.000	0.000	740.321
200	C1	01	PIPE OD-711X9.53 L=3695	2-80-468-15669	29	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,695.000	0.000	609.121
200	C1	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
201	92	30	PIPE NB700 L=3884 WITH R/L & FL	2-80-468-15669	30	NO			C			00	1.000	0.000	0.000	766.532
201	C2	01	PIPE OD-711X9.53 L=3854	2-80-468-15669	30	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,854.000	0.000	635.332
201	C2	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
202	92	31	PIPE NB700 L=5731 WITH R/L & FL	2-80-468-15669	31	NO			C			00	1.000	0.000	0.000	1,071.010
202	C3	01	PIPE OD-711X9.53 L=5701	2-80-468-15669	31	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,701.000	0.000	939.810
202	C3	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
203	92	32	PIPE NB700 L=5500 WITH R/L & FL	2-80-468-15669	32	NO			C			00	1.000	0.000	0.000	1,032.929
203	C4	01	PIPE OD-711X9.53 L=5470	2-80-468-15669	32	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,470.000	0.000	901.729
203	C4	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
204	92	33	PIPE NB700 L=5732 WITH R/L & FL	2-80-468-15669	33	NO			C			00	1.000	0.000	0.000	1,071.175
204	C5	01	PIPE OD-711X9.53 L=5702	2-80-468-15669	33	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,702.000	0.000	939.975

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
204	C5	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
205	92	34	PIPE NB700 L=3030 WITH R/L & FL	2-80-468-15669	34	NO			C			00	1.000	0.000	0.000	625.750
205	C6	01	PIPE OD-711X9.53 L=3000	2-80-468-15669	34	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,000.000	0.000	494.550
205	C6	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
206	92	35	PIPE NB700 L=2702 WITH R/L & FL	2-80-468-15669	35	NO			C			00	1.000	0.000	0.000	571.679
206	C7	01	PIPE OD-711X9.53 L=2672	2-80-468-15669	35	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	2,672.000	0.000	440.479
206	C7	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
207	92	36	PIPE NB700 L=3727 WITH R/L & FL	2-80-468-15669	36	NO			C			00	1.000	0.000	0.000	740.650
207	C8	01	PIPE OD-711X9.53 L=3697	2-80-468-15669	36	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,697.000	0.000	609.450
207	C8	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
208	92	37	PIPE NB700 L=4500 WITH R/L & FL	2-80-468-15669	37	NO			C			00	1.000	0.000	0.000	868.079
208	C9	01	PIPE OD-711X9.53 L=4470	2-80-468-15669	37	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	4,470.000	0.000	736.879
208	C9	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
209	92	38	PIPE NB700 L=2250 WITH R/L & FL	2-80-468-15669	38	NO			C			00	1.000	0.000	0.000	497.167
209	D0	01	PIPE OD-711X9.53 L=2220	2-80-468-15669	38	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	2,220.000	0.000	365.967
209	D0	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
210	92	39	PIPE NB700 L=4363 WITH R/L & FL	2-80-468-15669	39	NO			C			00	1.000	0.000	0.000	845.495
210	D1	01	PIPE OD-711X9.53 L=4333	2-80-468-15669	39	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	4,333.000	0.000	714.295
210	D1	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
211	92	40	PIPE NB700 L=3921 WITH R/L & FL	2-80-468-15669	40	NO			C			00	1.000	0.000	0.000	772.631
211	D2	01	PIPE OD-711X9.53 L=3891	2-80-468-15669	40	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,891.000	0.000	641.431
211	D2	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
212	92	41	PIPE NB700 L=3342 WITH R/L & FL	2-80-468-15669	41	NO			C			00	1.000	0.000	0.000	677.183
212	D3	01	PIPE OD-711X9.53 L=3312	2-80-468-15669	41	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,312.000	0.000	545.983
212	D3	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
213	92	42	PIPE NB700 L=3343 WITH R/L & FL	2-80-468-15669	42	NO			C			00	1.000	0.000	0.000	677.348
213	D4	01	PIPE OD-711X9.53 L=3313	2-80-468-15669	42	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,313.000	0.000	546.148
213	D4	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
214	92	43	PIPE NB700 L=2517 WITH R/L & FL	2-80-468-15669	43	NO			C			00	1.000	0.000	0.000	541.182
214	D5	01	PIPE OD-711X9.53 L=2487	2-80-468-15669	43	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	2,487.000	0.000	409.982
214	D5	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
215	92	44	PIPE NB700 L=4959 WITH R/L & FL	2-80-468-15669	44	NO			C			00	1.000	0.000	0.000	943.746
215	D6	01	PIPE OD-711X9.53 L=4929	2-80-468-15669	44	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	4,929.000	0.000	812.546
215	D6	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
216	92	45	PIPE NB700 L=5750 WITH R/L & FL	2-80-468-15669	45	NO			C			00	1.000	0.000	0.000	1,074.142
216	D7	01	PIPE OD-711X9.53 L=5720	2-80-468-15669	45	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,720.000	0.000	942.942
216	D7	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
217	92	46	PIPE NB700 L=5500 WITH R/L & FL	2-80-468-15669	46	NO			C			00	1.000	0.000	0.000	1,032.929
217	D8	01	PIPE OD-711X9.53 L=5470	2-80-468-15669	46	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,470.000	0.000	901.729
217	D8	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
218	92	47	PIPE NB700 L=3594 WITH R/L & FL	2-80-468-15669	47	NO			C			00	1.000	0.000	0.000	718.725
218	D9	01	PIPE OD-711X9.53 L=3564	2-80-468-15669	47	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,564.000	0.000	587.525
218	D9	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
219	92	48	PIPE NB700 L=3718 WITH R/L & FL	2-80-468-15669	48	NO			C			00	1.000	0.000	0.000	739.167
219	E0	01	PIPE OD-711X9.53 L=3688	2-80-468-15669	48	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,688.000	0.000	607.967
219	E0	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
220	92	49	PIPE NB700 L=3099 WITH R/L & FL	2-80-468-15669	49	NO			C			00	1.000	0.000	0.000	637.125
220	E1	01	PIPE OD-711X9.53 L=3069	2-80-468-15669	49	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,069.000	0.000	505.925
220	E1	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
221	92	50	PIPE NB700 L=2360 WITH R/L & FL	2-80-468-15669	50	NO			C			00	1.000	0.000	0.000	515.301
221	E2	01	PIPE OD-711X9.53 L=2330	2-80-468-15669	50	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	2,330.000	0.000	384.101
221	E2	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
222	92	51	PIPE NB700 L=4482 WITH R/L & FL	2-80-468-15669	51	NO			C			00	1.000	0.000	0.000	865.112
222	E3	01	PIPE OD-711X9.53 L=4452	2-80-468-15669	51	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	4,452.000	0.000	733.912
222	E3	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
223	92	52	PIPE NB700 L=5598 WITH R/L & FL	2-80-468-15669	52	NO			C			00	1.000	0.000	0.000	1,049.085
223	E4	01	PIPE OD-711X9.53 L=5568	2-80-468-15669	52	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,568.000	0.000	917.885
223	E4	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
224	92	53	PIPE NB700 L=5216 WITH R/L & FL	2-80-468-15669	53	NO			C			00	1.000	0.000	0.000	986.112
224	E5	01	PIPE OD-711X9.53 L=5186	2-80-468-15669	53	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,186.000	0.000	854.912
224	E5	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
225	92	54	PIPE NB700 L=2692 WITH R/L & FL	2-80-468-15669	54	NO			C			00	1.000	0.000	0.000	570.031
225	E6	01	PIPE OD-711X9.53 L=2662	2-80-468-15669	54	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	2,662.000	0.000	438.831
225	E6	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
226	92	55	PIPE NB700 L=3837 WITH R/L & FL	2-80-468-15669	55	NO			C			00	1.000	0.000	0.000	758.784
226	E7	01	PIPE OD-711X9.53 L=3807	2-80-468-15669	55	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,807.000	0.000	627.584
226	E7	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
227	92	56	PIPE NB700 L=4814 WITH R/L & FL	2-80-468-15669	56	NO			C			00	1.000	0.000	0.000	919.842
227	E8	01	PIPE OD-711X9.53 L=4784	2-80-468-15669	56	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	4,784.000	0.000	788.642
227	E8	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
228	92	57	PIPE NB700 L=5500 WITH R/L & FL	2-80-468-15669	57	NO			C			00	1.000	0.000	0.000	1,032.929
228	E9	01	PIPE OD-711X9.53 L=5470	2-80-468-15669	57	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,470.000	0.000	901.729
228	E9	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
229	92	58	PIPE NB700 L=4250 WITH R/L & FL	2-80-468-15669	58	NO			C			00	1.000	0.000	0.000	826.867
229	F0	01	PIPE OD-711X9.53 L=4220	2-80-468-15669	58	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	4,220.000	0.000	695.667
229	F0	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
230	92	59	PIPE NB700 L=3750 WITH R/L & FL	2-80-468-15669	59	NO			C			00	1.000	0.000	0.000	744.442
230	F1	01	PIPE OD-711X9.53 L=3720	2-80-468-15669	59	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,720.000	0.000	613.242
230	F1	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
231	92	60	PIPE NB700 L=5100 WITH R/L & FL (VALVE)	2-80-468-15669	60	NO			C			00	1.000	0.000	0.000	966.989
231	F2	01	PIPE OD-711X9.53 L=5070	2-80-468-15669	60	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,070.000	0.000	835.789
231	F2	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	1.000	928.000	928.000	65.600
231	F2	03	F.F.FLANGE NB700 VALVE END	2-80-468-15669	60	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	1.000	10.000	10.000	65.600
232	92	61	PIPE NB700 L=2100 WITH R/L & FL (VALVE)	2-80-468-15669	61	NO			C			00	1.000	0.000	0.000	472.439
232	F3	01	PIPE OD-711X9.53 L=2070	2-80-468-15669	61	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	2,070.000	0.000	341.239
232	F3	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	1.000	928.000	928.000	65.600
232	F3	03	F.F.FLANGE NB700 VALVE END	2-80-468-15669	61	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	1.000	10.000	10.000	65.600
233	92	62	PIPE NB700 L=900 WITH R/L & FL (VALVE)	2-80-468-15669	62	NO			C			00	1.000	0.000	0.000	274.620
233	F4	01	PIPE OD-711X9.53 L=870	2-80-468-15669	62	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	870.000	0.000	143.420
233	F4	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	1.000	928.000	928.000	65.600
233	F4	03	F.F.FLANGE NB700 VALVE END	2-80-468-15669	62	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	1.000	10.000	10.000	65.600
234	92	63	PIPE NB700 L=3600 WITH R/L & FL (VALVE)	2-80-468-15669	63	NO			C			00	1.000	0.000	0.000	719.715
234	F5	01	PIPE OD-711X9.53 L=3570	2-80-468-15669	63	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	3,570.000	0.000	588.515
234	F5	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	1.000	928.000	928.000	65.600
234	F5	03	F.F.FLANGE NB700 VALVE END	2-80-468-15669	63	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	1.000	10.000	10.000	65.600
235	92	64	PIPE NB700 L=6000 WITH R/L & FL (UT FLOW	2-80-468-15669	64	NO			C			00	1.000	0.000	0.000	1,115.354
235	F6	01	PIPE OD-711X9.53 L=5970	2-80-468-15669	64	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,970.000	0.000	984.154
235	F6	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
236	92	65	PIPE NB700 L=6000 WITH R/L & FL (UT FLOW	2-80-468-15669	65	NO			C			00	1.000	0.000	0.000	1,115.354
236	F7	01	PIPE OD-711X9.53 L=5970	2-80-468-15669	65	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,970.000	0.000	984.154
236	F7	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
237	92	66	PIPE NB700 L=5000 WITH R/L & FL	2-80-468-15669	66	NO			C			00	1.000	0.000	0.000	950.504
237	F8	01	PIPE OD-711X9.53 L=4970	2-80-468-15669	66	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	4,970.000	0.000	819.304
237	F8	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
238	92	67	PIPE NB700 L=2500 WITH R/L & FL	2-80-468-15669	67	NO			C			00	1.000	0.000	0.000	538.380
238	F9	01	PIPE OD-711X9.53 L=2470	2-80-468-15669	67	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	2,470.000	0.000	407.180
238	F9	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
239	92	68	PIPE NB700 L=6003 WITH R/L & FL	2-80-468-15669	68	NO			C			00	1.000	0.000	0.000	1,115.849
239	G0	01	PIPE OD-711X9.53 L=5973	2-80-468-15669	68	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	5,973.000	0.000	984.649
239	G0	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
240	92	69	PIPE NB700 L=1000 WITH R/L & FL	2-80-468-15669	69	NO			C			00	1.000	0.000	0.000	1,120.300
240	G1	01	PIPE OD-711X9.53 L=6000	2-80-468-15669	69	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	1.000	6,000.000	0.000	989.100
240	G1	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	2.000	928.000	928.000	131.200
241	92	70	90DEG MITREBEND NB700 L-717/717 R/L&FL	3-80-468-34872	NU	NO			C			00	1.000	0.000	0.000	317.329
241	G2	01	PIPE OD-711X9.53 L=1159	3-80-468-34872	NU	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410184091	159389906000	00	1.000	1,159.000	0.000	186.129
241	G2	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410184091	159421170000	00	2.000	10.000	10.000	131.200
242	92	71	90DEG MITREBEND NB700 L-754/754 R/L&FL	3-80-468-34868	NU	NO			C			00	7.000	0.000	0.000	2,306.605
242	G3	01	PIPE OD-711X9.53 L=1233	3-80-468-34868	NU	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	7.000	1,233.000	0.000	1,388.205
242	G3	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	14.000	928.000	928.000	918.400
243	92	72	45DEG MITREBEND NB700 L-566/566 R/L&FL	3-80-468-34869	NU	NO			C			00	2.000	0.000	0.000	661.336
243	G4	01	PIPE OD-711X9.53 L=1230	3-80-468-34869	NU	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	2.000	1,230.000	0.000	398.936
243	G4	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	4.000	928.000	928.000	262.400
244	92	73	45DEG MITREBEND NB700 L-484/484 R/L&FL	3-80-468-34870	NU	NO			C			00	12.000	0.000	0.000	3,643.596
244	G5	01	PIPE OD-711X9.53 L=1066	3-80-468-34870	NU	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	12.000	1,066.000	0.000	2,069.196
244	G5	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	24.000	928.000	928.000	1,574.400
245	92	74	30DEG MITREBEND NB700 L-484/484 R/L&FL	3-80-468-34871	NU	NO			C			00	4.000	0.000	0.000	1,000.888
245	G6	01	PIPE OD-711X9.53 L=732	3-80-468-34871	NU	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389906000	00	4.000	732.000	0.000	476.088
245	G6	02	F.F.FLANGE NB700 CL-D	3-80-468-34836	02	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410181523	159421170000	00	8.000	928.000	928.000	524.800
245	92	75	PUDDLE FLANGE NB500 WITH R/L COATING	3-80-468-34845	NU	NO			C			00	5.000	10.000	0.000	2,417.135
246	G7	01	PIPE DIA 508 X 10 L=1170	3-80-468-34845	NU	NO	PIPE OD-508X9.53X6000-A134-A283GRD	A134-A283GRD	C	410181523	159389936000	00	5.000	1,170.000	0.000	685.270
246	G7	02	SLEEVE PAD 10X827X1000	3-80-468-34845	NU	NO	PLATE 10.0 MM - SA515GR70	SA515GR70	C	410181523	159421090000	00	10.000	827.000	1,000.000	649.190
246	G7	03	PUDDLE FLANGE PLATE 10X900X900	3-80-468-34845	NU	NO	PLATE 10.0 MM - SA515GR70	SA515GR70	C	410181523	159421090000	00	5.000	900.000	900.000	230.675
246	G7	04	RIB PLATE-1 10X150X395	3-80-468-34845	NU	NO	PLATE 10.0 MM - SA515GR70	SA515GR70	C	410181523	159421090000	00	40.000	150.000	395.000	104.000
246	G7	05	RIB PLATE-2 10X340X395	3-80-468-34845	NU	NO	PLATE 10.0 MM - SA515GR70	SA515GR70	C	410181523	159421090000	00	40.000	340.000	395.000	208.000
246	G7	06	F.F.FLANGE NB500	3-80-468-34835	11	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410181523	159421180000	00	10.000	700.000	700.000	540.000
247	G8	01	PUDDLE FLANGE NB1400PU COATING-OG	3-80-468-34844	NU	NO			C			00	3.000	10.000	0.000	3,381.186

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
247	G9	01	P.F.PIPE OD 1422X10 ; L=1200	3-80-468-34844	NU	NO	PLATE 10.0 MM - SA515GR70	SA515GR70	C	410181523	159421090000	00	3.000	4,436.000	1,200.000	1,253.568
247	G9	02	SLEEVE PAD 12 X 2252X 700	3-80-468-34844	NU	NO	PLATE 12.0 MM - SA515GR70	SA515GR70	C	410181523	159421100000	00	6.000	2,252.000	700.000	890.754
247	G9	03	PUDDLE FLANGE PLATE 16 X 1800 X 1800	3-80-468-34844	NU	NO	PLATE 16.0 MM - SA515GR70	SA515GR70	C	410181523	159421120000	00	3.000	1,800.000	1,800.000	602.040
247	G9	04	RIB PLATE-1 16 X 312X 520	3-80-468-34844	NU	NO	PLATE 16.0 MM - SA515GR70	SA515GR70	C	410181523	159421120000	00	24.000	312.000	520.000	489.048
247	G9	05	RIB PLATE-2 16 X 312X 155	3-80-468-34844	NU	NO	PLATE 16.0 MM - SA515GR70	SA515GR70	C	410181523	159421120000	00	24.000	312.000	155.000	145.776
248	G8	02	90DEG MITREBEND NB1400 (UG) PU COATING	3-80-468-34832	NU	NO			C			00	5.000	10.000	0.000	2,939.430
248	H0	01	P.F.PIPE OD1422X10 L=1719	3-80-468-34834	01	NO	PLATE 10.0 MM - SA515GR70	SA515GR70	C	410181523	159421090000	00	5.000	4,434.000	1,719.000	2,939.430
249	G8	03	45DEG MITREBEND NB1400 (UG) PU COATING	3-80-468-34833	NU	NO			C			00	2.000	10.000	0.000	598.014
249	H1	01	P.F.PIPE OD1422X10 L=879	3-80-468-34834	02	NO	PLATE 10.0 MM - SA515GR70	SA515GR70	C	410181523	159421090000	00	2.000	4,434.000	879.000	598.014
250	H2	01	PIPE NB400 WITH FLANGES R/L (OG) L-2081	3-80-468-35077	01	NO			C			00	1.000	2,081.000	0.000	271.293
250	H3	01	PIPE OD406.4X9.53 L=2051	3-80-468-35077	01	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	1.000	2,051.000	0.000	191.293
250	H3	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	2.000	10.000	0.000	80.000
251	H2	02	PIPE NB400 WITH FLANGES R/L (OG) L-2389	3-80-468-35077	02	NO			C			00	1.000	2,389.000	0.000	300.019
251	H4	01	PIPE OD406.4X9.53 L=2359	3-80-468-35077	02	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	1.000	2,359.000	0.000	220.019
251	H4	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	2.000	10.000	0.000	80.000
252	H2	03	PIPE NB400 WITH FLANGES R/L (OG) L-1650	3-80-468-35077	03	NO			C			00	1.000	1,650.000	0.000	231.094
252	H5	01	PIPE OD406.4X9.53 L=1620	3-80-468-35077	03	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	1.000	1,620.000	0.000	151.094
252	H5	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	2.000	10.000	0.000	80.000
253	H2	04	PIPE NB400 WITH FLANGES R/L (OG) L-3183	3-80-468-35077	04	NO			C			00	1.000	3,183.000	0.000	374.074
253	H6	01	PIPE OD406.4X9.53 L=3153	3-80-468-35077	04	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	1.000	3,153.000	0.000	294.074
253	H6	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	2.000	10.000	0.000	80.000
254	H2	05	PIPE NB400 WITH FLANGES R/L (OG) L-496	3-80-468-35077	05	NO			C			00	1.000	496.000	0.000	123.463
254	H7	01	PIPE OD406.4X9.53 L=466	3-80-468-35077	05	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	1.000	466.000	0.000	43.463
254	H7	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	2.000	10.000	0.000	80.000
255	H2	06	PIPE NB400 WITH FLANGES R/L (OG) L-996	3-80-468-35077	06	NO			C			00	1.000	996.000	0.000	170.097
255	H8	01	PIPE OD406.4X9.53 L=966	3-80-468-35077	06	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	1.000	966.000	0.000	90.097
255	H8	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	2.000	10.000	0.000	80.000
256	H2	07	PIPE NB400 WITH FLANGES R/L (OG) L-2289	3-80-468-35077	07	NO			C			00	1.000	2,289.000	0.000	290.692
256	H9	01	PIPE OD406.4X9.53 L=2259	3-80-468-35077	07	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	1.000	2,259.000	0.000	210.692
256	H9	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	2.000	10.000	0.000	80.000
257	H2	08	PIPE NB400 WITH FLANGES R/L (OG) L-1909	3-80-468-35077	08	NO			C			00	1.000	1,909.000	0.000	255.251
257	I0	01	PIPE OD406.4X9.53 L=1879	3-80-468-35077	08	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	1.000	1,879.000	0.000	175.251
257	I0	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	2.000	10.000	0.000	80.000
258	H2	09	PIPE NB400 WITH FLANGES R/L (OG) L-3455	3-80-468-35077	09	NO			C			00	1.000	3,455.000	0.000	399.443
258	I1	01	PIPE OD406.4X9.53 L=3425	3-80-468-35077	09	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	1.000	3,425.000	0.000	319.443
258	I1	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	2.000	10.000	0.000	80.000
259	H2	10	PIPE NB400 WITH FLANGES R/L (OG) L-1977	3-80-468-35077	10	NO			C			00	1.000	1,977.000	0.000	261.593
259	I2	01	PIPE OD406.4X9.53 L=1947	3-80-468-35077	10	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	1.000	1,947.000	0.000	181.593
259	I2	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	2.000	10.000	0.000	80.000
260	H2	11	PIPE NB400 WITH FLANGES R/L (OG) L-497	3-80-468-35077	11	NO			C			00	1.000	497.000	0.000	123.556
260	I3	01	PIPE OD406.4X9.53 L=467	3-80-468-35077	11	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	1.000	467.000	0.000	43.556
260	I3	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	2.000	10.000	0.000	80.000
261	H2	12	PIPE NB400 WITH FLANGES R/L (OG) L-692	3-80-468-35077	12	NO			C			00	1.000	692.000	0.000	141.743
261	I4	01	PIPE OD406.4X9.53 L=662	3-80-468-35077	12	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	1.000	662.000	0.000	61.743
261	I4	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	2.000	10.000	0.000	80.000
262	H2	13	PIPE NB400 WITH FLANGES R/L (OG) L-255	3-80-468-35077	13	NO			C			00	1.000	255.000	0.000	100.985
262	I5	01	PIPE OD406.4X9.53 L=225	3-80-468-35077	13	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	1.000	225.000	0.000	20.985
262	I5	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	2.000	10.000	0.000	80.000
263	H2	14	PIPE NB400 WITH FLANGES R/L (OG) L-243	3-80-468-35077	14	NO			C			00	1.000	243.000	0.000	99.866
263	I6	01	PIPE OD406.4X9.53 L=213	3-80-468-35077	14	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	1.000	213.000	0.000	19.866
263	I6	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	2.000	10.000	0.000	80.000
264	H2	15	PIPE NB600 WITH FLANGES R/L (OG) L-6000	3-80-468-35090	01	NO			C			00	18.000	6,000.000	0.000	17,011.206
264	I7	01	PIPE OD-610X9.53 L=5970	3-80-468-35090	01	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	18.000	5,970.000	0.000	15,163.686
264	I7	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	36.000	813.000	813.000	1,847.520
265	H2	16	PIPE NB600 WITH FLANGES R/L (OG) L-2030	3-80-468-35090	02	NO			C			00	1.000	2,030.000	0.000	384.860
265	I8	01	PIPE OD-610X9.53 L=2000	3-80-468-35090	02	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	2,000.000	0.000	282.220
265	I8	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	813.000	813.000	102.640
266	H2	17	PIPE NB600 WITH FLANGES R/L (OG) L-3458	3-80-468-35090	03	NO			C			00	1.000	3,458.000	0.000	586.365
266	I9	01	PIPE OD-610X9.53 L=3428	3-80-468-35090	03	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	3,428.000	0.000	483.725
266	I9	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	813.000	813.000	102.640
267	H2	18	PIPE NB600 WITH FLANGES R/L (OG) L-1657	3-80-468-35090	04	NO			C			00	1.000	1,657.000	0.000	332.226
267	J0	01	PIPE OD-610X9.53 L=1627	3-80-468-35090	04	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	1,627.000	0.000	229.586
267	J0	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	813.000	813.000	102.640
268	H2	19	PIPE NB600 WITH FLANGES R/L (OG) L-456	3-80-468-35090	05	NO			C			00	1.000	456.000	0.000	162.753
268	J1	01	PIPE OD-610X9.53 L=426	3-80-468-35090	05	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	426.000	0.000	60.113
268	J1	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	813.000	813.000	102.640
269	H2	20	PIPE NB600 WITH FLANGES R/L (OG) L-459	3-80-468-35090	06	NO			C			00	1.000	459.000	0.000	163.176
269	J2	01	PIPE OD-610X9.53 L=429	3-80-468-35090	06	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	429.000	0.000	60.536
269	J2	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	813.000	813.000	102.640
270	H2	21	PIPE NB600 WITH FLANGES R/L (OG) L-3936	3-80-468-35090	07	NO			C			00	1.000	3,936.000	0.000	653.816
270	J3	01	PIPE OD-610X9.53 L=3906	3-80-468-35090	07	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	3,906.000	0.000	551.176
270	J3	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	813.000	813.000	102.640
271	H2	22	PIPE NB600 WITH FLANGES R/L (OG) L-3256	3-80-468-35090	08	NO			C			00	1.000	3,256.000	0.000	557.861
271	J4	01	PIPE OD-610X9.53 L=3226	3-80-468-35090	08	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	3,226.000	0.000	455.221
271	J4	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	813.000	813.000	102.640
272	H2	23	PIPE NB600 WITH FLANGES R/L (OG) L-5910	3-80-468-35090	09	NO			C			00	1.000	5,910.000	0.000	932.367
272	J5	01	PIPE OD-610X9.53 L=5880	3-80-468-35090	09	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	5,880.000	0.000	829.727
272	J5	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	813.000	813.000	102.640
273	H2	24	PIPE NB600 WITH FLANGES R/L (OG) L-3256	3-80-468-35090	08	NO			C			00	1.000	3,256.000	0.000	557.861
273	J4	01	PIPE OD-610X9.53 L=3226	3-80-468-35090	08	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	3,226.000	0.000	455.221
273	J4	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	813.000	813.000	102.640
274	H2	25	PIPE NB600 WITH FLANGES R/L (OG) L-930	3-80-468-35090	10	NO			C			00	1.000	930.000	0.000	229.639
274	J6	01	PIPE OD-610X9.53 L=900	3-80-468-35090	10	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	900.000	0.000	126.999
274	J6	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	813.000	813.000	102.640
275	H2	26	PIPE NB600 WITH FLANGES R/L (OG) L-2938	3-80-468-35091	01	NO			C			00	1.000	2,938.000	0.000	290.881
275	J7	01	PIPE OD-610X9.53 L=1334	3-80-468-35091	01	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	1,334.000	0.000	188.241
275	J7	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	1.000	10.000	10.000	51.320
275	J7	03	FLANGE NB600 (TP END) HOLD	3-80-468-35091	01	NO	Dummy Material	DUMMY MATERIAL	C	410182598	DUMMYKG	00	1.000	10.000	10.000	51.320
276	J8	01	PIPE NB400 WITH FLANGES R/L (OG) L-1057	3-80-468-35077	15	NO			C			00	3.000	0.000	0.000	527.358
276	J9	01	PIPE OD406.4X9.53 L=1027	3-80-468-35077	15	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	3.000	1,027.000	0.000	287.358
276	J9	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	6.000	10.000	0.000	240.000
277	J8	02	PIPE NB400 WITH FL R/L (L-1573 (VAL)HOLD	3-80-468-35078	00	NO			C			00	3.000	0.000	0.000	671.739
277	K0	01	PIPE OD406.4X9.53 L=1543	3-80-468-35078	00	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	3.000	1,543.000	0.000	431.739
277	K0	02	FLANGE NB400 CL-150	3-80-468-34835	09	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	3.000	10.000	10.000	120.000
277	K0	03	FLANGE NB400 (VALVE END) HOLD	3-80-468-35078	00	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	3.000	10.000	10.000	120.000
278	J8	03	PIPE NB400 WITH FL R/L L-422 (VAL) HOLD	3-80-468-35079	00	NO			C			00	3.000	0.000	0.000	813.879
278	K1	01	PIPE OD406.4X9.53 L=2051	3-80-468-35079	00	NO	PIPE OD-406.4X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389916000	00	3.000	2,051.000	0.000	573.879
278	K1	02	FLANGE NB400 (VALVE END) HOLD	3-80-468-35079	00	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	3.000	10.000	10.000	120.000
278	K1	03	FLANGE NB400 (VALVE END) HOLD	3-80-468-35079	00	NO	PLATE 40.0 MM - SA515GR70	SA515GR70	C	410182598	159421170000	00	3.000	10.000	10.000	120.000
279	J8	04	PIPE NB600 WITH FLANGES R/L (OG) L-6000	3-80-468-35090	01	NO			C			00	6.000	6,000.000	0.000	5,670.402
279	I7	01	PIPE OD-610X9.53 L=5970	3-80-468-35090	01	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	6.000	5,970.000	0.000	5,054.562
279	I7	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	12.000	813.000	813.000	615.840
280	J8	05	PIPE NB600 WITH FLANGES R/L (OG) L-2942	3-80-468-35090	13	NO			C			00	2.000	2,942.000	0.000	1,027.104
280	K2	01	PIPE OD-610X9.53 L=2912	3-80-468-35090	13	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	2.000	2,912.000	0.000	821.824
280	K2	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	4.000	813.000	813.000	205.280
281	J8	06	PIPE NB600 WITH FLANGES R/L (OG) L-4527	3-80-468-35090	14	NO			C			00	1.000	4,527.000	0.000	737.212
281	K3	01	PIPE OD-610X9.53 L=4497	3-80-468-35090	14	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	4,497.000	0.000	634.572
281	K3	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	813.000	813.000	102.640
282	J8	07	PIPE NB600 WITH FLANGES R/L (OG) L-2899	3-80-468-35090	15	NO			C			00	1.000	2,899.000	0.000	507.485
282	K4	01	PIPE OD-610X9.53 L=2869	3-80-468-35090	15	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	2,869.000	0.000	404.845
282	K4	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	813.000	813.000	102.640
283	J8	08	PIPE NB600 WITH FLANGES R/L (OG) L-3279	3-80-468-35090	16	NO			C			00	1.000	3,279.000	0.000	561.106
283	K5	01	PIPE OD-610X9.53 L=3249	3-80-468-35090	16	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	3,249.000	0.000	458.466
283	K5	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	813.000	813.000	102.640
284	J8	09	PIPE NB600 WITH FL R/L L-1364 (TP) HOLD	3-80-468-35091	01	NO			C			00	3.000	1,364.000	0.000	872.643
284	J7	01	PIPE OD-610X9.53 L=1334	3-80-468-35091	01	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	3.000	1,334.000	0.000	564.723
284	J7	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	3.000	10.000	10.000	153.960
284	J7	03	FLANGE NB600 (TP END) HOLD	3-80-468-35091	01	NO	Dummy Material	DUMMY MATERIAL	C	410182598	DUMMYKG	00	3.000	10.000	10.000	153.960
285	J8	10	PIPE NB600 WIT STUB&FL R/L L-849 VALHOLD	3-80-468-35092	00	NO			C			00	3.000	0.000	0.000	674.700
285	K6	01	PIPE OD-610X9.53 L=819	3-80-468-35092	00	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	3.000	819.000	0.000	346.707
285	K6	02	FLANGE NB600 (VALVE)-HOLD	3-80-468-35092	00	NO	Dummy Material	DUMMY MATERIAL	C	410182598	DUMMYKG	00	3.000	10.000	10.000	153.960
285	K6	03	FLANGE NB600 (VALVE)) HOLD	3-80-468-35092	00	NO	Dummy Material	DUMMY MATERIAL	C	410182598	DUMMYKG	00	3.000	10.000	10.000	153.960
285	K6	04	PIPE OD-114.3X4.78 L=100	3-80-468-35092	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410182598	159389756000	00	3.000	100.000	0.000	3.873
285	K6	05	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410182598	159421140000	00	3.000	230.000	230.000	16.200
286	J8	11	PIPE NB600 WIT 200 BRANCH &FL R/L L-6000	3-80-468-35093	00	NO			C			00	1.000	0.000	0.000	962.423
286	K7	01	PIPE OD-610X9.53 L=5970	3-80-468-35093	00	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	5,970.000	0.000	842.427
286	K7	02	F.F.FLANGE NB600 CL-D SA515GR70	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	813.000	813.000	102.640
286	K7	03	PIPE OD-219.1X5.56 L=200	3-80-468-35093	00	NO	PIPE OD-219.1X5.56X6000-A53-GRB	A53-GRB	C	410182598	159389776000	00	1.000	200.000	0.000	5.856
286	K7	04	F.F.FLANGE NB200 CL-150	3-80-468-34835	05	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410182598	159421990000	00	1.000	10.000	10.000	11.500
287	J8	12	PIPE NB600 WITH STUBS & FL R/L L-4895	3-80-468-35094	00	NO			C			00	1.000	0.000	0.000	815.904
287	K8	01	PIPE OD-610X9.53 L=4865	3-80-468-35094	00	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	1.000	4,865.000	0.000	686.500
287	K8	02	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	2.000	10.000	10.000	102.640
287	K8	03	PIPE OD-114.3X4.78 L=100	3-80-468-35094	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410182598	159389756000	00	4.000	100.000	0.000	5.164
287	K8	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410182598	159421140000	00	4.000	230.000	230.000	21.600
288	J8	13	PIPE NB600 WIT STUB&FL R/L L-3947 VALHOL	3-80-468-35095	00	NO			C			00	3.000	0.000	0.000	1,986.177
288	K9	01	PIPE OD-610X9.53 L=3917	3-80-468-35095	00	NO	PIPE OD-610X9.53X6000-A134-A283GRD	A134-A283GRD	C	410182598	159389946000	00	3.000	3,917.000	0.000	1,658.184

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
288	K9	02	F.F.FLANGE NB600 CL-D	3-80-468-34836	01	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410182598	159421160000	00	3.000	10.000	10.000	153.960
288	K9	03	PIPE OD-114.3X4.78 L=100	3-80-468-35095	00	NO	PIPE OD-114.3X4.78X6000-A53-GRB	A53-GRB	C	410182598	159389756000	00	3.000	100.000	0.000	3.873
288	K9	04	F.F.FLANGE NB100 CL-150	3-80-468-34835	02	NO	PLATE 25 - SA515GR70	SA515GR70	C	410182598	159421140000	00	3.000	230.000	230.000	16.200
288	K9	05	FLANGE NB600 (VALVE END) HOLD	3-80-468-35095	00	NO	Dummy Material	DUMMY MATERIAL	C	410182598	DUMMYKG	00	3.000	10.000	10.000	153.960
289	L0	01	PIPE NB900 WIT FL&SADDLE R/L L-656 HOLD	3-80-468-35113	00	NO			C			00	1.000	656.000	0.000	538.408
289	L1	01	PIPE OD-914X9.53 L= 626	3-80-468-35113	00	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182598	159389888000	00	1.000	626.000	0.000	133.056
289	L1	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182598	159421180000	00	1.000	1,168.000	1,168.000	120.162
289	L1	03	BOTTOM PLATE 20X300X900 SA/IS2062	3-80-468-35113	00	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	150111500000	00	1.000	300.000	900.000	42.390
289	L1	04	PAD PLATE 10X600X1042 SA/IS2062	3-80-468-35113	00	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	152110980000	00	1.000	600.000	1,042.000	49.063
289	L1	05	MIDDLE PLATE 16X490X800 SA/IS2062	3-80-468-35113	00	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	150110260000	00	1.000	490.000	800.000	49.235
289	L1	06	STIFFNER PL-1 10X120X372 SA/IS2062	3-80-468-35113	00	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	152110980000	00	4.000	120.000	372.000	14.016
289	L1	07	STIFFNER PL-2 10X120X274 SA/IS2062	3-80-468-35113	00	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	152110980000	00	4.000	120.000	274.000	10.324
289	L1	08	FLANGE NB900 (VALVE) HOLD	3-80-468-35113	00	NO	Dummy Material	DUMMY MATERIAL	C	410182598	DUMMYKG	00	1.000	10.000	10.000	120.162
290	L0	02	PIPE NB900 WITH STUB&FL R/L L-656 HOLD	3-80-468-35114	00	NO			C			00	1.000	656.000	0.000	384.843
290	L2	01	PIPE OD-914X9.53 L= 626	3-80-468-35114	00	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182598	159389888000	00	1.000	626.000	0.000	133.056
290	L2	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182598	159421180000	00	1.000	1,168.000	1,168.000	120.162
290	L2	03	PIPE OD-168.3X5.56X6000-A53-GRB	3-80-468-35114	00	NO	PIPE OD-168.3X5.56X6000-A53-GRB	A53-GRB	C	410182598	159389766000	00	1.000	200.000	0.000	4.463
290	L2	04	F.F.FLANGE NB150 CL-150	3-80-468-34835	04	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410182598	159421990000	00	1.000	10.000	10.000	7.000
290	L2	05	FLANGE NB900 (VALVE) HOLD	3-80-468-35114	00	NO	Dummy Material	DUMMY MATERIAL	C	410182598	DUMMYKG	00	1.000	10.000	10.000	120.162
291	L0	03	PIPE NB900 WITH FL R/L L-821 (VAL)HOLD	3-80-468-35115	00	NO			C			00	1.000	821.000	0.000	408.901
291	L3	01	PIPE OD-914X9.53 L= 791	3-80-468-35115	00	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182598	159389888000	00	1.000	791.000	0.000	168.127
291	L3	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182598	159421180000	00	1.000	1,168.000	1,168.000	120.162
291	L3	04	FLANGE NB900 (VAL) HOLD	3-80-468-35115	00	NO	Dummy Material	DUMMY MATERIAL	C	410182598	DUMMYKG	00	1.000	10.000	10.000	120.612
292	L0	04	PIPE NB900 WIT FL&SADDLE&STUB R/L L-6M	3-80-468-35116	00	NO			C			00	1.000	6,000.000	0.000	1,685.739
292	L4	01	PIPE OD-914X9.53 L= 5970	3-80-468-35116	00	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182598	159389888000	00	1.000	5,970.000	0.000	1,268.924
292	L4	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182598	159421180000	00	2.000	1,168.000	1,168.000	240.324
292	L4	03	BOTTOM PLATE 20X300X900 SA/IS2062	3-80-468-35116	00	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	150111500000	00	1.000	300.000	900.000	42.390
292	L4	04	PAD PLATE 10X600X1042 SA/IS2062	3-80-468-35116	00	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	152110980000	00	1.000	600.000	1,042.000	49.063
292	L4	05	MIDDLE PLATE 16X490X800 SA/IS2062	3-80-468-35116	00	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	150110260000	00	1.000	490.000	800.000	49.235
292	L4	06	STIFFNER PL-1 10X120X372 SA/IS2062	3-80-468-35116	00	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	152110980000	00	4.000	120.000	372.000	14.016
292	L4	07	STIFFNER PL-2 10X120X274 SA/IS2062	3-80-468-35116	00	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	152110980000	00	4.000	120.000	274.000	10.324
292	L4	08	PIPE OD-168.3X5.56X6000-A53-GRB	3-80-468-35116	00	NO	PIPE OD-168.3X5.56X6000-A53-GRB	A53-GRB	C	410182598	159389766000	00	1.000	200.000	0.000	4.463
292	L4	09	F.F.FLANGE NB150 CL-150	3-80-468-34835	04	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410182598	159421990000	00	1.000	10.000	10.000	7.000
293	L0	05	PIPE NB900 WIT ARV&FL R/L (OG) L-496	3-80-468-35117	00	NO			C			00	1.000	496.000	0.000	350.835
293	L5	01	PIPE OD-914X9.53 L= 466	3-80-468-35117	00	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182598	159389888000	00	1.000	466.000	0.000	99.048
293	L5	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182598	159421180000	00	2.000	1,168.000	1,168.000	240.324
293	L5	03	PIPE OD-168.3X5.56X6000-A53-GRB	3-80-468-35117	00	NO	PIPE OD-168.3X5.56X6000-A53-GRB	A53-GRB	C	410182598	159389766000	00	1.000	200.000	0.000	4.463
293	L5	04	F.F.FLANGE NB150 CL-150	3-80-468-34835	04	NO	PLATE 30.0 MM - SA515GR70	SA515GR70	C	410182598	159421990000	00	1.000	10.000	10.000	7.000
294	L0	06	PIPE NB900 WIT FL&SADDLE R/L L-2890 HOLD	3-80-468-35118	00	NO			C			00	1.000	2,890.000	0.000	1,013.245
294	L6	01	PIPE OD-914X9.53 L= 2860	3-80-468-35118	00	NO	PIPE OD-914X9.53X8000-A134-A283GRD	A134-A283GRD	C	410182598	159389888000	00	1.000	2,860.000	0.000	607.893
294	L6	02	F.F.FLANGE NB900 CL-D	3-80-468-34836	04	NO	PLATE 45.0 MM - SA515GR70	SA515GR70	C	410182598	159421180000	00	1.000	1,168.000	1,168.000	120.162
294	L6	03	BOTTOM PLATE 20X300X900 SA/IS2062	3-80-468-35118	00	NO	PLATE 20.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	150111500000	00	1.000	300.000	900.000	42.390
294	L6	04	PAD PLATE 10X600X1042 SA/IS2062	3-80-468-35118	00	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	152110980000	00	1.000	600.000	1,042.000	49.063
294	L6	05	MIDDLE PLATE 16X490X800 SA/IS2062	3-80-468-35118	00	NO	PLATE 16.0 MM - IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	150110260000	00	1.000	490.000	800.000	49.235
294	L6	06	STIFFNER PL-1 10X120X372 SA/IS2062	3-80-468-35118	00	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	152110980000	00	4.000	120.000	372.000	14.016
294	L6	07	STIFFNER PL-2 10X120X274 SA/IS2062	3-80-468-35118	00	NO	PLATE 10 MM-IS2062E250A(Fe410W)	IS2062E250GRA	C	410182598	152110980000	00	4.000	120.000	274.000	10.324
294	L6	08	FLANGE NB900 (VALVE) HOLD	3-80-468-35118	00	NO	Dummy Material	DUMMY MATERIAL	C	410182598	DUMMYKG	00	1.000	10.000	10.000	120.162
295	15	04	PIPE OD711X9.53 L-6MWITH FL. (R/L)-O.G	2-80-468-15581	NU	NO			C	410183482		01	69.000	0.000	0.000	76,956.942
295	17	01	PIPE OD-711X9.53X5970-A134-A283GRD	2-80-468-15581	NU	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410177244	159389906000	01	69.000	5,970.000	0.000	67,906.626
295	17	02	F.F.FLANGE NB700 SA515GR70	2-80-468-15581	NU	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410177244	159421160000	01	138.000	928.000	928.000	9,050.316
296	15	05	PIPE OD711X9.53 L-6MWITH FL. (R/L)-O.G	2-80-468-15581	NU	NO			C	410183482		01	46.000	0.000	0.000	51,304.628
296	17	01	PIPE OD-711X9.53X5970-A134-A283GRD	2-80-468-15581	NU	NO	PIPE OD-711X9.53X6000-A134-A283GRD	A134-A283GRD	C	410177244	159389906000	01	46.000	5,970.000	0.000	45,271.084
296	17	02	F.F.FLANGE NB700 SA515GR70	2-80-468-15581	NU	NO	PLATE 35.0 MM - SA515GR70	SA515GR70	C	410177244	159421160000	01	92.000	928.000	928.000	6,033.544
297	L7	01	PIPEOD 114.3X3.05 L=1000M EP-STY-D-108.2		NU	M	PIPEOD 114.3 X 3.05X 6000 - SA790-S32205	SA790-S32205	C		154550036000	00	1,000.000	0.000	0.000	8,370.000
298	L7	02	PIPE OD-457X4.78 L=350M EP-D-447.5 SHOP		NU	M	PIPE OD-457X4.78X6000-SA790-S32205	SA790-S32205	C		154550146000	00	350.000	0.000	0.000	18,656.750
299	L8	01	PIPE NB1400 L=5M (OG-PU COAT)WITH SADDLE	3-80-468-35506	01	NO			C			00	1.000	0.000	0.000	1,866.855
299	L9	01	P.F. PIPE OD1422X10 L=5000	3-80-468-35505	01	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410186756	159420400000	00	1.000	5,000.000	4,344.000	1,705.020
299	L9	02	SADDLE SUPPORT NB1400	3-80-468-35541	NU	NO			C	410186756		00	1.000	0.000	0.000	161.835
299	M0	01	BOTTOM PLATE 20X300X1230	3-80-468-35541	NU	NO	PLATE 20MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111850000	00	1.000	300.000	1,230.000	57.933
299	M0	02	PAD PLATE 12X250X1502	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	250.000	1,502.000	35.419
299	M0	03	MIDDLE PLATE 16X449X1130	3-80-468-35541	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111800000	00	1.000	449.000	1,130.000	63.679
299	M0	04	STIFFNER PLATE-1,12X100X320	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	320.000	3.014
299	M0	05	STIFFNER PLATE -2, 12X100X190	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	190.000	1.790
300	L8	02	PIPE NB1400 L=5M (OG-PU COAT)WITH SADDLE	3-80-468-35506	01	NO			C			00	1.000	0.000	0.000	1,866.855
300	L9	01	P.F. PIPE OD1422X10 L=5000	3-80-468-35505	01	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410186756	159420400000	00	1.000	5,000.000	4,344.000	1,705.020
300	L9	02	SADDLE SUPPORT NB1400	3-80-468-35541	NU	NO			C	410186756		00	1.000	0.000	0.000	161.835
300	M0	01	BOTTOM PLATE 20X300X1230	3-80-468-35541	NU	NO	PLATE 20MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111850000	00	1.000	300.000	1,230.000	57.933
300	M0	02	PAD PLATE 12X250X1502	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	250.000	1,502.000	35.419
300	M0	03	MIDDLE PLATE 16X449X1130	3-80-468-35541	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111800000	00	1.000	449.000	1,130.000	63.679
300	M0	04	STIFFNER PLATE-1,12X100X320	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	320.000	3.014
300	M0	05	STIFFNER PLATE -2, 12X100X190	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	190.000	1.790
301	L8	03	PIPE NB1400 L=5M (OG-PU COAT)WITH SADDLE	3-80-468-35506	02	NO			C			00	1.000	0.000	0.000	335.870
301	M1	01	P.F. PIPE OD1422X10 L=5000	3-80-468-35505	01	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410186756	159420400000	00	1.000	500.000	4,434.000	174.035
301	M1	02	SADDLE SUPPORT NB1400	3-80-468-35541	NU	NO			C	410186756		00	1.000	0.000	0.000	161.835
301	M0	01	BOTTOM PLATE 20X300X1230	3-80-468-35541	NU	NO	PLATE 20MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111850000	00	1.000	300.000	1,230.000	57.933
301	M0	02	PAD PLATE 12X250X1502	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	250.000	1,502.000	35.419
301	M0	03	MIDDLE PLATE 16X449X1130	3-80-468-35541	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111800000	00	1.000	449.000	1,130.000	63.679
301	M0	04	STIFFNER PLATE-1,12X100X320	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	320.000	3.014
301	M0	05	STIFFNER PLATE -2, 12X100X190	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	190.000	1.790
302	L8	04	PIPE NB1400 L=5M (OG-PU COAT)WITH SADDLE	3-80-468-35506	03	NO			C			00	1.000	0.000	0.000	1,902.180
302	M2	01	P.F. PIPE OD1422X10 L=5000	3-80-468-35505	01	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410186756	159420400000	00	1.000	5,000.000	4,434.000	1,740.345
302	M2	02	SADDLE SUPPORT NB1400	3-80-468-35541	NU	NO			C	410186756		00	1.000	0.000	0.000	161.835
302	M0	01	BOTTOM PLATE 20X300X1230	3-80-468-35541	NU	NO	PLATE 20MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111850000	00	1.000	300.000	1,230.000	57.933
302	M0	02	PAD PLATE 12X250X1502	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	250.000	1,502.000	35.419
302	M0	03	MIDDLE PLATE 16X449X1130	3-80-468-35541	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111800000	00	1.000	449.000	1,130.000	63.679
302	M0	04	STIFFNER PLATE-1,12X100X320	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	320.000	3.014
302	M0	05	STIFFNER PLATE -2, 12X100X190	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	190.000	1.790
303	L8	05	PIPE NB1400 L=5M (OG-PU COAT)WITH SADDLE	3-80-468-35506	04	NO			C			00	1.000	0.000	0.000	1,902.180
303	M3	01	P.F. PIPE OD1422X10 L=5000	3-80-468-35505	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410186756	159420400000	00	1.000	5,000.000	4,434.000	1,740.345
303	M3	02	SADDLE SUPPORT NB1400	3-80-468-35541	NU	NO			C	410186756		00	1.000	0.000	0.000	161.835
303	M0	01	BOTTOM PLATE 20X300X1230	3-80-468-35541	NU	NO	PLATE 20MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111850000	00	1.000	300.000	1,230.000	57.933
303	M0	02	PAD PLATE 12X250X1502	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	250.000	1,502.000	35.419
303	M0	03	MIDDLE PLATE 16X449X1130	3-80-468-35541	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111800000	00	1.000	449.000	1,130.000	63.679
303	M0	04	STIFFNER PLATE-1,12X100X320	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	320.000	3.014
303	M0	05	STIFFNER PLATE -2, 12X100X190	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	190.000	1.790
304	L8	06	PIPE NB1400 L=7.5M(OG-PU COAT)WIT SADDLE	3-80-468-35507	NU	NO			C			00	1.000	0.000	0.000	2,772.353
304	M4	01	P.F. PIPE OD1422X10 L=7500	3-80-468-35505	02	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410186756	159420400000	00	1.000	7,500.000	4,434.000	2,610.518
304	M4	02	SADDLE SUPPORT NB1400	3-80-468-35541	NU	NO			C	410186756		00	1.000	0.000	0.000	161.835
304	M0	01	BOTTOM PLATE 20X300X1230	3-80-468-35541	NU	NO	PLATE 20MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111850000	00	1.000	300.000	1,230.000	57.933
304	M0	02	PAD PLATE 12X250X1502	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	250.000	1,502.000	35.419
304	M0	03	MIDDLE PLATE 16X449X1130	3-80-468-35541	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111800000	00	1.000	449.000	1,130.000	63.679
304	M0	04	STIFFNER PLATE-1,12X100X320	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	320.000	3.014
304	M0	05	STIFFNER PLATE -2, 12X100X190	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	190.000	1.790
305	L8	07	PIPE NB1400 L=5M (OG-PU COAT)WITH SADDLE	3-80-468-35506	05	NO			C			00	1.000	0.000	0.000	1,902.180
305	M5	01	P.F. PIPE OD1422X10 L=5000	3-80-468-35505	01	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410186756	159420400000	00	1.000	5,000.000	4,434.000	1,740.345
305	M5	02	SADDLE SUPPORT NB1400	3-80-468-35541	NU	NO			C	410186756		00	1.000	0.000	0.000	161.835
305	M0	01	BOTTOM PLATE 20X300X1230	3-80-468-35541	NU	NO	PLATE 20MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111850000	00	1.000	300.000	1,230.000	57.933
305	M0	02	PAD PLATE 12X250X1502	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	250.000	1,502.000	35.419
305	M0	03	MIDDLE PLATE 16X449X1130	3-80-468-35541	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111800000	00	1.000	449.000	1,130.000	63.679
305	M0	04	STIFFNER PLATE-1,12X100X320	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	320.000	3.014
305	M0	05	STIFFNER PLATE -2, 12X100X190	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	190.000	1.790
306	L8	08	PIPE NB1400 L=5M (OG-PU COAT)WITH SADDLE	3-80-468-35506	06	NO			C			00	1.000	0.000	0.000	1,902.180
306	M6	01	P.F. PIPE OD1422X10 L=5000	3-80-468-35505	NU	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410186756	159420400000	00	1.000	5,000.000	4,434.000	1,740.345
306	M6	02	SADDLE SUPPORT NB1400	3-80-468-35541	NU	NO			C	410186756		00	1.000	0.000	0.000	161.835
306	M0	01	BOTTOM PLATE 20X300X1230	3-80-468-35541	NU	NO	PLATE 20MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111850000	00	1.000	300.000	1,230.000	57.933
306	M0	02	PAD PLATE 12X250X1502	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	250.000	1,502.000	35.419
306	M0	03	MIDDLE PLATE 16X449X1130	3-80-468-35541	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111800000	00	1.000	449.000	1,130.000	63.679
306	M0	04	STIFFNER PLATE-1,12X100X320	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	320.000	3.014
306	M0	05	STIFFNER PLATE -2, 12X100X190	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	190.000	1.790
307	L8	09	PIPE NB1400 L=7680(OG-PU COAT)WIT SADDLE	3-80-468-35508	NU	NO			C			00	1.000	0.000	0.000	2,834.996
307	M7	01	P.F. PIPE OD1422X10 L=7680	3-80-468-35505	03	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410186756	159420400000	00	1.000	7,680.000	4,434.000	2,673.161
307	M7	02	SADDLE SUPPORT NB1400	3-80-468-35541	NU	NO			C	410186756		00	1.000	0.000	0.000	161.835
307	M0	01	BOTTOM PLATE 20X300X1230	3-80-468-35541	NU	NO	PLATE 20MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111850000	00	1.000	300.000	1,230.000	57.933
307	M0	02	PAD PLATE 12X250X1502	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	250.000	1,502.000	35.419
307	M0	03	MIDDLE PLATE 16X449X1130	3-80-468-35541	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111800000	00	1.000	449.000	1,130.000	63.679
307	M0	04	STIFFNER PLATE-1,12X100X320	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	320.000	3.014
307	M0	05	STIFFNER PLATE -2, 12X100X190	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	190.000	1.790
308	L8	10	PIPE NB1400 L=2.7M(OG-PU COAT)WIT SADDLE	3-80-468-35509	NU	NO			C			00	1.000	0.000	0.000	1,101.637
308	M8	01	P.F. PIPE OD1422X10 L=2700	3-80-468-35505	04	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410186756	159420400000	00	1.000	2,700.000	4,434.000	939.802
308	M8	02	SADDLE SUPPORT NB1400	3-80-468-35541	NU	NO			C	410186756		00	1.000	0.000	0.000	161.835
308	M0	01	BOTTOM PLATE 20X300X1230	3-80-468-35541	NU	NO	PLATE 20MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111850000	00	1.000	300.000	1,230.000	57.933
308	M0	02	PAD PLATE 12X250X1502	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	250.000	1,502.000	35.419
308	M0	03	MIDDLE PLATE 16X449X1130	3-80-468-35541	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111800000	00	1.000	449.000	1,130.000	63.679
308	M0	04	STIFFNER PLATE-1,12X100X320	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	320.000	3.014
308	M0	05	STIFFNER PLATE -2, 12X100X190	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	190.000	1.790
309	L8	11	PIPE NB1400 L=6376(OG-PU COAT)WIT SADDLE	3-80-468-35510	NU	NO			C			00	1.000	0.000	0.000	2,542.944

DU No.	Bom No	Item No	Description	Drawing Number	Var	Unit	Material Description	Specification	Attestation Ind	Notification	Material	Rev	Quantity	Size 1	Size 2	Weight (KG)
309	M9	01	P.F. PIPE OD1422X10 L=6376	3-80-468-35505	05	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410186756	159420400000	00	1.000	6,376.000	4,434.000	2,219.274
309	M9	02	SADDLE SUPPORT NB1400	3-80-468-35541	NU	NO			C	410186756		00	2.000	0.000	0.000	323.670
309	M0	01	BOTTOM PLATE 20X300X1230	3-80-468-35541	NU	NO	PLATE 20MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111850000	00	2.000	300.000	1,230.000	115.866
309	M0	02	PAD PLATE 12X250X1502	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	2.000	250.000	1,502.000	70.838
309	M0	03	MIDDLE PLATE 16X449X1130	3-80-468-35541	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111800000	00	2.000	449.000	1,130.000	127.358
309	M0	04	STIFFNER PLATE-1,12X100X320	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	2.000	100.000	320.000	6.028
309	M0	05	STIFFNER PLATE -2, 12X100X190	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	2.000	100.000	190.000	3.580
310	L8	12	PIPE NB1400 L=3949(OG-PU COAT)WIT SADDLE	3-80-468-35511	NU	NO			C			00	1.000	0.000	0.000	1,536.370
310	N0	01	P.F. PIPE OD1422X10 L=3949	3-80-468-35505	06	NO	PLATE-10X2500X5100-SA515GR60	SA515GR60	C	410186756	159420400000	00	1.000	3,949.000	4,434.000	1,374.535
310	N0	02	SADDLE SUPPORT NB1400	3-80-468-35541	NU	NO			C	410186756		00	1.000	0.000	0.000	161.835
310	M0	01	BOTTOM PLATE 20X300X1230	3-80-468-35541	NU	NO	PLATE 20MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111850000	00	1.000	300.000	1,230.000	57.933
310	M0	02	PAD PLATE 12X250X1502	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	250.000	1,502.000	35.419
310	M0	03	MIDDLE PLATE 16X449X1130	3-80-468-35541	NU	NO	PLATE 16MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111800000	00	1.000	449.000	1,130.000	63.679
310	M0	04	STIFFNER PLATE-1,12X100X320	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	320.000	3.014
310	M0	05	STIFFNER PLATE -2, 12X100X190	3-80-468-35541	NU	NO	PLATE 12MM - ASMESAIS2062E250A	ASMESAIS2062E250A	C	410186756	150111790000	00	1.000	100.000	190.000	1.790

	DOCUMENT TITLE: ESTIMATED BILL OF MATERIALS FOR COOLING WATER SUPPLY & RETURN SYSTEM		**DOCUMENT NO: PC:7328:01**	**REV NO: 00 DATE :05.06.18**
	PROJECT TITLE: MAITREE 2x660MW	**PREPARED BY**	**CHECKED BY:**	**APPROVED BY:**	**Document Referred:**
	CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH	**JITENDRA**	**VENKAT**	**SARAVANAN C**	**MAITREE-01-QHX-MFB-550001-PCC, Maitree-00-LB-MB-00307-31623-PC**
		THIS BOM IS FOR ONE UNIT ONLY*			

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			ELBOW			REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		PRESS. Kg/cm^2 (g)	TEMP (^{o}C)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
1.00	COOLING WATER SYSTEM																			
1.01	COOLING WATER SUPPLY HEADER	12	60	ASTM A53 Gr.B	273.1	6.00	100	1.5D	90	15	250/200	1	250/150 250/80	1 2				STUBS NB50 STUBS NB25 STUBS NB15	1 2 2	STUBS RC 1"-2 NO.S
		12	60	ASTM A53 Gr.B	219.1	6.00	310	1.5D	90	20	200/100	1	200/100 200/80	1 1				STUBS NB50 STUBS NB40 STUBS NB25	1 2 12	
		12	60	ASTM A53 Gr.B	114.3	5.40	30				100/80	1	100/50	1						
1.02	COOLING WATER RETURN HEADER	12	60	ASTM A53 Gr.B	273.1	6.00	100	1.5D	90	13	250/200	1	250/150 250/80	1 1				STUBS NB50 STUBS NB25 STUBS NB15	1 3 2	STUBS RC 1"-2 NO.S
		12	60	ASTM A53 Gr.B	219.1	6.00	310	1.5D	90	20	200/100	1	200/100 200/80	1 1				STUBS NB50 STUBS NB40 STUBS NB25	1 3 12	
		12	60	ASTM A53 Gr.B	114.3	5.40	30				100/80	1	100/50	1						
1.03	COOLING WATER SUPPLY TO MILLS	12	60	ASTM A53 Gr.B	168.3	5.40	33	1.5D	90	1	150/100	1	150/80	2						
		12	60	ASTM A53 Gr.B	114.3	5.40	23				100/80	1	100/80	2						
		12	60	ASTM A53 Gr.B	88.9	4.85	85	1.5D	90	25			80	7				STUBS NB15	12	STUBS RC 1"-6 NO.S
1.04	COOLING WATER RETURN FROM MILLS	12	60	ASTM A53 Gr.B	168.3	5.40	33	1.5D	90	1	150/100	1	150/80	2						
		12	60	ASTM A53 Gr.B	114.3	5.40	23				100/80	1	100/80	2						
		12	60	ASTM A53 Gr.B	88.9	4.85	85	1.5D	90	25			80	7				STUBS NB15 STUBS NB25	12 12	STUBS RC 1"-12 NO.S
1.05	TO ACCESS DOOR	12	60	ASTM A53 Gr.B	33.4	4.05	40	1.5D	90	10								STUBS NB15	1	ADAPTORS NB80/NB25 RC 1" - 01 NO
1.06	FROM ACCESS DOOR	12	60	ASTM A53 Gr.B	33.4	4.05	40	1.5D	90	10								STUBS NB15 STUBS NB25	1 1	ADAPTORS NB80/NB25 RC 1" - 01 NO

	DOCUMENT TITLE: ESTIMATED BILL OF MATERIALS FOR COOLING WATER SUPPLY & RETURN SYSTEM		**DOCUMENT NO: PC:7328:01**	**REV NO: 00 DATE :05.06.18**
	PROJECT TITLE: MAITREE 2x660MW	**PREPARED BY**	**CHECKED BY:**	**APPROVED BY:**	**Document Referred:**
	CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH	**JITENDRA**	**VENKAT**	**SARAVANAN C**	**MAITREE-01-QHX-MFB-550001-PCC, Maitree-00-LB-MB-00307-31623-PC**
		THIS BOM IS FOR ONE UNIT ONLY*			

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			ELBOW			REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		PRESS. Kg/cm^2 (g)	TEMP (^oC)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
1.07	TO EMERGENCY FILL PUMP	12	60	ASTM A53 Gr.B	88.9	4.85	16	1.5D	90	6			80	1				STUBS NB15	2	
1.08	FROM EMERGENCY FILL PUMP	12	60	ASTM A53 Gr.B	60.3	4.50	6	1.5D	90	2			50	1				STUBS NB15	2	
1.09	TO ECW TANK	12	60	ASTM A53 Gr.B	60.3	4.50	75	1.5D	90	17			50/40	1				STUBS NB15	1	
1.10	ECW TANK OVERFLOW	12	60	ASTM A53 Gr.B	60.3	4.50	3	1.5D	90	1										
1.11	ECW TANK DRAIN	12	60	ASTM A53 Gr.B	60.3	4.50	70	1.5D	90	17			50	1						
1.12	EMERGENCY COOLING WATER SUPPLY TO LP COOLERS FROM ECW TANK	12	60	ASTM A53 Gr.B	88.9	4.85	80	1.5D	90	16										
1.13	TO SCAFFOLD	12	60	ASTM A53 Gr.B	48.3	4.05	10	1.5D	90	3	40/25	1	40/25	1						
		12	60	ASTM A53 Gr.B	33.4	4.05	60	1.5D	90	20								STUBS NB15	2	ADAPTORS NB80/NB25 RC 1" - 02 NO.S
1.14	FROM SCAFFOLD	12	60	ASTM A53 Gr.B	48.3	4.05	60	1.5D	90	10	40/25	2	40	1						
		12	60	ASTM A53 Gr.B	33.4	4.05	60	1.5D	90	16								STUBS NB15 STUBS NB25	2 2	ADAPTORS NB80/NB25 RC 1" - 02 NO.S
1.15	TO LP COOLER MOTOR	12	60	ASTM A53 Gr.B	88.9	4.85	5	1.5D	90	3										
1.16	FROM LP COOLER MOTOR	12	60	ASTM A53 Gr.B	88.9	4.85	4	1.5D	90	3										
1.17	TO SAMPLE COOLERS	12	60	ASTM A53 Gr.B	60.3	4.50	40	1.5D	90	6										
1.18	FROM SAMPLE COOLERS	12	60	ASTM A53 Gr.B	60.3	4.50	40	1.5D	90	6										
1.19	TO LP CONDENSATE PUMP	12	60	ASTM A53 Gr.B	33.4	4.05	25	1.5D	90	8			25	1				STUBS NB15	2	ADAPTORS NB80/NB25 RC 1" - 01 NO
1.20	FROM LP CONDENSATE PUMP	12	60	ASTM A53 Gr.B	33.4	4.05	25	1.5D	90	8			25	1				STUBS NB15 STUBS NB25	2 2	ADAPTORS NB80/NB25 RC 1" - 02 NO.S

	DOCUMENT TITLE: ESTIMATED BILL OF MATERIALS FOR COOLING WATER SUPPLY & RETURN SYSTEM		**DOCUMENT NO: PC:7328:01**	**REV NO: 00 DATE :05.06.18**
	PROJECT TITLE: MAITREE 2x660MW	**PREPARED BY**	**CHECKED BY:**	**APPROVED BY:**	**Document Referred:**
	CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH	**JITENDRA**	**VENKAT**	**SARAVANAN C**	**MAITREE-01-QHX-MFB-550001-PCC, Maitree-00-LB-MB-00307-31623-PC**
		THIS BOM IS FOR ONE UNIT ONLY*			

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			ELBOW			REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		PRESS. Kg/cm^2 (g)	TEMP (^oC)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
1.21	TO FD FAN - B	12	60	ASTM A53 Gr.B	33.4	4.05	60	1.5D	90	12			25	1				STUBS NB15	2	ADAPTORS NB80/NB25 RC 1" - 01 NO
1.22	FROM FD FAN - B	12	60	ASTM A53 Gr.B	33.4	4.05	60	1.5D	90	12			25	1				STUBS NB15 STUBS NB25	2 2	ADAPTORS NB80/NB25 RC 1" - 02 NO.S
1.23	TO FD FAN - A	12	60	ASTM A53 Gr.B	33.4	4.05	16	1.5D	90	8			25	1				STUBS NB15	2	ADAPTORS NB80/NB25 RC 1" - 01 NO
1.24	FROM FD FAN - A	12	60	ASTM A53 Gr.B	33.4	4.05	16	1.5D	90	8			25	1				STUBS NB15 STUBS NB25	2 2	ADAPTORS NB80/NB25 RC 1" - 02 NO.S
1.25	TO PA FAN - B	12	60	ASTM A53 Gr.B	48.3	4.05	35	1.5D	90	12			40	1				STUBS NB15	2	ADAPTORS NB80/NB40 RC 1" - 01 NO
1.26	FROM PA FAN - B	12	60	ASTM A53 Gr.B	48.3	4.05	35	1.5D	90	12			40	1				STUBS NB15 STUBS NB25	2 2	ADAPTORS NB80/NB40 RC 1" - 02 NO.S
1.27	TO PA FAN - A	12	60	ASTM A53 Gr.B	48.3	4.05	18	1.5D	90	8			40	1				STUBS NB15	2	ADAPTORS NB80/NB40 RC 1" - 01 NO
1.28	FROM PA FAN - A	12	60	ASTM A53 Gr.B	48.3	4.05	20	1.5D	90	8			40	1				STUBS NB15 STUBS NB25	2 2	ADAPTORS NB80/NB40 RC 1" - 02 NO.S
1.29	TO APH-B OIL CARRY OVER PROBE	12	60	ASTM A53 Gr.B	33.4	4.05	55	1.5D	90	12	25/15	1	25	2				STUBS NB15	1	ADAPTORS NB80/NB25 RC 1" - 01 NO
1.30	FROM APH-B OIL CARRY OVER PROBE	12	60	ASTM A53 Gr.B	33.4	4.05	55	1.5D	90	12	25/15	1	25	2				STUBS NB15 STUBS NB25	1 1	ADAPTORS NB80/NB25 RC 1" - 01 NO
1.31	TO APH-B SUPPORT BEARING COOLER	12	60	ASTM A53 Gr.B	33.4	4.05	25	1.5D	90	7			25	1				STUBS NB15	2	ADAPTORS NB80/NB25 RC 1" - 01 NO
1.32	FROM APH-B SUPPORT BEARING COOLER	12	60	ASTM A53 Gr.B	33.4	4.05	30	1.5D	90	11			25	1				STUBS NB15 STUBS NB25	2 2	ADAPTORS NB80/NB25 RC 1" - 02 NO.S
1.33	TO APH-B GUIDE BEARING COOLER	12	60	ASTM A53 Gr.B	33.4	4.05	20	1.5D	90	8			25	1				STUBS NB15	2	ADAPTORS NB80/NB25 RC 1" - 01 NO

	DOCUMENT TITLE: ESTIMATED BILL OF MATERIALS FOR COOLING WATER SUPPLY & RETURN SYSTEM	**DOCUMENT NO: PC:7328:01**	**REV NO: 00 DATE :05.06.18**
	PROJECT TITLE: MAITREE 2x660MW	**PREPARED BY** JITENDRA / **CHECKED BY:** VENKAT / **APPROVED BY:** SARAVANAN C	**Document Referred:** MAITREE-01-QHX-MFB-550001-PCC, Maitree-00-LB-MB-00307-31623-PC
	CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH		
		THIS BOM IS FOR ONE UNIT ONLY*	

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			ELBOW			REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		PRESS. Kg/cm^2 (g)	TEMP (^oC)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
1.34	FROM APH-B GUIDE BEARING COOLER	12	60	ASTM A53 Gr.B	33.4	4.05	25	1.5D	90	10			25	1				STUBS NB15 STUBS NB25	2 2	ADAPTORS NB80/NB25 RC 1" - 02 NO.S
1.35	TO APH-A OIL CARRY OVER PROBE	12	60	ASTM A53 Gr.B	33.4	4.05	55	1.5D	90	12	25/15	1	25	2				STUBS NB15	1	ADAPTORS NB80/NB25 RC 1" - 01 NO
1.36	FROM APH-A OIL CARRY OVER PROBE	12	60	ASTM A53 Gr.B	33.4	4.05	55	1.5D	90	12	25/15	1	25	2				STUBS NB15 STUBS NB25	1 1	ADAPTORS NB80/NB25 RC 1" - 01 NO
1.37	TO APH-A SUPPORT BEARING COOLER	12	60	ASTM A53 Gr.B	33.4	4.05	25	1.5D	90	7			25	1				STUBS NB15	2	ADAPTORS NB80/NB25 RC 1" - 01 NO
1.38	FROM APH-A SUPPORT BEARING COOLER	12	60	ASTM A53 Gr.B	33.4	4.05	30	1.5D	90	11			25	1				STUBS NB15 STUBS NB25	2 2	ADAPTORS NB80/NB25 RC 1" - 02 NO.S
1.39	TO APH-A GUIDE BEARING COOLER	12	60	ASTM A53 Gr.B	33.4	4.05	20	1.5D	90	8			25	1				STUBS NB15	2	ADAPTORS NB80/NB25 RC 1" - 01 NO

	DOCUMENT TITLE: ESTIMATED BILL OF MATERIALS FOR COOLING WATER SUPPLY & RETURN SYSTEM		**DOCUMENT NO: PC:7328:01**	**REV NO: 00 DATE :05.06.18**
	PROJECT TITLE: MAITREE 2x660MW	**PREPARED BY**	**CHECKED BY:**	**APPROVED BY:**	**Document Referred:**
	CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH	**JITENDRA**	**VENKAT**	**SARAVANAN C**	**MAITREE-01-QHX-MFB-550001-PCC, Maitree-00-LB-MB-00307-31623-PC**
		THIS BOM IS FOR ONE UNIT ONLY*			

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			ELBOW			REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		PRESS. Kg/cm^2 (g)	TEMP (^{o}C)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
1.40	FROM APH-A GUIDE BEARING COOLER	12	60	ASTM A53 Gr.B	33.4	4.05	25	1.5D	90	10			25	1				STUBS NB15 STUBS NB25	2 2	ADAPTORS NB80/NB25 RC 1" - 02 NO.S
1.41	TO FGD	12	60	ASTM A53 Gr.B	114.3	5.40	20	1.5D	90	4										TP UNKNOWN
1.42	FROM FGD	12	60	ASTM A53 Gr.B	114.3	5.40	20	1.5D	90	4										TP UNKNOWN
1.43	TO ID FAN-A STATOR COOLER	12	60	ASTM A53 Gr.B	88.9	4.85	12	1.5D	90	4	80/65	2	80	1				STUBS NB15 STUBS RC 1"	2 2	
1.44	FROM ID FAN-A STATOR COOLER	12	60	ASTM A53 Gr.B	88.9	4.85	12	1.5D	90	4	80/65	2	80	1				STUBS NB15 STUBS NB25	2 2	STUBS RC 1" - 02 NO.S
1.45	TO ID FAN-B STATOR COOLER	12	60	ASTM A53 Gr.B	88.9	4.85	15	1.5D	90	6	80/65	2	80	1				STUBS NB15 STUBS RC 1"	2 2	
1.46	FROM ID FAN-B STATOR COOLER	12	60	ASTM A53 Gr.B	88.9	4.85	15	1.5D	90	6	80/65	2	80	1				STUBS NB15 STUBS NB25	2 2	STUBS RC 1" - 02 NO.S
1.47	TO ID FAN - A	12	60	ASTM A53 Gr.B	60.3	4.50	30	1.5D	90	10			50	1				STUBS NB15	2	ADAPTORS NB80/NB50 RC 1" - 01 NO
1.48	FROM ID FAN - A	12	60	ASTM A53 Gr.B	60.3	4.50	30	1.5D	90	10			50	1				STUBS NB15 STUBS NB25	2 2	ADAPTORS NB80/NB50 RC 1" - 02 NO.S
1.49	TO ID FAN - B	12	60	ASTM A53 Gr.B	60.3	4.50	30	1.5D	90	10			50	1				STUBS NB15	2	ADAPTORS NB80/NB50 RC 1" - 01 NO
1.50	FROM ID FAN - B	12	60	ASTM A53 Gr.B	60.3	4.50	30	1.5D	90	10			50	1				STUBS NB15 STUBS NB25	2 2	ADAPTORS NB80/NB50 RC 1" - 02 NO.S
1.51	DRAINS & VENTS	12	60	ASTM A53 Gr.B	33.4	4.05	350	1.5D	90	20										

Note: TP with PEM is yet to be freezed. FGD TP is yet to be known

	DOCUMENT TITLE: ESTIMATED BILL OF MATERIALS FOR APH WATER WASH	**DOCUMENT NO: PC:7328:02**	**REV NO: 00 DATE :21.05.18**
	PROJECT TITLE: MAITREE 2x660MW	**PREPARED BY** / **CHECKED BY:** / **APPROVED BY:**	**Document Referred: MAITREE-00-SGA-MFB-550006-PCC-A, Maitree-00-LB-MB-00307-31623-PC**
	CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH	**JITENDRA** / **VENKAT** / **SARAVANAN C**	
		THIS BOM IS FOR ONE UNIT ONLY*	

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE						REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		PRESS. Kg/cm^2 (g)	TEMP (^oC)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
1.00	APH & ESP WATER WASH																			
1.01	APH WATER WASH	10	60	ASTM A53	323.8	5.56	155	1.5D	90	15	300/200	2	300 300/200	1 3				STUB NB15 STUB NB25	3 2	
		10	60	ASTM A53	219.1	5.56	40	1.5D	90	18	200/150	4						STUB NB25	4	
		10	60	ASTM A53	168.3	5.56	2													
		10	60	ASTM A53	33.4	3.38	100	1.5D	90	40			25	4						
1.02	ESP WATER WASH	10	60	ASTM A53	219.1	5.56	60	1.5D	90	6										

	DOCUMENT TITLE: ESTIMATED BILL OF MATERIALS FOR INSTRUMENT AIR PIPING		**DOCUMENT NO:** PC: 7328-05	**REV NO: 01** DATE : 11.12.18
	PROJECT TITLE: MAITREE 2x660MW	**PREPARED BY**	**CHECKED BY:**	**APPROVED BY:**
	CUSTOMER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.)LIMITED, BANGLADESH	VENKAT	VENKAT	K. V. RAMANI
				Document Referred: MAITREE-01-QFB-MFB-550004-PCC-0, Maitree-00-LB-MB-00307-31623-PC
		THIS BOM IS FOR ONE UNIT ONLY		

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			BENDS / ELBOWS			REDUCERS		TEES		FLANGES			MISCELLANEOUS		REV	REMARKS
		PRESS. Kg/cm^2 (g)	TEMP (^oC)		OD (mm)	THK (mm)	LEN (M)	R	θ deg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No		
1.00	INSTRUMENT AIR																				
1.01	TO OUTER RING HEADER	8.5	50	ASTM A53 G&T	114.3	4.78	250	1.5D	90	25			100/100	1						01	
1.02	TO INNER RING HEADER	8.5	50	ASTM A53 G&T	60.3	3.91	300	1.5D	90	25			100/50	6							
1.03	TO EQUIPMENTS/SPARE	8.5	50	ASTM A53 G&T	60.3	3.91	200	1.5D	90	40			100/25	20				END CAP NB50	10		
				ASTM A53 G&T	48.3	5.08	250	1.5D	90	40	40/15	12	50/50	6				END CAP NB40	10		
				ASTM A53 G&T	33.4	4.55	1750	1.5D	90	350	25/15	20	50/25	15				END CAP NB25	50		
													25/25	25							
													25/15	390							
													15/15	110							
				ASTM A53 G&T	21.3	3.73	5000	1.5D	90	1100			50/15	125				END CAP NB15	100		
1.04	INSTRUMENT AIR FOR EDN SUPPLIED LIE/LIR	8.5	50	ASTM A53 G&T	33.4	4.55	350	1.5D	90	70			50/40	10							VALVES NB25-2 NO.S
		8.5	50	ASTM A53 G&T	21.3	3.73	1250	1.5D	90	250	25/15	6	40/15	70				END CAP NB25	5		VALVES NB15-70 NO.S

NOTE: SOCKETS, UNIONS AND NIPPLES SHALL BE CONSIDER SUITABLY FOR RELEASE

OD (mm)	THK (mm)	LEN (M)	No	red	No	tee	No	SIZE (NB)	No	
114.3	4.78	250	25			100/100	1			
60.3	3.91	300	25			100/50	6			
60.3	3.91	200	40			100/25	20	END CAP NB50	10	
48.3	5.08	250	40	40/15	12	50/50	6	END CAP NB40	10	
33.4	4.55	1750	350	25/15	20	50/25	15	END CAP NB25	50	
						25/25	25			
						25/15	390			
						15/15	110			
21.3	3.73	5000	1100			50/15	125	END CAP NB15	100	
33.4	4.55	350	70			50/40	10			VALVES NB25-2 NO.S
21.3	3.73	1250	250	25/15	6	40/15	70	END CAP NB25	5	VALVES NB15-70 NO.S

OD (mm)	THK (mm)	Sum of LEN (M)
21.3	3.73	6250
33.4	4.55	2100
48.3	5.08	250
60.3	3.91	500
114.3	4.78	250
(blank)	(blank)	
Grand Total		9350

elbow	Sum of No
21.3	1350
33.4	420
48.3	40
60.3	65
114.3	25
(blank)	
Grand Total	1900

reducer	Sum of No
25/15	26
40/15	12
(blank)	
Grand Total	38

tee	Sum of No
100/100	1
100/25	20
100/50	6
15/15	110
25/15	390
25/25	25
40/15	70
50/15	125
50/25	15
50/40	10
50/50	6
Grand Total	778

cap	Sum of No
END CAP NB15	100
END CAP NB25	55
END CAP NB40	10
END CAP NB50	10
(blank)	
Grand Total	175

BOM FOR DMCW SYSTEM PER UNIT

Description	Unit	Specification	Attestation Ind	Quantity
PIPE OD-711X9.53 L=60M EP-STY-D-693 (OG)	M	A134-A283GRD	C	60.000
PIPE OD-610X9.53 L=110M EP-STY-D-592(OG)	M	A134-A283GRD	C	110.000
PIPE OD-406.4X9.53 L=220M EP-D-389 (OG)	M	A134-A283GRD	C	220.000
PIPE OD-323.8X5.56 L=200M EP-D-314 (OG)	M	A53-GRB	C	200.000
PIPE OD-273X5.56 L=250M EP-D-262 (OG)	M	A53-GRB	C	250.000
PIPE OD-219.1X5.56 L=150M EP-D-208 (OG)	M	A53-GRB	C	150.000
PIPE OD-168.3X5.56 L=175M EP-D-157.5(OG)	M	A53-GRB	C	175.000
PIPE OD-114.3X4.78 L=100M EP-D-105 (OG)	M	A53-GRB	C	100.000
PIPE OD88.9X3.96 L=150M EP-D-81 (OG)	M	A53-GRB	C	150.000
PIPE OD60.3X3.91 L=200M EP-D-53 (OG)	M	A53-GRB	C	200.000
PIPE OD48.3X5.08 L=200M EP-D-38.5 (OG)	M	A53-GRB	C	200.000
PIPE OD33.4X4.55 SA53 GRB EP-D-24.5-(OG)	M	ASTM A53 GRB	C	200.000
PIPE OD-457X9.53 L=20M EP-STY-D-439 (OG)	M	A134-A283GRD	C	20.000
PIPE OD-508X9.53 L=20M EP-STY-D-490 (OG)	M	A134-A283GRD	C	20.000
PIPE OD-813X9.53 L=30M EP-STY-D-795 (OG)	M	A134-A283GRD	C	30.000
PIPE OD-914X9.53 L=30M EP-STY-D-896 (OG)	M	A134-A283GRD	C	30.000
SUPPORT PIPE OD 508X9.53 L=10M	M	A134-A283GRD	C	10.000
SUPPORT PIPE OD-610X9.53 L=10M	M	A134-A283GRD	C	10.000
SUPPORT PIPE OD-406.4X9.53 L=10M	M	A134-A283GRD	C	10.000
SUPPORT PIPE OD-323.8X5.56 L=10M	M	A53-GRB	C	10.000
SUPPORT PIPE OD-219.1X5.56 L=20M	M	A53-GRB	C	20.000
SUPPORT PIPE OD-114.3X4.78 L=20M	M	A53-GRB	C	20.000
SW LR 90DEG ELB OD33.4X4.05 SA234WPB	NO	SA105	C	100.000
SW LR 90DEG ELB OD48.3X4.05 SA234WPB	NO	SA234WPB	C	100.000
SW LR 90DEG ELB OD60.3X4.5 SA234WPB	NO	SA234WPB	C	100.000
BW LR 90DEG ELB OD88.9X3.96 SA234WPB	NO	SA234WPB	C	25.000
BW LR 90DEG ELB OD114.3X4.78 SA234WPB	NO	SA234WPB	C	75.000
BW LR 90DEG ELB OD168.3X5.56 SA234WPB	NO	SA234WPB	C	60.000
BW LR 90DEG ELB OD219.1X5.56 SA234WPB	NO	SA234WPB	C	25.000
BW LR 90DEG ELB OD273X5.56 SA234WPB	NO	SA234WPB	C	30.000
BW LR 90DEG ELB OD323.9X5.56 SA234WPB	NO	SA234WPB	C	50.000
BW LR 90DEG ELL OD406.4X9.53 SA234WPB	NO	SA234WPB	C	25.000
BW SR 90DEG ELL OD609.6X9.53 SA234WPB	NO	SA234WPB	C	20.000
BW LR 90DEG ELL OD711X9.53 SA234WPB	NO	DUMMY MATERIAI	C	5.000
BW CON.RED 114.3X4.78/88.9X3.96-WPB	NO	SA234WPB	C	6.000
16.9BW RED.OD219.1X5.56/OD114.3X4.78 WPB	NO	SA234WPB	C	5.000
BW CON.RED 219.1X5.56/168.3X5.56-WPB	NO	SA234WPB	C	5.000
BW CON.RED 273X5.56/219.1X5.56-WPB	NO	SA234WPB	C	2.000
BW CON.RED 323.9X5.56/168.3X5.56-WPB	NO	SA234WPB	C	4.000
BW CON.RED 323.9X5.56/273X5.56-WPB	NO	SA234WPB	C	5.000
BW CON.RED 48.3X3.68/33.4X3.38-WPB	NO	SA234WPB	C	10.000
BW CON.RED 406.4X9.53/219.1X5.56-WPB	NO	SA234WPB	C	3.000
BW CON.RED 406.4X9.53/273X5.56-WPB	NO	SA234WPB	C	3.000
BW CON.RED 406.4X9.53/323.9X5.56-WPB	NO	SA234WPB	C	6.000
BW RED OD60.3X5.54/OD33.4X4.55 WPB	NO	SA234WPB	C	10.000
ASMEB16.9 RED OD610X10/355.6X7.92	NO	SA234WPB	C	5.000
16.9BW REDUCER OD610X9.53/406.4X9.53 WPB	NO	SA234WPB	C	3.000
BW CON.RED 88.9X5.49/48.3X5.08-WPB	NO	SA234WPB	C	10.000
ASMEB16.9 RED OD48.3X3.68/21.3X2.77	NO	SA234WPB	C	10.000
ASMEB16.9 RED OD508X9.53/457.2X9.53	NO	SA234WPB	C	4.000
ASMEB16.9 ECCRED OD323.9X6.35/273X6.35	NO	SA234WPB	C	3.000
ASMEB16.9 ECCRED OD406.4X9.53/323.9X9.53	NO	SA234WPB	C	3.000
BW ECC REDUCER OD711X9.53/406.4X9.53 WPE	NO	DUMMY MATERIAI	C	2.000
ECC BW RED 813X10/457X9.53 SA234WPB(W)	NO	DUMMY MATERIAI	C	3.000
REDUCER NB300XSGPHE	NO	DUMMY MATERIAI	C	4.000
BW EQT 114.3X4.78-WPB	NO	SA234WPB	C	10.000
BW EQT 168.3X5.56-WPB	NO	SA234WPB	C	5.000
ASMEB16.9 UEQT OD168.3X7.11/60.3X5.54	NO	SA234WPB	C	10.000
ASMEB16.9 UEQT OD168.3X7.11/88.9X5.49	NO	SA234WPB	C	5.000
BW UEQT 219.1X5.56/114.3X5.56-WPB	NO	SA234WPB	C	10.000
BW EQT 219.1X5.56-WPB	NO	SA234WPB	C	5.000
BW UEQT 273X5.56/168.3X5.56-WPB	NO	SA234WPB	C	5.000
ASMEB16.9 UEQT OD273X6.35/88.9X5.49	NO	SA234WPB	C	2.000
ASMEB16.9 UEQT OD323.9X6.35/114.3X6.02	NO	SA234WPB	C	1.000
BW UEQT 323.9X5.56/168.3X5.56-WPB	NO	SA234WPB	C	4.000
BW UEQT 323.9X5.56/273X5.56-WPB	NO	SA234WPB	C	5.000
BW EQT 48.3X3.68-WPB	NO	SA234WPB	C	10.000
ASMEB16.9 UEQT OD406.4X9.53/168.3X7.11	NO	SA234WPB	C	2.000
BW CON.RED 168.3X5.56/114.3X4.78-WPB	NO	SA234WPB	C	10.000
BW UEQT 406.4X9.53/273X5.56-WPB	NO	SA234WPB	C	5.000
BW UEQT 406.4X9.53/323.9X5.56-WPB	NO	SA234WPB	C	5.000
BW EQT OD406.4X9.53 SA234WPB	NO	SA234WPB	C	2.000
BW EQT 610X9.53-WPB	NO	SA234WPB	C	9.000
ASMEB16.9 RED OD609.6X14.27/273X9.27	NO	SA234WPC	C	1.000
BW EQT 711X9.53-WPB	NO	SA234WPB	C	6.000
BW RED 711X9.53/273X9.27 SA234WPC(W)	NO	SA234WPC	C	1.000
BW EQT 323.9X5.56-WPB	NO	SA234WPB	C	8.000
FLAT END CLOSURE NB600	NO	SA515GR70	C	2.000
BW LR 90DEG ELL OD406.4X9.53 SA234WPB	NO	SA234WPB	C	10.000

BW LR 90DEG ELL OD508X9.53 SA234WPB	NO	SA234WPB	C	5.000
BW SR 90DEG ELL OD609.6X9.53 SA234WPB	NO	SA234WPB	C	10.000
B16.9BW LR 90DEG ELB OD711X9.53 SA234WPB	NO	SA234WPB	C	10.000
ASMEB16.9 BWLR 90DEG ELBOW OD813X9.53	NO	SA234WPB	C	6.000
ASMEB16.9 BWSR 90DEG ELBOW OD914X9.53	NO	SA234WPB	C	5.000
ASMEB16.9 BWLR 45DEG ELBOW OD711.2X9.53	NO	SA234WPB	C	5.000
16.9BW REDUCER OD610X9.53/406.4X9.53 WPB	NO	SA234WPB	C	2.000
ASMEB16.9 RED OD610X10/508X9.53	NO	SA234WPB	C	2.000
ASMEB16.9 RED OD711.2X9.53/610X9.53	NO	SA234WPB	C	4.000
ASMEB16.9 RED OD914X10/813X10	NO	SA234WPB(W)	C	2.000
WELDED RED OD813X10/711X10	NO	SA234WPB	C	2.000
F.F.FLANGE NB400 CL 150	NO	SA515GR70	C	20.000
F.F.FLANGE NB450 CL 150	NO	SA515GR70	C	10.000
F.F.FLANGE NB500 CL 150	NO	SA515GR70	C	10.000
F.F.FLANGE NB600 CL-D	NO	SA515GR70	C	15.000
F.F.FLANGE NB700 CL-D	NO	SA515GR70	C	25.000
F.F.FLANGE NB800 CL-D	NO	SA515GR70	C	25.000
F.F.FLANGE NB900 CL-D	NO	SA515GR70	C	10.000
16.9BW RED.OD88.9X3.96/OD60.3X3.91 WPB	NO	SA234WPB	C	10.000
BW EQT 48.3X3.68-WPB	NO	SA234WPB	C	15.000
BW EQT 60.3X3.91-WPB	NO	SA234WPB	C	10.000
BW UEQT 88.9X5.54/60.3X5.54-WPB	NO	SA234WPB	C	10.000
PIPE OD60.3X3.91 L=160M EP-D-53 (OG)	M	A53-GRB	C	160.000
PIPE OD48.3X5.08 L=200M EP-D-38.5 (OG)	M	A53-GRB	C	200.000
PIPE OD33.4X4.55 SA53 GRB EP-D-24.5-(OG)	M	ASTM A53 GRB	C	200.000
PIPE OD-21.3X3.73 (OG)	M	A53-GRB	C	500.000
BW CON.RED 48.3X3.68/33.4X3.38-WPB	NO	SA234WPB	C	15.000
BW CON.RED 48.3X3.68/21.3X3.73-WPB	NO	SA234WPB	C	10.000
BW CON.RED 60.3X3.91/33.4X3.38-WPB	NO	SA234WPB	C	10.000
PIPE DIA 33.4 X 3.38 L=120M SA312TP316	M	SA312TP316	C	120.000
PIPE DIA 48.3 X 3.68 L=65M - SA312TP316	M	SA312TP316	C	65.000
PIPE DIA 88.9 X 3.05 L=25M - SA312TP316	M	SA312TP316	C	25.000
PIPE DIA 21.3 X 3.73 L=15M SA312TP316L	M	SA312TP316L	C	15.000
PIPE DIA 60.3 X 3.91 L=10M SA312TP316	M	SA312TP316	C	10.000
ASMEB16.9 BWLR 90DEG ELBOW OD33.4X3.38	NO	SA403WP316L	C	25.000
ASMEB16.9 BWLR 90DEG ELBOW OD48.3X3.68	NO	SA403WP316L	C	15.000
ASMEB16.9 BWLR 90DEG ELBOW OD88.9X3.05	NO	SA403WP316L	C	7.000
ASMEB16.9 BWLR 90DEG ELBOW OD60.3X3.91	NO	SA403WP316L	C	2.000
ASMEB16.11 SWLR 90DEG ELBOW NB15 CL3000	NO	SA182F316L	C	20.000
ASMEB16.9 RED OD60.3X3.91/48.3X3.68	NO	SA403WP316L	C	2.000
ASMEB16.9 RED OD48.3X3.68/33.4X3.38	NO	SA403WP316L	C	2.000
ASMEB16.9 UEQT OD88.9X3.05/60.3X3.91	NO	SA403WP316L	C	2.000
ASMEB16.9 UEQT OD88.9X3.05/48.3X3.68	NO	SA403WP316L	C	2.000
SW EQT NB 50 CL 3000 SA182F316H	NO	DUMMY MATERIAI	C	2.000
SW STUB NB25 CL3000 SA479TY316L	NO	SA479TY316L	C	5.000
SW UEQT NB 50/NB25 CL 3000 SA182F316H	NO	DUMMY MATERIAI	C	5.000
SW EQT NB 15 CL 3000 SA182F316	NO	DUMMY MATERIAI	C	5.000

LP BOM INSIDE TGHALL (ABOVE NB50)

QUANTITY FOR ONE UNIT UNLESS NOTED OTHERWISE

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
INSTRUMENT AIR SYSTEM INSIDE TG HALL (P&ID NO: MAITREE-00-QEA-FB-112302-PEM-0)																					
1	INSTRUMENT AIR PIPING INSIDE TG HALL			CARBON STEEL ASTM A53, TYPE-E, GRADE B, SCH.40, HOT DIP GALVANISED	150NB		450	50	1.5D	90	50			150X100	5						
SERVICE AIR SYSTEM INSIDE TG HALL (P&ID NO: MAITREE-00-QEA-FB-112303-PEM-0)																					
1	INSTRUMENT AIR PIPING INSIDE TG HALL			CARBON STEEL ASTM A53, TYPE-E, GRADE B, SCH.40, HOT DIP GALVANISED	150NB		450	50	1.5D	90	50			150X100	5						

			DOCUMENT TITLE			ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)										DOCUMENT NO:						REV NO: 0	
						(DESALINATED WATER PIPING SYSTEM)																11-Mar-19	
			PROJECT TITLE:	2X660MW MAITREE								PREPARED BY	CHECKED BY:		APPROVED BY:							
			CUSTOMER: -	BIFPCL								KK	KK		SK							
												QUANTITY FOR TWO UNITS										
			DESIGN		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
Sl. No.		LINE DESCRIPTION	TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
PLANT WATER SYSTEM P&ID (P&ID NO: Maitree-00-PC-MFB-116003-PEM)																						
1		DESALINATED WATER INLET LINE FROM DM PLANT TO DESALINATED WATER TANK, POTABLE WATER TANK & SERVICE WATER TANK			CS AS PER ASTM A53	355.6	9.53	75	350	1.5D	90	6	350X250	2	350X350	2						
2		TO SERVICE WATER TANK			CS AS PER ASTM A53	114.3	4.78	30	100	1.5D	90	6	350X100	2								
3		TO POTABLE WATER TANK (PLANT)			CS AS PER ASTM A53	60.3	3.91	12	50	1.5D	90	4			350X50	1						
4		TO POTABLE WATER TANK (COLONY)			CS AS PER ASTM A53	88.9	3.96	12	50	1.5D	90	4			350X80	1						
5		TO DESALINATED WATER TANK			CS AS PER ASTM A53	273	5.56	65	250	1.5D	90	8	350X250	2								
6		TO FIRE WATER STORAGE TANK			CS AS PER ASTM A53	219.1	5.56	70	200	1.5D	90	4			250X200	2						
7					CS AS PER ASTM A53				200	1.5D	45	3										
8		COMMON SUCTION HEADER FROM DESALINATED WATER TANK TO VARIOUS PUMPS			CS AS PER SA134-A283Gr D/SA 515Gr 60	508	9.53	60	500	1.5D	90	3	500X300	1	500X500	1						
					CS AS PER SA134-A283Gr D/SA 515Gr 60				500	1.5D	45	2	300X150	1								
9	APH-ESP WASH PUMPS (3 NOS)	APH-ESP WASH PUMPS INDIVIDUAL SUCTION (3 NOS PUMPS)			CS AS PER ASTM A53	323.9	5.56	20	300	1.5D	90	4	300X200	4	500X300	4						
		APH-ESP WASH PUMPS INDIVIDUAL DISCHARGE (3 NOS PUMPS)			CS AS PER ASTM A53	273	5.56	25	250	1.5D	90	18	250X150	4	400X250	4				250NB FLANGE	6	
		APH-ESP WASH LINE TO TERMINAL POINT WITH PC (AT ESP UNIT-2 GRID T-10)			CS AS PER ASTM A53	406.4	9.53	500	400	1.5D	90	30			400X400	2						
					SS	400NB		25	400	1.5D	90	5										
		APH-ESP WASH PUMPS RECIRCULATION LINE			CS AS PER ASTM A53	168.3	5.56	15	150	1.5D	90	2			500X150	1						
					CS AS PER ASTM A53				150	1.5D	45	2			400X150	1						
10	FGD PUMPS (3 NOS)	FGD PUMPS INDIVIDUAL SUCTION (3 NOS PUMPS)			CS AS PER ASTM A53	219.1	5.56	20	200	1.5D	90	4	200X125	4	500X200	4						
		FGD PUMPS INDIVIDUAL DISCHARGE (3 NOS PUMPS)			CS AS PER ASTM A53	168.3	5.56	30	150	1.5D	90	17	150X100	4	200X150	4						
		FGD PUMPS DISCH LINE TO TERMINAL POINT WITH RANIPET NEAR FGD-2			CS AS PER ASTM A53	219.1	5.56	500	200	1.5D	90	25			200x200	2						
					SS	200NB		30	200	1.5D	90	6										
		FGD PUMPS RECIRCULATION LINE			CS AS PER ASTM A53	88.9	3.96	15	80	1.5D	90	8	200X80	1	500X80 80X80	1 3						
					CS AS PER ASTM A53	219.1	5.56	16	200	1.5D	90	3	200X150	3	500X200	2						

			DOCUMENT TITLE		ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)												DOCUMENT NO:						REV NO: 0	
					(DESALINATED WATER PIPING SYSTEM)																		11-Mar-19	
			PROJECT TITLE:	2X660MW MAITREE									PREPARED BY		CHECKED BY:		APPROVED BY:						
			CUSTOMER: -	BIFPCL									KK		KK		SK						
													QUANTITY FOR TWO UNITS										
			DESIGN		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS	
Sl. No.		LINE DESCRIPTION	TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
11	AHP PUMPS (2 NOS)	AHP PUMPS INDIVIDUAL SUCTION (2 NOS PUMPS)			CS AS PER ASTM A53				200	1.5D	45	3											
					CS AS PER ASTM A53				150	1.5D	90	3											
		AHP PUMPS INDIVIDUAL DISCHARGE (2 NOS PUMPS)			CS AS PER ASTM A53	168.3	5.56	20	150	1.5D	90	3	150X100	3	150X150	3							
					CS AS PER ASTM A53				100	1.5D	90	3											
		TO HCSD TANK NEAR JETTY AREA			CS AS PER ASTM A53	168.3	5.56	1630	150	1.5D	90	25			150X150	2							
					CS AS PER ASTM A53				150	1.5D	45	4											
					SS	150NB		20	150	1.5D	90	6											
		TO M/U OF SHIP UNLOADING			CS AS PER ASTM A53	60.3	3.91	100	50	1.5D	90	10	150X50	1	150X50	2							
		TO BOTTOM ASH HOPPER			CS AS PER ASTM A53	88.9	3.96	550	80	1.5D	90	20	80X50	2	150X80	2							
					CS AS PER ASTM A53	60.3	3.91	300	50	1.5D	90	15	150X80	1	80X50	2							
		AHP PUMPS RECIRCULATION LINE			CS AS PER ASTM A53	88.9	3.96	15	80	1.5D	90	8	150X80	1	500X80 80X80	1 3							
12	CHP PUMPS (2 NOS)	CHP PUMPS INDIVIDUAL SUCTION (2 NOS PUMPS)			CS AS PER ASTM A53	219.1	5.56	16	200	1.5D	90	3	200X125	3	500X200	3							
					CS AS PER ASTM A53				200	1.5D	45	3											
					CS AS PER ASTM A53				125	1.5D	90	3											
		CHP PUMPS INDIVIDUAL DISCHARGE (2 NOS PUMPS)			CS AS PER ASTM A53	168.3	5.56	20	150	1.5D	90	3	150X100	3	150X150	3							
					CS AS PER ASTM A53				100	1.5D	45	3											
		TO DSPH-2 NEAR HYDROGEN PLANT			CS AS PER ASTM A53	168.3	5.56	850	150	1.5D	90	25			150X150								
					CS AS PER ASTM A53					1.5D	45	4											
		TO DSPH-1 NEAR JETTY			CS AS PER ASTM A53	114.3	4.78	950	100	1.5D	90	20	150X100	2	150X100	1							
					SS	100NB		20	100	1.5D	90	6											
		CHP PUMPS RECIRCULATION LINE			CS AS PER ASTM A53	88.9	3.96	15	80	1.5D	90	8	150X80	1	500X80 80X80	1 3							

NOTES:-
1. THIS IS ONLY ESTIMATED BOM. ACTUAL BOM SHALL BE AS PER DRAWING.
2. FOR DESIGN PREESURE, TEMPERATURE, PIPE SIZE AND MATERIAL PLEASE REFER RESPECTIVE P&ID.
3. REQUIRED COUPLINGS, UNIONS, NIPPLES ETC TO BE DECIDED AND SUPPLED BY PIPING CENTRE.

	DOCUMENT TITLE	ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)	DOCUMENT NO:	REV NO: 0
		(DM WATER SYSTEM BOM)		11-Mar-19
	PROJECT TITLE: 2X660MW MAITREE	PREPARED BY: KK	CHECKED BY: KK	APPROVED BY: SK
	CUSTOMER: - BIFPCL	QUANTITY FOR TWO UNITS		

Sl. No.		LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
			TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
DM MAKE-UP WATER SYSTEM(P&ID NO: Maitree-00-LCR-MFB-119110-PEM)																						
1	DM MAKE UP PUMPS (3 NOS)	DM MAKE UP PUMPS COMMON SUCTION FROM TANK TO PUMPS HEADER			SA 312 TP 304	168.3	3.4	60	150	1.5D	90	8			150X150	2						
					SA 312 TP 304				150	1.5D	45	2			150X100	2						
					SA 312 TP 304	114.3	3.05	2														
		DM MAKE UP PUMPS INDIVIDUAL SUCTION (3 NOS PUMPS)			SA 312 TP 304	168.3	3.4	25	150	1.5D	90	4	150X100	4	150X150	4						
					SA 312 TP 304				150	1.5D	45	4										
					SA 312 TP 304				100	1.5D	90	4										
		DM MAKE UP PUMPS INDIVIDUAL DISCHARGE (3 NOS PUMPS)			SA 312 TP 304	114.3	3.05	35	100	1.5D	90	4	100X80	4	150X100	4						
					SA 312 TP 304				80	1.5D	90	4	150X100	2								
		TO NORMAL MAKE UP (UPTO C-ROW)			SA 312 TP 304	168.3	3.4	575	150	1.5D	90	25	150X100	2	150X100	1						
					SA 312 TP 304	114.3	3.05	175	100	1.5D	90	15										
		TO CONDENSATE STORAGE TANKS			SA 312 TP 304	168.3	3.4	35	150	1.5D	90	6	150X100	2	150X100	2						
					SA 312 TP 304	114.3	3.05	35	100	1.5D	90	8			150X150	2						
		TO AUXILIARY BOILER			SA 312 TP 304	114.3	3.05	250	100	1.5D	90	10	150X100	1	150X100	1						
		TO HYDROGEN GENERATION PLANT			SA 312 TP 304	33.4	3.38	700	100	1.5D	90	16			150X25	1						
		DM MAKE UP PUMPS RECIRCULATION LINE			SA 312 TP 304	60.3	3.91	70	50	1.5D	90	16	100X50		150X100 50X50	1 2						
					SA 312 TP 304	33.4	3.38	3	25	1.5D	90	4			50X25	3						
		INLET FROM DM PLANT			SA 312 TP 304	168.3	3.4	55	150	1.5D	90	8	150x100	2	150x100	2						
					SA 312 TP 304	114.3	3.05	60	100	1.5D	90	12										
CONDENSATE TRANSFER SYSTEM(P&ID NO: Maitree-00-LCR-MFB-119109-PEM)																						

			DOCUMENT TITLE		ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)													DOCUMENT NO:					REV NO: 0	
					(DM WATER SYSTEM BOM)																			11-Mar-19	
			PROJECT TITLE:	2X660MW MAITREE									PREPARED BY		CHECKED BY:			APPROVED BY:						
			CUSTOMER: -	BIFPCL									KK		KK			SK						
													QUANTITY FOR TWO UNITS											
			DESIGN		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES			FLANGES			MISCELLANEOUS		REMARKS
Sl. No.		LINE DESCRIPTION	TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
1	CONDENSATE FORWARDING PUMPS (4 NOS)	CONDENSATE FORWARDING PUMPS COMMON SUCTION FROM TANK TO PUMPS HEADER			SA 312 TP 304	219.1	3.76	30	200	1.5D	90	5			200X200	3						
		CONDENSATE FORWARDING PUMPS INDIVIDUAL SUCTION (4 NOS PUMPS)			SA 312 TP 304	219.1	3.76	30	200	1.5D	90	6	200X125	5	200X200	5						
					SA 312 TP 304				125	1.5D	90	6										
		CONDENSATE FORWARDING PUMPS INDIVIDUAL DISCHARGE (4 NOS PUMPS)			SA 312 TP 304	168.3	3.4	25	150	1.5D	90	5	150X100	5	150X150	5						
					SA 312 TP 304				100	1.5D	90	5										
		EMERGENCY MAKE UP TO UNIT-1			SA 312 TP 304	168.3	3.4	115	150	1.5D	90	15										
		EMERGENCY MAKE UP TO UNIT-2			SA 312 TP 304	168.3	3.4	300	150	1.5D	90	25										
					SA 312 TP 304				150	1.5D	45	4										
		INTERCONNECTION BETWEEN COND FORWARDING PUMPS DISCH, UNIT-1 & 2			SA 312 TP 304	168.3	3.4	4	150	1.5D	90	3			150X150	3						
		COND FORWARDING PUMP UNIT-1 RECIRCULATION			SA 312 TP 304	60.3	3.91	25	50	1.5D	90	12	150X100 100X50	2 2	100X50	1						
					SA 312 TP 304	33.4	3.38	5	25	1.5D	90	4	50X25	2	50X25	4						
		COND FORWARDING PUMP UNIT-2 RECIRCULATION			SA 312 TP 304	60.3	3.91	27	50	1.5D	90	12	150X100 100X50	2 2	100X50	1						
					SA 312 TP 304	33.4	3.38	5	25	1.5D	90	4	50X25	2	50X25	4						
2	BOILER FILL PUMPS (2 NOS)	BOILER FILL PUMPS INDIVIDUAL SUCTION (2 NOS PUMPS)			SA 312 TP 304	168.3	3.4	16	150	1.5D	90	8			150X150	3						
		BOILER FILL PUMPS INDIVIDUAL DISCHARGE (2 NOS PUMPS)			SA 312 TP 304	114.3	3.05	16	100	1.5D	90	14	125X100	3	100X100	2						FLANGE = 4 NOS
		BOILER FILL DISCH HEADER UPTO UNIT-2			SA 312 TP 304	114.3	3.05	375	100	1.5D	90	25			100X100	4						
		BOILER INITIAL FILLING UNIT-1			SA 312 TP 304	114.3	3.05	50	100	1.5D	90	15	200X100	1	100X100	1						
		BOILER INITIAL FILLING UNIT-2			SA 312 TP 304	114.3	3.05	50	100	1.5D	90	15	200X100	2	100X100	1						
		BOILER FILL PUMPS RECIRCULATION LINE			SA 312 TP 304	60.3	3.91	6	50	1.5D	90	4			100X50 50X50	2 2						
3		COND EXCESS RETURN TO CST FROM UNIT-1 (UPTO C-ROW NEAR GRID-10)			SA 106 Gr. C	219.1	6.35	225	200	1.5D	90	20										
4		COND EXCESS RETURN TO CST FROM UNIT-2 (UPTO C-ROW NEAR GRID-23)			SA 106 Gr. C	219.1	6.35	400	200	1.5D	90	25										
5		DRAIN & VENT			SA 312 TP 304	33.4	3.38	50	25	1.5D	90	25										

NOTES:-
1. THIS IS ONLY ESTIMATED BOM. ACTUAL BOM SHALL BE AS PER DRAWING.
2. FOR DESIGN PREESURE, TEMPERATURE, PIPE SIZE AND MATERIAL PLEASE REFER RESPECTIVE P&IDs.
3. REQUIRED COUPLINGS, UNIONS, NIPPLES ETC TO BE DECIDED AND SUPPLED BY PIPING CENTRE.

	DOCUMENT TITLE	ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)																			DOCUMENT NO:		REV NO: 0
		(DESALINATED WATER PIPING SYSTEM)																					11-Mar-19
	PROJECT TITLE: 2X660MW MAITREE											PREPARED BY		CHECKED BY:			APPROVED BY:						
	CUSTOMER: - BIFPCL											KK		KK			SK						
												QUANTITY FOR TWO UNITS											

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
DMCW SYSTEM (P&ID NO: Maitree-01-QUG-MFB-117001-PEM)																					
1	DMCW SUPPLY TO AHP COMPRESSOR				219.1	5.56	220	200	1.5D	90	20	300X200	2	300X200	2						
					273	5.56	400	250	1.5D	90	25	250X200	2	250X200	1						
								250	1.5D	90	10										
2	DMCW RETURN FROM AHP COMPRESSOR				219.1	5.56	220	200	1.5D	90	20	300X200	2	300X200	2						
					273	5.56	400	250	1.5D	90	25	250X200	2	250X200	1						
								250	1.5D	90	10										
3	DMCW SUPPLY TO PLANT COMPRESSOR HOUSE				273	5.56	220	250	1.5D	90	20	300X250	2	300X250	2						
					323.9	5.56	150	300	1.5D	90	16										
4	DMCW RETURN FROM PLANT COMPRESSOR HOUSE				273	5.56	220	250	1.5D	90	20	300X250	2	300X250	2						
					323.9	5.56	150	300	1.5D	90	16										
5	DMCW SUPPLY TO AUX. BOILER				60.3	3.91	675	50	1.5D	90	25			300X50	2						
6	DMCW RETURN FROM AUX. BOILER				60.3	3.91	675	50	1.5D	90	25			300X50	2						
7	DMCW TO BOILER AUXILIARIES (TOTAL FOR 2 UNITS)				273	5.56	50	250	1.5D	90	12	300X250	2	300X250	2						
8	DMCW RETURN FROM BOILER AUXILIARIES (TOTAL FOR 2 UNITS)				273	5.56	50	250	1.5D	90	12	300X250	2	300X250	2						
9	DMCW SUPPLY TO SWAS (TOTAL FOR 2 UNITS)				88.9	3.96	250	80	1.5D	90	15	80X50	2	250X80	2						
					60.3	3.91	40	50	1.5D	90	10	80X40	1	80X40 80X50	2 2						
					48.3	3.68	20	40	1.5D	90	8			50X50	2						
10	DMCW RETURN FROM SWAS (TOTAL FOR 2 UNITS)				88.9	3.96	250	80	1.5D	90	15	80X50	2	250X80	2						
					60.3	3.91	40	50	1.5D	90	10	80X40	1	80X40 80X50	2 2						
					48.3	3.68	20	40	1.5D	90	8			50X50	2						

NOTES:-

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2. FOR DESIGN PREESURE, TEMPERATURE, PIPE SIZE AND MATERIAL PLEASE REFER RESPECTIVE P&ID
3. REQUIRED COUPLINGS, UNIONS, NIPPLES ETC TO BE DECIDED AND SUPPLED BY PIPING CENTRE.

			DOCUMENT TITLE		ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)										DOCUMENT NO:						REV NO: 0	
					(PIPING BOQ FOR DUPLEX SS PIPING)																14-Mar-19	
			PROJECT TITLE:	2X660MW MAITREE								PREPARED BY		CHECKED BY:			APPROVED BY:					
			CUSTOMER: -	BIFPCL								KK		KK			SK					
												QUANTITY FOR TWO UNITS										
			DESIGN		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
Sl. No.		LINE DESCRIPTION	TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
1	RAW WATER INTAKE SYSTEM	RAW WATER PUMPS RECIRCULATION			DUPLEX SS SA790 AS PER SCH. 10S.	273.1	4.19	90	250	1.5D	90	20										
		TO RAW WATER CHLORINATION			DUPLEX SS SA790 AS PER SCH. 10S.	88.9	3.05	160	80	1.5D	90	10										
		TO SCREEN WASH PUMPS			DUPLEX SS SA790 AS PER SCH. 10S.	219.1	3.76	20	200	1.5D	90	5										
		SILT REMOVAL SUMP PUMP DISCH LINE			DUPLEX SS SA790 AS PER SCH. 10S.	114.3	3.05	1100	100	1.5D	90	25			100X100	2						
					DUPLEX SS SA790 AS PER SCH. 10S.				100	1.5D	45	20			100X25	2						
					DUPLEX SS SA790 AS PER SCH. 40S.	33.4	3.38	10	25	1.5D	90	6										
2	CW SYSTEM	TO CW CHLRINATION PLANT			DUPLEX SS SA790AS PER SCH. 10S	219.1	3.76	45	200	1.5D	90	4	300X200	1	300X200	1						
						323.9	4.57	160	300	1.5D	90	8										
3	ACW SYSTEM	ACW TO CPU HEAT EXCHANGER (ONLY THE STRETCH WHICH IS OUTSIDE TG HALL) **(UNIT-1)**			DUPLEX SS	450NB		92	450	1.5D	90	4										
					DUPLEX SS				450	1.5D	**60**	2										
		ACW FROM CPU HEAT EXCHANGER (ONLY THE STRETCH WHICH IS OUTSIDE TG HALL) **(UNIT-1)**			DUPLEX SS	450NB		96	450	1.5D	90	4										
					DUPLEX SS				450	1.5D	**45**	2										
		ACW TO CPU HEAT EXCHANGER (ONLY THE STRETCH WHICH IS OUTSIDE TG HALL) **(UNIT-2)**			DUPLEX SS	450NB		92	450	1.5D	90	4										
					DUPLEX SS				450	1.5D	**60**	2										
		ACW FROM CPU HEAT EXCHANGER (ONLY THE STRETCH WHICH IS OUTSIDE TG HALL) **(UNIT-2)**			DUPLEX SS	450NB		96	450	1.5D	90	4										
					DUPLEX SS				450	1.5D	**45**	2										

	DOCUMENT TITLE	ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)	DOCUMENT NO:	REV NO: 0
		(PIPING BOQ FOR DUPLEX SS PIPING)		14-Mar-19
	PROJECT TITLE: 2X660MW MAITREE	PREPARED BY: KK	CHECKED BY: KK	APPROVED BY: SK
	CUSTOMER: - BIFPCL	QUANTITY FOR TWO UNITS		

Sl. No.		LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
			TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
4	PRETREATED WATER PH	DESALINATION FEED PUMPS DISCH LINE ELBOW AT PUMP DISCH			DUPLEX SS SA790 AS PER SCH. 10S.				300	1.5D	90	3										THE ELBOW SHALL HAVE FLANGE AT BOTH ENDS
		DESALINATION FEED PIPE RECIRCULATION LINE			DUPLEX SS SA790 AS PER SCH. 10S.	219.1	3.76	16	200	1.5D	90	6			1400X200 600X200 200X200	2 2 1				200NB FLANGE	6 NOS	
		PRE-TREATED WATER TANK OVERFLOW			DUPLEX SS	LATER																
		PRE-TREATED WATER TANK DRAIN			DUPLEX SS	LATER																
		IDCT SLUDGE DISPOSAL PIPE TO CW BLOWDOWN			DUPLEX SS	LATER																
		ARV PIPE, INSTRUMENT PIPE ETC, ACW PIPING INSIDE TG HALL, COLTCS PIPING, SCS DEBRIS DICH PIPING, OTHERS			DUPLEX SS	AS PER P&ID & LAYOUT																

NOTES:-

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3. REQUIRED COUPLINGS, UNIONS, NIPPLES ETC TO BE DECIDED AND SUPPLED BY PIPING CENTRE.

	DOCUMENT TITLE	ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)	DOCUMENT NO:	REV NO: 1
		(HSD SYSTEM)		14-Mar-19
	PROJECT TITLE: 2X660MW MAITREE	PREPARED BY: KK	CHECKED BY: KK	APPROVED BY: SK
	CUSTOMER: - BIFPCL	QUANTITY FOR TWO UNITS		

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
HSD SYSTEM (P&ID NO: MAITREE-0-EG-FB-111704-PEM)																					
1	FROM FOPH (TP 1M OUTSIDE PH) TO FIRE WATER PUMP HOUSE (TP AT 5M FROM FWPH)			AS PER P&ID	50NB		325	50	1.5D	90	16										
2	FROM FOPH (TP 1M OUTSIDE PH) TO FOAM PUMP HOUSE (TP AT 5M FROM FOAM PH)			AS PER P&ID	50NB		100	50	1.5D	90	12										
				SS	DELETED																
3	FROM FOPH (TP 1M OUTSIDE PH) TO DG SET(TP AT 5M FROM DG SET)			AS PER P&ID	50NB		1200	50	1.5D	90	30										
				SS	50NB		150	50	1.5D	90	25										
4	DRAIN & VENTS			CS AS PER ASTM A53	33.4	3.38	50	25	1.5D	90	25										

NOTES:-

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2. FOR DESIGN PREESURE, TEMPERATURE, PIPE SIZE AND MATERIAL PLEASE REFER P&ID OF FOHS SYSTEM.

	DOCUMENT TITLE	ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)	DOCUMENT NO:	REV NO: 1
		(INSTRUMENT AIR SYSTEM OUTSIDE TG HALL)		14-Mar-19
	PROJ: 2X660MW MAITREE	PREPARED BY:	CHECKED BY:	APPROVED BY:
	CUST: BIFPCL	KK	KK	SK
		QUANTITY FOR TWO UNITS		

Sl. No.	LINE DESCRIPTION	DESIG TEMP (°C)	DESIG PRESS. Kg/cm2 (g)	PIPE MATERIAL SPECIFICATION	PIPE OD (mm)	PIPE THK (mm)	PIPE LEN (M)	MITRE / ELBOWS SIZE (NB)	MITRE / ELBOWS R	MITRE / ELBOWS θ dg	MITRE / ELBOWS No	REDUCERS SIZE (NB)	REDUCERS No	TEES SIZE (NB)	TEES No	FLANGES SIZE (NB)	FLANGES Rating	FLANGES No	MISCELLANEOUS SIZE (NB)	MISCELLANEOUS No	REMARKS
INSTRUMENT AIR DISTRIBUTION SYSTEM OUTSIDE TG HALL (P&ID NO: MAITREE-00-QEA-FB-112302-PEM)																					
1	FROM COMPRESSOR HOUSE TO UNIT-1 TAP OFF NEAR COLUMN C-2 (INCLUDING SMALL PORTION TOWARDS BOP AREA FOR INSTALLING VALVE)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	200NB		200	200	1.5D	90	15	250X200	2	200X200	2						
2	TO UNIT-1 (UPTO RECEIVER ONLY, FURTHER BOM INSIDE TG HALL SHALL BE AS PER DRAWING)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	150NB		20	150	1.5D	90	8			200X150	2						
3	TO UNIT-2 (UPTO RECEIVER ONLY, FURTHER BOM INSIDE TG HALL SHALL BE AS PER DRAWING)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	150NB		20	150	1.5D	90	8			150X150	2						
4	IA HEADER FROM UNIT-1 TO UNIT-2			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	150NB		200	150	1.5D	90	10	200X150	2								
				CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG				150	1.5D	45	4										
5	FROM UNIT-2 TAP-OFF TO FGD (NEAR FGD, U#2)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	50NB		500	50	1.5D	90	25	150X50	3	150X50	2						
				CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG				50	1.5D	45	4										
6	TO ESP CONTROL ROOM UNIT-1			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	DELETED																
7	TO ESP CONTROL ROOM UNIT-2			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	DELETED																
8	TO BOILER UNIT-1 (UPTO TP)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	100NB		25	100	1.5D	90	6	150X100	1	150X150 150X100	2 2						
9	TO BOILER UNIT-2 (UPTO TP)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	100NB		25	100	1.5D	90	6	150X100	1	150X150 150X100	2 2						
10	IA HEADER TO BOP AREA UPTO TAP-OFF FOR PT PLANT			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	150NB		320	150	1.5D	90	16	200X150	2								
11	FROM TAP OFF OF PT PANT (NEAR TR-130) TO PIPE RACK T-POINT NEAR ETP (TR-165)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	80NB		350	80	1.5D	90	10	150X80	2	150X80	2						
12	PIPE RACK T-POINT NEAR ETP (TR-165) TO TAP-OFF TO CHEMICAL LAB (TR-207)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	80NB		100	80	1.5D	90	5			80X80	2						
13	FROM CHEMICAL LAB TAP-OFF (TR-207) TO ETP TAP-OFF (TR-208)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	50NB		25	50	1.5D	90	5	80X50	2	80X50	2						
14	TO STP			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		100	25	1.5D	90	16	50X25 80X25	2 2	50X25 80X25	2 2						

	DOCUMENT TITLE	ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)																	DOCUMENT NO:		REV NO: 1
		(INSTRUMENT AIR SYSTEM OUTSIDE TG HALL)																			14-Mar-19
	PROJ 2X660MW MAITREE								PREPARED BY		CHECKED BY:			APPROVED BY:						
	CUST BIFPCL								KK		KK			SK						
									QUANTITY FOR TWO UNITS											

Sl. No.	LINE DESCRIPTION	DESIG TEMP (°C)	DESIG PRESS. Kg/cm2 (g)	PIPE MATERIAL SPECIFICATION	PIPE OD (mm)	PIPE THK (mm)	PIPE LEN (M)	MITRE / ELBOWS SIZE (NB)	MITRE / ELBOWS R	MITRE / ELBOWS θ dg	MITRE / ELBOWS No	REDUCERS SIZE (NB)	REDUCERS No	TEES SIZE (NB)	TEES No	FLANGES SIZE (NB)	FLANGES Rating	FLANGES No	MISCELLANEOUS SIZE (NB)	MISCELLANEOUS No	REMARKS
15	TO ETP			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		50	25	1.5D	90	16	50X25 80X25	2 2	50X25 80X25	2 2						
16	FROM PIPE RACK T-POINT (TR-165) TO FUEL OIL DYKE AREA			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	DELETED																
				CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	DELETED																
17	TO FUEL OIL PUMP HOUSE			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	DELETED																
18	TO CHEMICAL LAB			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	DELETED																
				SS	DELETED																
19	TO AUX BOILER			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	50NB		50	50	1.5D	90	8			80X50	2						
20	TO PT PLANT			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	50NB		130	50	1.5D	90	4			150X50	2						
				SS	50NB		30	50	1.5D	90	5										
				CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		275	25	1.5D	90	10	50X25	2	50X25	2						
				SS	25NB		75	25	1.5D	90	14										
21	TO CPU REGENERATION			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		25	25	1.5D	90	5	50X25	1	50X25	1						
				SS	25NB		25	25	1.5D	90	5										
22	TO DM PLANT			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	50NB		50	25	1.5D	90	12	50X25	1	50X50	2						
				SS	50NB		25	25	1.5D	90	5										
23	GAS CHLORINATION FOR CW PUMP HOUSE			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	DELETED																
				SS	DELETED																
24	TO CW TREATMENT PLANT			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	DELETED																

	DOCUMENT TITLE	ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)	DOCUMENT NO:	REV NO: 1
		(INSTRUMENT AIR SYSTEM OUTSIDE TG HALL)		14-Mar-19
	PROJ: 2X660MW MAITREE	PREPARED BY:	CHECKED BY:	APPROVED BY:
	CUST: BIFPCL	KK	KK	SK
		QUANTITY FOR TWO UNITS		

Sl. No.	LINE DESCRIPTION	DESIG TEMP (°C)	DESIG PRESS. Kg/cm2 (g)	PIPE MATERIAL SPECIFICATION	PIPE OD (mm)	PIPE THK (mm)	PIPE LEN (M)	MITRE / ELBOWS SIZE (NB)	MITRE / ELBOWS R	MITRE / ELBOWS θ dg	MITRE / ELBOWS No	REDUCERS SIZE (NB)	REDUCERS No	TEES SIZE (NB)	TEES No	FLANGES SIZE (NB)	FLANGES Rating	FLANGES No	MISCELLANEOUS SIZE (NB)	MISCELLANEOUS No	REMARKS
24	TO CW TREATMENT PLANT			SS	DELETED																
25	CONNECTING PIPING FOR AIR TRAPS (TOTAL 52 NOS)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		450	25	1.5D	90	250			150X25 80X25 50X25	30 20 20				3/8" BSP BOTH SIDE THREADED NIPPLE (APPROX. 100MM LONG)	70 NOS	
				CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	15NB		75	15	1.5D	90	110	15NB X (3/8")	70	25X25 25X15	80 70						
26	DRAIN & VENTS			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		100	25	1.5D	90	25			150X25 80X25 50X25 25X25	5 10 10 5						

NOTES:-
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2. FOR DESIGN PREESURE, TEMPERATURE, PIPE SIZE AND MATERIAL PLEASE REFER P&ID OF INSTRUMENT AIR SYSTEM.
3. REQUIRED COUPLINGS, UNIONS, NIPPLES ETC TO BE DECIDED AND SUPPLED BY PIPING CENTRE.

	DOCUMENT TITLE	ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)	DOCUMENT NO:	REV NO: 1
		(POTABLE WATER SYSTEM OUTSIDE TG HALL)		14-Mar-19
	PROJECT TITLE: 2X660MW MAITREE	PREPARED BY	CHECKED BY:	APPROVED BY:
	CUSTOMER: - BIFPCL	KK	KK	SK
		QUANTITY FOR TWO UNITS		

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
POTABLE WATER DISTRIBUTION SYSTEM OUTSIDE TG HALL(P&ID NO: Maitree-00-PC-MFB-116003-PEM)																					
1	SUCTION PIPE FROM PW TANK (PLANT) TO PUMPS			ERW AS PER ASTM A53 GR.B GAL	88.9	3.96	30	80	1.5D	90	6										
2	INTERCONNECTION LINE WITH PW-COLONY			ERW AS PER ASTM A53 GR.B GAL	88.9	3.96	10	80	1.5D	90	7			150X80 80X80	2 2						
3	PW PUMPS(PLANT) INDIVIDUAL SUCTION LINES (2 PUMPS)			ERW AS PER ASTM A53 GR.B GAL	88.9	3.96	20	80	1.5D	90	4	80X50	3	80X80	3						
								50	1.5D	90	3										
4	PW PUMP (PLANT) INDIVIDUAL DISCH (2 PUMPS)			ERW AS PER ASTM A53 GR.B GAL	88.9	3.96	24	80	1.5D	90	6	80X32	3	80X80	3						
5	PW PUMPS(PLANT) DISCH HDR UPTO PIPE RACK			ERW AS PER ASTM A53 GR.B GAL	88.9	3.96	70	80	1.5D	90	7			80X80	2						
6	PW PUMPS(PLANT) RECIRCULATION LINE			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	15	40	1.5D	90	10	80X40	3	80X40 40X40	2 3						
7	SUCTION PIPE FROM PW TANK (COLONY) TO PUMPS			ERW AS PER ASTM A53 GR.B GAL	168.3	5.56	30	150	1.5D	90	6										
8	PW PUMPS(COLONY) INDIVIDUAL SUCTION LINES (2 PUMPS)			ERW AS PER ASTM A53 GR.B GAL	168.3	5.56	20	150	1.5D	90	4	150X80	3	150X150	3						
				ERW AS PER ASTM A53 GR.B GAL				80	1.5D	90	3										
9	PW PUMP (COLONY) INDIVIDUAL DISCH (2 PUMPS)			ERW AS PER ASTM A53 GR.B GAL	168.3	5.56	24	150	1.5D	90	4	150X65	3	150X150	3						
				ERW AS PER ASTM A53 GR.B GAL				65	1.5D	90	3										
10	PW PUMPS(COLONY) DISCH HDR UPTO PIPE RACK			ERW AS PER ASTM A53 GR.B GAL	168.3	5.56	75	150	1.5D	90	7			150X150	2						
11	PW PUMPS(COLONY) RECIRCULATION LINE			ERW AS PER ASTM A53 GR.B GAL	60.3	3.91	5	50	1.5D	90	5	150X50	2	150X50	2						
12	PW LINE FROM PIPE RACK (NEAR DE-SAL PH) TO COLONY (UPTO TP AT BOUNDARY WALL)			ERW AS PER ASTM A53 GR.B GAL	168.3	5.56	550	150	1.5D	90	30										
				ERW AS PER ASTM A53 GR.B GAL				150	1.5D	45	8										
				SS	150NB		180	150	1.5D	90	8										
	POTABLE WATER MAIN DISTRIBUTION HEADER (JETTY-RAW WATER PH-ADMIN BLDG-SWITCHYARD CTRL ROOM																				
13	DESALINATED WATER PH TO PIPE RACK T-POINT (NEAR ETP)			ERW AS PER ASTM A53 GR.B GAL	88.9	3.96	230	80	1.5D	90	5			80X80	1						
14	FROM PIPE RACK T-POINT (NEAR ETP) TOWARDS JETTY AREA UPTO H2 TAPPING			ERW AS PER ASTM A53 GR.B GAL	88.9	3.96	375	80	1.5D	90	8			80X80	2						
				ERW AS PER ASTM A53 GR.B GAL				80	1.5D	45	4										
15	H2 TAPPING POINT TO JETTY AREA UPTO TP AT			ERW AS PER ASTM A53 GR.B GAL	60.3	3.91	1000	50	1.5D	90	20	80X50	2								
				ERW AS PER ASTM A53 GR.B GAL				50	1.5D	45	4										
				SS	50NB		22	50	1.5D	90	6										
16	PIPE RACK T-POINT TO RAW WATER PUMP HOUSE			ERW AS PER ASTM A53 GR.B GAL	88.9	3.96	1450	80	1.5D	90	20			80X80	2						
				ERW AS PER ASTM A53 GR.B GAL				80	1.5D	45	10										
				SS	80NB		50	80	1.5D	90	6										
17	SW SUPPLY TO RAW WATER PUMP HOUSE			SS	40NB		10	40	1.5D	90	5	80X40	1	80X40	1						
18	DESALINATED WATER PH TO C-ROW			ERW AS PER ASTM A53 GR.B GAL	88.9	3.96	800	80	1.5D	90	30										
19	C-ROW TO ADMIN BUILDING HEADER			ERW AS PER ASTM A53 GR.B GAL	60.3	3.91	250	50	1.5D	90	15	80X50	2	80X50	2						
				ERW AS PER ASTM A53 GR.B GAL				50	1.5D	45	8										
				SS	50NB		150	50	1.5D	90	10	50X40	2	50X50 50X40	2 2						
20	ADMIN BLDG TO AUDITORIUM			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	150	40	1.5D	90	10	50X40	1	50X40	1						
21	C-ROW TO PRAYER AREA			ERW AS PER ASTM A53 GR.B GAL	60.3	3.91	240	50	1.5D	90	15	80X50	2	80X80	2						
				ERW AS PER ASTM A53 GR.B GAL				50	1.5D	45	4			80X50	2						
				SS	50NB		60	50	1.5D	90	12										
22	PRAYER HALL TO PARKING AREA			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	60	40	1.5D	90	7	50X40	1	50X40	1						
23	FROM PIPE RACK CORNER NEAR CW PH TO SWITCHYARD CORNER PEDESTAL			ERW AS PER ASTM A53 GR.B GAL	88.9	3.96	165	80	1.5D	90	12			80X80	2						
				SS	80NB		25	80	1.5D	90	6										
24	FROM SWITCHYARD CORNER PEDESTAL TO SWITCHYARD CTRL ROOM			ERW AS PER ASTM A53 GR.B GAL	88.9	3.96	170	80	1.5D	90	5			80X80	2						

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	PROJECT TITLE:		2X660MW MAITREE								PREPARED BY		CHECKED BY:			APPROVED BY:				
	CUSTOMER: -		BIFPCL								KK		KK			SK				
											QUANTITY FOR TWO UNITS									

		DESIGN		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
Sl. No.	LINE DESCRIPTION	TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
	ROOM			SS	80NB		60	80	1.5D	90	9										
25	FROM SWITCHYARD CTRL ROOM TO DG SET			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	110	40	1.5D	90	4	80X40	1	80X40	1						
				SS	40NB		40	40	1.5D	90	9										
26	FROM SWITCHYARD CORNER PEDESTAL TO SOLID WASTE TREATMENT PLANT			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	400	40	1.5D	90	10	80X40	2	80X40	2						
				SS	40NB		100	40	1.5D	90	20										
	DISTRIBUTION TO VARIOUS BUILDINGS																				
27	TO DESALINATER WATER PUMP HOUSE			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	10	40	1.5D	90	5			80X40	2						
28	TO AUX BOILER			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	50	40	1.5D	90	8			80X40	1						
29	TO FIRE WATER PUMP HOUSE			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	25	40	1.5D	90	5			80X40	2						
30	TO FGD			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	340	40	1.5D	90	12			80X40	2						
				SS	40NB		30	40	1.5D	90	6										
31	TO WORKSHOP			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	55	40	1.5D	90	10	80X40	2	80X40	2						
				SS	40NB		45	40	1.5D	90	10										
32	TO CHEMICAL LAB			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	25	40	1.5D	90	4	80X40	1	80X40	2						
				SS	40NB		25	40	1.5D	90	5										
33	TO ETP			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	40	40	1.5D	90	6			80X40	1						
34	TO STP			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	40	40	1.5D	90	6			80X40	2						
35	TO BHEL SITE OFFICE			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	50	40	1.5D	90	8			80X40	2						
36	TO CUSTOMER OFFICE			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	50	40	1.5D	90	8			80X40	1						
				SS	40NB		25	40	1.5D	90	5										
37	TO CHLORINATION PLANT FOR RWPH			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	200	40	1.5D	90	16	80X40	1	80X40 80X80	1 1						
				SS	40NB		25	40	1.5D	90	4										
38	TO FUEL OIL PUMP HOUSE			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	40	40	1.5D	90	8	80X40	1	80X40	2						
39	TO O&M STORES			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	25	40	1.5D	90	6			80X40	1						
				SS	40NB		25	40	1.5D	90	5										
40	TO DSPH-2			ERW AS PER ASTM A53 GR.B GAL	88.9	3.96	170	80	1.5D	90	8			80X80	2						
41	TO H2 PLANT			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	20	40	1.5D	90	4			80X40	1						
42	TO PT PLANT (UPTO PRE-TREATED WATER PH)			ERW AS PER ASTM A53 GR.B GAL	60.3	3.91	225	50	1.5D	90	4			80X50	2						
				SS	50NB		50	50	1.5D	90	12										
43	TO PT PLANT (FROM PRE-TREATED WATER PH TO PT PLANT TP)			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	170	40	1.5D	90	5	50X40	2	50X50 50X40	2 2						
				SS	40NB		30	40	1.5D	90	5										
44	TO CPU REGENERATION			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	15	40	1.5D	90	4			50X40	1						
				SS	40NB		25	40	1.5D	90	5										
45	TO DM PLANT			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	35	40	1.5D	90	6			50X40	2						
				SS	40NB		25	40	1.5D	90	5										
46	TO PRE-TREATED WATER PUMP HOUSE			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	15	40	1.5D	90	4			50X40	1						
				SS	40NB		25	40	1.5D	90	5										

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	CUSTOMER: - BIFPCL	QUANTITY FOR TWO UNITS		

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
47	TO CHLORINATION PLANT FOR CWPH			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	125	40	1.5D	90	7			80X40	2						
				SS	40NB		25	40	1.5D	90	5										
48	TO CW PUMP HOUSE			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	50	40	1.5D	90	8			80X40	1						
49	TO CW TREATMENT PLANT			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	50	40	1.5D	90	8			80X40	2						
				SS	40NB		30	40	1.5D	90	5										
50	TO SWITCHYARD CONTROL ROOM			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	20	40	1.5D	90	5			80X40	1						
				SS	40NB		75	40	1.5D	90	10										
51	TO COMP HOUSE			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	35	40	1.5D	90	6			80X40	2						
				SS	40NB		25	40	1.5D	90	5										
52	TO ESP CONTROL ROOM, UNIT-1			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	170	40	1.5D	90	10			80X40	1						
53	TO MRS UNIT-1			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	50	40	1.5D	90	8			80X40	1						
54	TO SWAS ROOM, UNIT-1			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	50	40	1.5D	90	8			80X40	1						
55	TO BOILER, UNIT-1			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	50	40	1.5D	90	12			80X40	2						
56	TO MRS UNIT-2			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	50	40	1.5D	90	8			80X40	1						
57	TO SWAS ROOM, UNIT-2			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	50	40	1.5D	90	8			80X40	1						
58	TO BOILER, UNIT-2			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	50	40	1.5D	90	12			80X40	2						
59	TO AHP COMP HOUSE			ERW AS PER ASTM A53 GR.B GAL	60.3	3.91	300	50	1.5D	90	16	80X50	2	80X80 80X50	2 2						
60	TO ESP CTRL ROOM UNIT-2			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	20	40	1.5D	90	6			50X40	1						
61	TO CANTEEN			SS	40NB		30	40	1.5D	90	6			50X40	1						
62	TO FIRE STATION			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	40	40	1.5D	90	6			50X40	1						
63	TO CUSTOMER OFFICE (NEAR MAIN GATE)			SS	40NB		50	40	1.5D	90	6			50X40	1						
64	TO SERVICE BUILDING			ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	20	40	1.5D	90	6			50X40	1						
65	TO MAIN GATE			SS	50NB		40	50	1.5D	90	6			50X50	2						
				SS	40NB		110	40	1.5D	90	10	50X40	2	50X40	2						
66	TO WEIGH BRIDGE			SS	40NB		30	40	1.5D	90	6			50X40	1						
67	SPARE			ERW AS PER ASTM A53 GR.B GAL	88.9	3.96	50	80	1.5D	90	5	80X50	10	80X80 80X50	10 10						
				ERW AS PER ASTM A53 GR.B GAL	60.3	3.91	100	50	1.5D	90	10	50X40	10	50X50 50X40	10 10						
				ERW AS PER ASTM A53 GR.B GAL	48.3	3.68	200	40	1.5D	90	25										
68	DRAIN & VENTS			ERW AS PER ASTM A53 GR.B GAL	33.4	3.38	100	25	1.5D	90	25										

NOTES:-
1. THIS IS ONLY ESTIMATED BOM. ACTUAL BOM SHALL BE AS PER DRAWING.
2. FOR DESIGN PREESURE, TEMPERATURE, PIPE SIZE AND MATERIAL PLEASE REFER SERVICE WATER & POTABLE WATER DISTRIBUTION SCHEMATICS.
3. REQUIRED COUPLINGS, UNIONS, NIPPLES ETC TO BE DECIDED AND SUPPLED BY PIPING CENTRE.

	DOCUMENT TITLE	ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)																	DOCUMENT NO:		REV NO: 1
		(SERVICE AIR SYSTEM OUTSIDE TG HALL)																			14-Mar-19
	PROJ 2X660MW MAITREE								PREPARED BY		CHECKED BY:			APPROVED BY:						
	CUST BIFPCL								KK		KK			SK						
									QUANTITY FOR TWO UNITS											

Sl. No.	LINE DESCRIPTION	DESIG TEMP (°C)	DESIG PRESS. Kg/cm2 (g)	PIPE MATERIAL SPECIFICATION	PIPE OD (mm)	PIPE THK (mm)	PIPE LEN (M)	MITRE / ELBOWS SIZE (NB)	MITRE / ELBOWS R	MITRE / ELBOWS θ dg	MITRE / ELBOWS No	REDUCERS SIZE (NB)	REDUCERS No	TEES SIZE (NB)	TEES No	FLANGES SIZE (NB)	FLANGES Rating	FLANGES No	MISCELLANEOUS SIZE (NB)	MISCELLANEOUS No	REMARKS
SERVICE AIR DISTRIBUTION SYSTEM OUTSIDE TG HALL (P&ID NO: MAITREE-00-QEA-FB-112303-PEM)																					
1	FROM COMPRESSOR HOUSE TO UNIT-1 TAP OFF NEAR COLUMN C-2 (INCLUDING SMALL PORTION TOWARDS BOP AREA FOR INSTALLING VALVE)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	200NB		200	200	1.5D	90	15	250X200	2	200X200	2						
2	TO UNIT-1 (UPTO HEADER ONLY, FURTHER BOM INSIDE TG HALL SHALL BE AS PER DRAWING)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	150NB		20	150	1.5D	90	8			200X150	2						
3	TO UNIT-2 (UPTO HEADER ONLY, FURTHER BOM INSIDE TG HALL SHALL BE AS PER DRAWING)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	150NB		20	150	1.5D	90	8			150X150	2						
4	SA HEADER FROM UNIT-1 TO UNIT-2			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	150NB		200	150	1.5D	90	10	200X150	2								
				CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG				150	1.5D	45	4										
5	SA HEADER ALONG C-ROW			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	80NB		175	80	1.5D	90	6	150X80	2								
6	TO CANTEEN			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	50NB		110	50	1.5D	90	6										
				CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG				50	1.5D	45	4										
				SS	50NB		50	50	1.5D	90	8										
				SS	25NB		30	25	1.5D	90	6	50X25	2	50X25	2						
7	TO FIRE STATION			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		70	50	1.5D	90	8	50X25	1	50X25	1						
8	TO SERVICE BUILDING			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	50NB		50	50	1.5D	90	8	80X50	2	80X50	2						
				CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		25	25	1.5D	90	8	50X25	2	50X25	2						
9	TO FGD			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	50NB		600	50	1.5D	90	30	80X50	2	80X50	2						
10	TO ESP CONTROL ROOM UNIT-1			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		170	25	1.5D	90	10			150X25	3						
11	TO ESP CONTROL ROOM UNIT-2			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		20	25	1.5D	90	6	50X25	2	50X25	2						
12	TO BOILER UNIT-1 (UPTO TP)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	150NB		25	150	1.5D	90	6			150X150	1						
13	TO BOILER UNIT-2 (UPTO TP)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	150NB		25	150	1.5D	90	6			150X150	1						
14	SA HEADER TO BOP AREA UPTO TAP-OFF FOR PT PLANT			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	150NB		320	150	1.5D	90	16	200X150	2								

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	CUST BIFPCL										KK		KK			SK						
											QUANTITY FOR TWO UNITS											

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15	FROM TAP OFF OF PT PANT (NEAR TR-130) TO PIPE RACK T-POINT NEAR ETP (TR-165)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	80NB		350	80	1.5D	90	10	150X80	2	150X80	2						
16	PIPE RACK T-POINT NEAR ETP (TR-165) TO TAP-OFF TO WORKSHOP (TR-211)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	80NB		140	80	1.5D	90	5			80X80	2						
17	TO DESILTING CHAMBER AREA (FROM TR-211)			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	50NB		50	50	1.5D	90	5	80X50	2	80X50	2						
				CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		1300	25	1.5D	90	30	50X25 80X25	2 2	50X25 80X25	2 2						
				CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG				25	1.5D	45	15										
				SS	25NB		25	25	1.5D	90	8										
18	FROM PIPE RACK T-POINT (TR-165) TO FUEL OIL DYKE AREA			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	50NB		150	50	1.5D	90	10	50X25	2	50X50	2						
				CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		50	25	1.5D	90	8			50X25	2						
19	TO FUEL OIL PUMP HOUSE			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		15	25	1.5D	90	6	50X25	1	50X25	1						
20	TO O&M STORES			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		35	25	1.5D	90	8	50X25	1	50X25	2						
				SS	25NB		25	25	1.5D	90	6										
21	TO ETP			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		40	25	1.5D	90	6			80X25 50X25	1 1						
22	TO STP			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		40	25	1.5D	90	6			80X25 50X25	1 1						
23	TO CHEMICAL LAB			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		35	25	1.5D	90	6			80X25 50X25	2 2						
				SS	25NB		25	25	1.5D	90	5										
24	TO WROKSHOP			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		75	25	1.5D	90	16			80X25 50X25	2 2						
				SS	25NB		45	25	1.5D	90	10										
25	TO AUX BOILER			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	50NB		50	50	1.5D	90	8			80X50	2						
26	TO FIRE WATER PUMP HOUSE			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		30	25	1.5D	90	5			80X25	1						
27	TO DESALINATED WATER PUMP HOUSE			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		30	25	1.5D	90	5			80X25	2						

	DOCUMENT TITLE	ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)																			DOCUMENT NO:		REV NO: 1
		(SERVICE AIR SYSTEM OUTSIDE TG HALL)																					14-Mar-19
	PROJ	2X660MW MAITREE										PREPARED BY		CHECKED BY:			APPROVED BY:						
	CUST	BIFPCL										KK		KK			SK						
												QUANTITY FOR TWO UNITS											
		DESIG		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS		
Sl. No.	LINE DESCRIPTION	TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No			
28	TO PT PLANT			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	50NB		130	50	1.5D	90	4			150X50	2								
				SS	50NB		30	50	1.5D	90	5												
				CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		275	25	1.5D	90	10	50X25	2	50X25	2								
				SS	25NB		75	25	1.5D	90	14												
29	TO CPU REGENERATION			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		25	25	1.5D	90	5	50X25	1	50X25	1								
				SS	25NB		25	25	1.5D	90	5												
30	TO DM PLANT			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		35	25	1.5D	90	6	50X25	1	50X25	1								
				SS	25NB		25	25	1.5D	90	5												
31	GAS CHLORINATION FOR CW PUMP HOUSE			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		125	25	1.5D	90	8	50X25	2	150X25	2								
				SS	25NB		25	25	1.5D	90	5												
32	TO CW TREATMENT PLANT			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		50	25	1.5D	90	8	150X80 80X25	1 1	150X150 150X25	1 1								
				SS	25NB		30	25	1.5D	90	5												
33	DRAIN & VENTS			CS AS PER ASTM A53, TYPE-E, GRADE-B, SCH40, HDG	25NB		100	25	1.5D	90	25			150X25 80X25 50X25 25X25	5 10 10 5								

NOTES:-
1. THIS IS ONLY ESTIMATED BOM. ACTUAL BOM SHALL BE AS PER DRAWING.
2. FOR DESIGN PREESURE, TEMPERATURE, PIPE SIZE AND MATERIAL PLEASE REFER P&ID OF SERVICE AIR SYSTEM.
3. REQUIRED COUPLINGS, UNIONS, NIPPLES ETC TO BE DECIDED AND SUPPLED BY PIPING CENTRE.

	DOCUMENT TITLE	ESTIMATED BILL OF MATERIAL (PIPING AND FITTINGS)	DOCUMENT NO:	REV NO: 1
		(SERVICE WATER SYSTEM OUTSIDE TG HALL)		14-Mar-19
	PROJECT TITLE: 2X660MW MAITREE	PREPARED BY	CHECKED BY:	APPROVED BY:
	CUSTOMER: - BIFPCL	KK	KK	SK
		QUANTITY FOR TWO UNITS		

Sl. No.	LINE DESCRIPTION	DESIGN TEMP (°C)	DESIGN PRESS. Kg/cm2 (g)	PIPE MATERIAL SPECIFICATION	PIPE OD (mm)	PIPE THK (mm)	PIPE LEN (M)	MITRE / ELBOWS SIZE (NB)	MITRE / ELBOWS R	MITRE / ELBOWS θ dg	MITRE / ELBOWS No	REDUCERS SIZE (NB)	REDUCERS No	TEES SIZE (NB)	TEES No	FLANGES SIZE (NB)	FLANGES Rating	FLANGES No	MISCELLANEOUS SIZE (NB)	MISCELLANEOUS No	REMARKS
SERVICE WATER DISTRIBUTION SYSTEM OUTSIDE TG HALL (P&ID NO: Maitree-00-PC-MFB-116003-PEM)																					
1	SUCTION PIPE FROM SW TANK TO PUMPS			CS AS PER ASTM A53	168.3	5.56	55	150	1.5D	90	8										
2	SW PUMPS INDIVIDUAL SUCTION LINES (2 PUMPS)			CS AS PER ASTM A53	168.3	5.56	20	150	1.5D	90	4	150X100	3	150X150	3						
				CS AS PER ASTM A53				100	1.5D	90	2										
3	SW PUMP INDIVIDUAL DISCH (2 PUMPS)			CS AS PER ASTM A53	114.3	4.78	24	100	1.5D	90	4	100X80	3	100X100	3						
				CS AS PER ASTM A53				80	1.5D	90	2										
4	SW PUMPS DISCH HDR UPTO PIPE RACK			CS AS PER ASTM A53	114.3	4.78	80	100	1.5D	90	7			100X100	2						
5	SW PUMPS RECIRCULATION LINE			CS AS PER ASTM A53	88.9	3.96	15	80	1.5D	90	10	100X80	2	100X80 80X80	1 3						
6	SERVICE WATER MAIN DISTRIBUTION HEADER (JETTY-RAW WATER PH-ADMIN BLDG-SWITCHYARD CTRL ROOM			CS AS PER ASTM A53																	
7	DESALINATED WATER PH TO PIPE RACK T-POINT (NEAR ETP)			CS AS PER ASTM A53	114.3	4.78	230	100	1.5D	90	5										
8	FROM PIPE RACK T-POINT (NEAR ETP) TOWARDS JETTY AREA UPTO H2 TAPPING			CS AS PER ASTM A53	114.3	4.78	375	100	1.5D	90	8			100X100	1						
				CS AS PER ASTM A53				100	1.5D	45	4										
9	H2 TAPPING POINT TO JETTY AREA UPTO TP AT			CS AS PER ASTM A53	88.9	3.96	1000	80	1.5D	90	20	100X80	2								
				CS AS PER ASTM A53				80	1.5D	45	4										
				SS	80NB		22	80	1.5D	90	6										
10	PIPE RACK T-POINT TO RAW WATER PUMP HOUSE			CS AS PER ASTM A53	88.9	3.96	1450	80	1.5D	90	20	100X80	2	100X100	2						
				CS AS PER ASTM A53				80	1.5D	45	10										
				SS	80NB		50	80	1.5D	90	6										
11	SW SUPPLY TO RAW WATER PUMP HOUSE			SS	40NB		10	40	1.5D	90	5	80X40	1	80X40	1						
12	DESALINATED WATER PH TO C-ROW			CS AS PER ASTM A53	114.3	4.78	800	100	1.5D	90	30										
13	C-ROW TO ADMIN BUILDING HEADER			CS AS PER ASTM A53	88.9	3.96	250	80	1.5D	90	15	100X80	2	100X80	2						
				CS AS PER ASTM A53				80	1.5D	45	8										
				SS	80NB		150	80	1.5D	90	10	80X40	2	80X80 80X40	2 2						
14	ADMIN BLDG TO AUDITORIUM			CS AS PER ASTM A53	48.3	3.68	150	40	1.5D	90	10	80X40	1	80X40	1						
15	C-ROW TO PRAYER AREA			CS AS PER ASTM A53	88.9	3.96	240	80	1.5D	90	15	100X80	2	100x100	2						
				CS AS PER ASTM A53				80	1.5D	45	4			100X80	2						
				SS	80NB		60	80	1.5D	90	12										
16	PRAYER HALL TO PARKING AREA			CS AS PER ASTM A53	48.3	3.68	60	40	1.5D	90	7	80X40	1	80X40	1						
17	FROM PIPE RACK CORNER NEAR CW PH TO SWITCHYARD CORNER PEDESTAL			CS AS PER ASTM A53	88.9	3.96	165	80	1.5D	90	12	100X80	1	100X80	1						
				SS	80NB		25	80	1.5D	90	6										
18	FROM SWITCHYARD CORNER PEDESTAL TO SWITCHYARD CTRL ROOM			CS AS PER ASTM A53	88.9	3.96	170	80	1.5D	90	5			80X80	2						
				SS	80NB		60	80	1.5D	90	9										
19	FROM SWITCHYARD CTRL ROOM TO DG SET			CS AS PER ASTM A53	48.3	3.68	110	40	1.5D	90	4	80X40	1	80X40	1						
				SS	40NB		40	40	1.5D	90	9										
20	FROM SWITCHYARD CORNER PEDESTAL TO SOLID WASTE TREATMENT PLANT			CS AS PER ASTM A53	48.3	3.68	400	40	1.5D	90	10	80X40	2	80X40	2						
				SS	40NB		100	40	1.5D	90	20										
	DISTRIBUTION TO VARIOUS BUILDINGS																				
21	TO DESALINATER WATER PUMP HOUSE			CS AS PER ASTM A53	48.3	3.68	10	40	1.5D	90	5			100X40	2						
22	TO AUX BOILER			CS AS PER ASTM A53	48.3	3.68	50	40	1.5D	90	8			100X40	1						
23	TO FIRE WATER PUMP HOUSE			CS AS PER ASTM A53	48.3	3.68	25	40	1.5D	90	5			100X40	2						
24	TO FGD			CS AS PER ASTM A53	48.3	3.68	340	40	1.5D	90	12			100X40	2						
				SS	40NB		30	40	1.5D	90	6										
25	TO WORKSHOP			CS AS PER ASTM A53	48.3	3.68	55	40	1.5D	90	10	80X40	2	100X40 80X40	2 2						
				SS	40NB		45	40	1.5D	90	10										

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		(SERVICE WATER SYSTEM OUTSIDE TG HALL)		14-Mar-19
	PROJECT TITLE:	2X660MW MAITREE	PREPARED BY	CHECKED BY:	APPROVED BY:
	CUSTOMER: -	BIFPCL	KK	KK	SK
		QUANTITY FOR TWO UNITS			

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
26	TO CHEMICAL LAB			CS AS PER ASTM A53	48.3	3.68	25	40	1.5D	90	4	80X40	1	100X40 80X40	1 1						
				SS	40NB		25	40	1.5D	90	5										
27	TO ETP			CS AS PER ASTM A53	48.3	3.68	40	40	1.5D	90	6			80X40	1						
28	TO STP			CS AS PER ASTM A53	48.3	3.68	40	40	1.5D	90	6			80X40	2						
29	TO BHEL SITE OFFICE			CS AS PER ASTM A53	48.3	3.68	50	40	1.5D	90	8			80X40	2						
30	TO CUSTOMER OFFICE			CS AS PER ASTM A53	48.3	3.68	50	40	1.5D	90	8			80X40	1						
				SS	40NB		25	40	1.5D	90	5										
	TO CHLORINATION PLANT FOR RWPH			CS AS PER ASTM A53	48.3	3.68	200	40	1.5D	90	16	80X40	1	80X40 80X80	1 1						
31				SS	40NB		25	40	1.5D	90	4										
32	TO FUEL OIL PUMP HOUSE			CS AS PER ASTM A53	48.3	3.68	40	40	1.5D	90	8	100X80	2	100X40	2						
33	TO O&M STORES			CS AS PER ASTM A53	48.3	3.68	25	40	1.5D	90	6			100X40	1						
				SS	40NB		25	40	1.5D	90	5										
34	TO DSPH-2			CS AS PER ASTM A53	88.9	3.96	170	80	1.5D	90	8	100X80	2	100X100 100X80	2 2						
35	TO H2 PLANT			CS AS PER ASTM A53	48.3	3.68	20	40	1.5D	90	4			80X40	1						
36	TO PT PLANT (UPTO PRE-TREATED WATER PH)			CS AS PER ASTM A53	88.9	3.96	225	80	1.5D	90	4			100x80	1						
				SS	80NB		50	80	1.5D	90	12										
37	TO PT PLANT (FROM PRE-TREATED WATER PH TO PT PLANT TP)			CS AS PER ASTM A53	48.3	3.68	170	40	1.5D	90	5	80X40	2	80X80	2						
				SS	40NB		30	40	1.5D	90	5										
38	TO CPU REGENERATION			CS AS PER ASTM A53	48.3	3.68	15	40	1.5D	90	4			80X40	1						
				SS	40NB		25	40	1.5D	90	5										
39	TO DM PLANT			CS AS PER ASTM A53	48.3	3.68	35	40	1.5D	90	6			100X40 80X40	2 2						
				SS	40NB		25	40	1.5D	90	5										
40	TO PRE-TREATED WATER PUMP HOUSE			CS AS PER ASTM A53	48.3	3.68	15	40	1.5D	90	4			80X40	2						
				SS	40NB		25	40	1.5D	90	5										
41	TO CHLORINATION PLANT FOR CWPH			CS AS PER ASTM A53	48.3	3.68	125	40	1.5D	90	7			100X40	2						
				SS	40NB		25	40	1.5D	90	5										
42	TO CW PUMP HOUSE			CS AS PER ASTM A53	48.3	3.68	50	40	1.5D	90	8			80X40	1						
43	TO CW TREATMENT PLANT			CS AS PER ASTM A53	48.3	3.68	50	40	1.5D	90	8			80X40	2						
				SS	40NB		30	40	1.5D	90	5										
44	TO SWITCHYARD CONTROL ROOM			CS AS PER ASTM A53	48.3	3.68	20	40	1.5D	90	5			80X40	1						
				SS	40NB		75	40	1.5D	90	10										
45	TO COMP HOUSE			CS AS PER ASTM A53	48.3	3.68	35	40	1.5D	90	6			80X40	2						
				SS	40NB		25	40	1.5D	90	5										
46	TO ESP CONTROL ROOM, UNIT-1			CS AS PER ASTM A53	48.3	3.68	170	40	1.5D	90	10			100X40	1						
47	TO MRS UNIT-1			CS AS PER ASTM A53	48.3	3.68	50	40	1.5D	90	8			100X40	1						
48	TO SWAS ROOM, UNIT-1			CS AS PER ASTM A53	48.3	3.68	50	40	1.5D	90	8			100X40	1						
49	TO BOILER, UNIT-1			CS AS PER ASTM A53	60.3	3.91	50	50	1.5D	90	12			100X50	2						

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	PROJECT TITLE: 2X660MW MAITREE	PREPARED BY: KK	CHECKED BY: KK	APPROVED BY: SK
	CUSTOMER: - BIFPCL	QUANTITY FOR TWO UNITS		

Sl. No.	LINE DESCRIPTION	DESIGN		PIPE MATERIAL	PIPE			MITRE / ELBOWS				REDUCERS		TEES		FLANGES			MISCELLANEOUS		REMARKS
		TEMP (°C)	PRESS. Kg/cm2 (g)	SPECIFICATION	OD (mm)	THK (mm)	LEN (M)	SIZE (NB)	R	θ dg	No	SIZE (NB)	No	SIZE (NB)	No	SIZE (NB)	Rating	No	SIZE (NB)	No	
50	TO CPU SERVICE VESSEL UNIT-1			CS AS PER ASTM A53	48.3	3.68	20	40	1.5D	90	5			100X40	1						
51	TO MRS UNIT-2			CS AS PER ASTM A53	48.3	3.68	50	40	1.5D	90	8			100X40	1						
52	TO SWAS ROOM, UNIT-2			CS AS PER ASTM A53	48.3	3.68	50	40	1.5D	90	8			100X40	1						
53	TO BOILER, UNIT-2			CS AS PER ASTM A53	60.3	3.91	50	50	1.5D	90	12			100X50	2						
54	TO CPU SERVICE VESSEL UNIT-2			CS AS PER ASTM A53	48.3	3.68	20	40	1.5D	90	5			100X40	1						
55	TO AHP COMP HOUSE			CS AS PER ASTM A53	88.9	3.96	300	80	1.5D	90	16	100X80	2	100X100 100X80	2 2						
56	TO ESP CTRL ROOM UNIT-2			CS AS PER ASTM A53	48.3	3.68	20	40	1.5D	90	6			80X40	1						
57	TO CANTEEN			SS	40NB		30	40	1.5D	90	6			80X40	1						
58	TO FIRE STATION			CS AS PER ASTM A53	48.3	3.68	40	40	1.5D	90	6			80X40	1						
59	TO CUSTOMER OFFICE (NEAR MAIN GATE)			SS	40NB		50	40	1.5D	90	6			80X40	1						
60	TO SERVICE BUILDING			CS AS PER ASTM A53	48.3	3.68	20	40	1.5D	90	6			80X40	1						
61	TO MAIN GATE			SS	80NB		40	80	1.5D	90	6			80X80	2						
				SS	40NB		110	40	1.5D	90	10	80X40	2	80X40	2						
62	TO WEIGH BRIDGE			SS	40NB		30	40	1.5D	90	6			80X40	1						
63	HOSE CONNECTION PIPE AT EAC INDIVIDUAL BUILDINGS (50 NOS BUILDINS)			CS AS PER ASTM A53	33.4	3.38	100	25	1.5D	90	100	40X25	25	40X25	75						
64	SPARE			CS AS PER ASTM A53	168.3	5.56	20	150	1.5D	90	5	150X100	5	150X150 150X100 100X100	5 5 5						
				CS AS PER ASTM A53	114.3	4.78	50	100	1.5D	90	5	100X80	5	100X80 80X80 80X40	5 5 15						
				CS AS PER ASTM A53	88.9	3.96	100	80	1.5D	90	10	80X40	10	40X40 40X25 25X25	5 10 5						
				CS AS PER ASTM A53	48.3	3.68	200	40	1.5D	90	25	40X25	10								
65	DRAIN & VENTS			CS AS PER ASTM A53	33.4	3.38	100	25	1.5D	90	25										

NOTES:-
1. THIS IS ONLY ESTIMATED BOM. ACTUAL BOM SHALL BE AS PER DRAWING.
2. FOR DESIGN PREESURE, TEMPERATURE, PIPE SIZE AND MATERIAL PLEASE REFER SERVICE WATER & POTABLE WATER DISTRIBUTION SCHEMATICS.
3. REQUIRED COUPLINGS, UNIONS, NIPPLES ETC TO BE DECIDED AND SUPPLED BY PIPING CENTRE.

CONTENT

CLAUSE NO	DESCRIPTION
1.0	BROAD SCOPE OF WORK
2.0	TECHNICAL SPECIFICATION FOR MAIN PLANT LP PIPING
3.0	PRECAUTIONS AGAINST FLOATATION
4.0	COATING & WRAPPING OF BURRIED PIPES
5.0	WELDING, HEAT TREATMENT & RADIOGRAPHY FOR MAIN PLANT LP PIPING
6.0	CLEANING /HYDRO TESTING /PNEUMATIC TESTING OF MAIN PLANT PIPING SYSTEM
7.0	FIELD PAINTING
8.0	PROCEDURE OF CIVIL WORK FOR BURRIED PIPE
9.0	EXCLUSION
10.0	OTHER

The technical specification, scope etc in this volume shall be construed as part of tender document and shall be read along with general conditions of contract (GCC), special conditions of contract (SCC). In case of any conflict or inconsistency between the GCC, SCC and this Volume-II, the same shall be brought out by the bidder in writing to BHEL for clarification, failing which most stringent interpretation/ clause in favour of BHEL shall be adopted and the same shall be binding to the bidder.

CLAUSE NO	DESCRIPTION
1.0	**BROAD SCOPE OF WORK**
1.1	This specification covers complete work of handling including arranging for issue of material, receipt from store/ yard, transportation to site, temporary storage prior to erection, erection & welding, dewatering during erection, protective coating (as applicable), final painting, testing at site and commissioning of River /Canal water/Plant water/ DMCW/CW/ACW other LP piping and associated materials, etc. of 'LP Piping Pkg.' as mentioned in different sections of this tender for 2X660 MW Maitree STPP, Rampal, Bangladesh.
1.2	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 their judgment is not in full accordance herewith.
1.3	Unless otherwise specifically brought out, it will be presumed that the bidders' offer is strictly in line with this specification and no deviation will be allowed after the award of contract.
1.4	The general terms and condition, instructions to tenderer and other attachments referred to elsewhere are hereby made part of the tender. The bidder will be responsible and governed by all requirements stipulated hereinafter.
1.5	The quality plan attached with this specification specifies minimum quality control requirement. The enclosed quality plans duly certified by the bidder shall be returned to purchaser indicating his concurrence to comply with these minimum requirements. However, after award of the job, the bidder have to submit proposed QP for BHEL/ customer approval.
1.6	The omission of specific reference to any fabrication/ erection method, equipment or material necessary for proper & efficient working of the plant shall not relieve the bidder 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 bidder free of cost. Inspection by BHEL/ customer does not relieve bidder of their responsibility of executing quality erection.
1.7	Following shall be bidder's responsibility and have to be provided within contract price.
1.7.1	Provision as required of all types of labour, supervisors, engineers, watch & ward, tools & tackles, calibrated IMTEs (Inspection, measuring and testing equipment) as specified and otherwise required for work, consumables for erection, testing and commissioning including material handling.
1.7.2	Proper out-turn 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.
1.8	All quality standards, tolerances, welding standards & other technical requirements shall be strictly adhered to. The Bidder shall fully apprise himself of the prevailing conditions at the proposed site, climatic conditions including monsoon pattern, soil conditions, local conditions and site specific parameters and shall include for all such

	conditions and contingent measures in the bid, including those which may not have been specifically brought out in the specifications.
1.9	All other points shall be as per the terms & conditions and specification along with aforesaid references together with amendments incorporated thereto.
2.0	**TECHNICAL SPECIFICATION FOR MAIN PLANT LP PIPING**
2.1	This specification is mainly intended to cover the erection & commissioning of River/Canal Water Piping / Plant water piping/DMCW/other low pressure piping/ misc piping, which shall cover handling from storage, erection, testing, inspection, final painting, testing, servicing and commissioning of piping & fittings as covered in specification.
2.2	The work to be carried out under the scope of this specification shall broadly comprise of but not be limited to the following systems.
2.2.1	It mainly consists of following for both unit # 1 & 2-
2.2.1.1	Canal/River water Intake water system piping from Intake water Pump house(which is located outside plant boundary) to Raw water reservoir inside plant (about 5 Kms, two runs)
2.2.1.2	Plant water system inside the plant boundary including service water and drinking water,
2.2.1.3	CW / DMCW piping
2.2.1.4	Any other piping under DMCW/ Chlroination System water supply piping/ DM water/ CW blowdown system.
2.2.1.5	Central lub-oil system piping.
2.2.1.6	Instrument/ service air piping of main plant and Aux. building.
2.2.1.7	Piping of Fire Protection System package
2.2.2	Deleted
2.2.3	All Canal Water, Plant water, DMCW, other LP piping system, Piping of Fire Protection Sys package etc. to be completed includes all its drains and vents, impulse lines as applicable.
2.3	BHEL reserve the right to get executed through the contractor any LP piping system work not mentioned in the tender document specifically (permanent/ temporary/ contingency nature), but required as per project requirement. Payment shall be made for such item as per applicable price schedule. However, no extra payment shall be made for dismantling of temporary/ contingent piping system.
2.4	The welding of pipes at terminal points shall be under the scope of this package and required to be done by the vendor.
2.5	Final flange connection with equipments like oil coolers/ PHE/ self cleaning strainers/ gas coolers etc is to be done by the bidder. Gaskets if required replacement, due to leakage/ damage during erection is to be replaced by the vendor free of cost including supply of the gasket of required specification.
2.6	All erectable gaskets, fasteners and other hardware shall be supplied by BHEL free of cost. However, temporary gasket, if required during testing, shall have to be provided by bidder. Bidder's quoted rates shall be inclusive of this.
2.7	During initial unit commissioning activities, DM water, instrument air, service air, fuel oil, etc availability thorugh temporary piping and valves may be required. Erection of the same is in the vendor scope. Payment will be made as per applicable erection rate. The piping, valves etc will be provided by BHEL free of cost. However dismantling of the piping, valve etc, its cleaning and edge preperation, for its reuse, if required, will have to done by the contractor without any extra claim.
2.8	All pipes including Canal water /Raw water piping (underground and overground) shall be supplied by BHEL in fabricated condition in tentatively 6 mtr to 12 mtr length. Fittings like tees, reducers, elbows, manholes, mitre bends, flanges etc shall be supplied by BHEL in fabricated condition. Cutting of tees, elbows/ reducers to suit the pipe fitting/ erection as required, is to be done without any extra claim.

2.9	The contractor may have to carry out fabrication of mitre bends, tees, reducer of sizes NB 250 and above for LP piping systems. Pipes will be supplied in running meters by BHEL free cost. Required number of mitre bends, tees is to be fabricated by the LP piping erection contractor. Payment shall be made as per applicable item of price schedule.
2.10	Scope of Field painting at site is as per painting schedule. Paints shall be arranged by the contractor from BHEL/BIFPCL approved supplier only.
2.11	Necessary scaffolding, required for painting of surfaces at various locations/ elevations shall be arranged by the contractor at their own cost. All the materials, required for scaffoldings shall be arranged by the contractor at their own cost.
2.12	The instructions of paint manufacturer/ BHEL's engineer shall be followed at all times. Colour code for paints, to be applied on surfaces of various equipment and system, shall be furnished during execution as per approval of BIPFCL/BHEL.
2.13	Coating thickness shall be measured by elcometer or other standard measuring device for measuring of finished film thickness of finished paint. If the thickness is found to be less than specified, the pipes shall be re-surfaced to bring the same to specified thickness.
2.14	The quoted rate will be inclusive of supply and application of painting and no separate payment shall be made for Finish painting.
2.15	Erection & welding, of all valves, misc fittings required to complete the system but not specifically mentioned in relevant annexure of tender is covered in the scope of contract and payment will be made as per applicable piping item of mechanical price schedule. All such materials will be supplied by BHEL. The erection activity of valve also includes cleaning, servicing and final painting of valves. All counter flanges, bolts, nuts, washer, gaskets etc shall be supplied by BHEL loose (free issue).
2.16	Commissioning assistance, post commissioning assistance and valve servicing till commercial handover of the plant to customer are included in the scope of work.
2.17	Calibration and commissioning of motor -actuated valves, pneumatic control valves, calibration of various measuring devices, including cabling is excluded from the scope of work.
2.18	Necessary excavation for buried pipe and backfilling with earth is excluded from the scope of bidder and shall be done by BHEL. BHEL will release excavated clear front to bidder for erection of buried pipe. Dewatering with all necessary arrangement required after handing over of excavated front is under the scope of bidder. Foxholes (cutting of earth below pipe joint) for welding will be in vendor scope. No seperate payment shall be made on account of fox holes, dewatering, as detailed above and the erection and commission rate as per price schedule of River/Canal Water piping shall be inclusive of the same. Concrete bedding/ encasing is excluded from scope of work.
2.19	Any other connected material supply which is not covered in BOM but required to complete the system shall be erected by the vendor and payment in this case shall be made as per applicable item rate.
2.20	Minor modification of erected pipes shall be carried out by the contractor for which no extra claim shall be admissible. Any major rework required after completion of work, shall be carried out based on man-hours and the same shall be done by a special team/ gang without affecting the regular work. The record of extra man-hours in carrying out the re-work shall be maintained by the contractor which shall be duly verified and approved by the purchaser.
2.21	Quantities given in the relevant annexure and price schedule are indicative only. Actual supplies shall be made based on the drawings finally approved by customer.
2.22	Pipelines from service air header is to be laid by contractor as per site routing as per instructions of BHEL site engineer (for TG filter cleaning in BFP & turbine oil filters and in various areas of boiler for cleaning operations) and payment will be made as per applicable item of price schedule.
2.23	Erection of all drains, vents, instrument tapping points with root valves, water traps etc. integral to the piping system shall be in the scope of contractor and site routing of drain, vent and miscellaneous small bore pipe shall be carried out as per direction

	of BHEL engineers.
2.24	For small bore piping, which is supplied in running length, electro-hydraulic pipe bending machines and pipe chamfering machine will be arranged and used at least to cater 3" schedule 160 pipes at site by the contractor.
2.25	Hanger and support/ anchors/ restraints, stubs for drains/ vents/ welded type thermowells, welding pressure connection, sockets, rain hood, cowls, aux structures for pipe supports etc for piping will be issued free as loose items. Erection, welding, painting etc of these items as per BHEL drawing is in the scope of contractor and payment for these items shall be made as per applicable item of price schedule. Seal welding of threaded thermowell with matching welding electrode is to be done by the vendor without any extra claim.
2.26	All pipe supports/ anchors coming on concrete floors/ walls are to be fixed with expansion/ rawl bolts with nuts. The same will be issued free to the bidder by BHEL.
2.27	Bidders to exercise utmost care while doing execution and commissioning work for this package so that no damage is caused to the existing plant at site. Any such damage will be back charged to bidder.
3.0	**PRECAUTIONS AGAINST FLOATATION**
3.1	When pipe line laid underground or above ground in a long narrow cutting gets submerged in water collected in the trench or cutting, it is subjected to an uplift pressure due to buoyancy and is likely to float if completely or partly empty. In the design of pipelines, provision is made to safeguard against floatation by providing sufficient over burden or by providing sufficient dead weight by means of blocks, etc. In case the works extend over one or more monsoon seasons, special care and precautions are necessary during the progress of work on this account. Contractors shall close pipe line, if required, by blank flanges well in time for the monsoon. The work of providing blocks, refilling the earth to the required level and compacting the same etc shall always be done as soon as the pipe line in the cutting has been laid.
3.2	The contractor shall see that the water shall not be allowed to accumulate in open trenches where work is in incomplete stage, precautionary works such as blank flanging the open ends of the pipe line and filling the pipe line with water etc. shall be taken as directed by the engineer. Such works shall be to the contractor's account and no separate payment will be made for the same.
3.3	Protection of pipeline against floatation during the contract period shall be the responsibility of the contractors. Should any section of the pipe line float due to their negligence etc. the entire cost of laying it again to the correct line and level shall be to the contractor's account.
4.0	**COATING & WRAPPING OF BURRIED PIPES**
4.1	This specification covers the supply of material, application, inspection, testing including supervision of coal tar protection tape.
4.2	Any of the following may be considered for coating of the buried Pipe – 1. Coal tar primer, coal tar enamel, inner wrap of fiber glass, final outer wrap of enamel impregnated fiber glass (as per relevant international code/approved FQP). Total thickness of coating shall not be less than 4.0 mm. 2. Coal Tar based Anti-Corrosion tape of minimum thickness 4 mm (as per relevant international code/approved FQP)
4.4	COATING THICKNESS
	The wrapping & coating system shall consist of applying pre-wrapping solution on the cleaned surface followed by the application of anti-corrosion protection tape spirally or circumferentially on the surface keeping proper tension and maintaining good adhesion with an overlap of 12 – 13 mm. The minimum thickness of coating shall be 4.0 mm.
4.5	TECHNICAL REQUIREMENTS
4.5.1	The coating and wrapping operation shall include surface preparations, application of pre-wrapping solution (primer) and application of layer of anti-corrosion protection tape and necessary testing. The above operation shall be performed under the supervision of tape supplier/ qualified personnel of the contractor and performed by personnel skilled in the application of same type of pre-fabricated tapes.

4.5.2	Inspection of the coating and wrapping of the pipes shall be performed by qualified inspectors under supervision of tape supplier.
4.7	BHEL/ customer reserve the right to inspect the material at supplier's works.
4.8	INSPECTION
	BHEL/ customer reserve the right to test the coating and any repair subsequently made to it as per BHEL/ customer approved QP/other documents. The testing shall be carried out prior to laying of pipes in the trench. Final acceptance of all coating and wrapping work shall be determined by BHEL/owner's representative after completion of wrapping over the welding joints. Pipes which have been cleaned and primed or coated and wrapped without having been inspected and approved by owner's representative shall liable to be rejected.
4.9	HOLIDAY DETECTION
4.9.1	All coated and wrapped pipes subjected to test with an electric holiday detector as specified in relevant IS
4.9.2	The holiday detector shall be supplied, correctly operated and always maintained in good condition along with adequate supply of spare parts. Any delay caused by the incorrect functioning of the holiday detector will not be entertained.
4.9.3	The operating voltage of the detector shall be determined by relevant international code.
4.9.4	Any pipe having three (3) or more holidays shall be rejected. Similarly, any pipe having any one holiday bigger than 0.1 sq mtr shall be rejected. Any defective places shall be plainly marked with chalk immediately after they are detected visually or by the holiday detector.
4.9.5	For pipe with pre-fabricated tape, the test voltage which the pipe should pass with holiday detector kit at voltage 15 KV for 4 mm thickness coating.
4.10	MEASURING COATING THICKNESS
4. 10.1	All pipes shall be tested for thickness as per applicable IS.
4. 10.2	Thickness shall be measured by pushing the point of an approved pit depth gauge or micro-tester through the coating and wrappers.
4. 10.3	Specified minimum thickness shall be present both at the pipe or any other point.
4.11	GENERAL GUIDELINES FOR TESTING THE ADHESION OF THE COATING
	At least two tests a day shall be carried out on finished coating after 72 hours from completion of coating. The test shall be carried out as per relevant IS. The areas where the coating has been removed for testing by the inspector shall be repaired by the contractor at his own expense.
4.12	During laying of buried piping etc, contractor may have to erect supporting structures etc for safeguarding existing RCC drains, cable trenches, River/canal water piping, DMW piping system and other installations, as applicable. Contractor shall submit a scheme in this regard in advance for BHEL's approval. BHEL will supply necessary supporting structural steel in this regard and payment for execution by contractor shall be made as per applicable item price schedule.
5.0	**WELDING, HEAT TREATMENT & RADIOGRAPHY**
5.1	The pipes shall be welded strictly in conformity with the methods as indicated in the detailed drawing or as instructed by BHEL engineer. BHEL engineer will have the option to change the method to suit site conditions. All the prepared/ matched edges will have to be suitably protected to prevent rusting or foreign material ingression.
5.2	Welding of high tensile structural steel shall be done by using certified welders, who posses requisite certificate and who are approved by BHEL engineer.
5.3	All welders shall be tested and approved by BHEL engineer before they are actually engaged on the work even though they may posses the requisite certificates. BHEL reserves the right to reject any welder without assigning any reasons. The welder identification code as approved by the BHEL engineer shall be stamped by the welder on each joint done by them. The contractor will be responsible for the periodic renewal, re-testing of the welders as demanded by BHEL.
5.4	BHEL engineer is entitled to stop any contractor's welders from his work if his work is unsatisfactory for any technical reason or there is a high percentage of rejection of joints welded by him, which in the opinion of BHEL engineer, will, adversely affect

	the quality of welding. Even though the welder has earlier passed the tests it does not relieve the contractor from his contractual obligations, to check the performance of the welders.
5.5	All charges for testing of welders including destructive and non destructive tests, if conducted by BHEL or by the inspecting agency shall have to be borne by the contractor. Test material shall be supplied free by BHEL, but the welding electrodes shall have to be arranged by contractor at his cost.
5.6	All welded joints shall be subjected to acceptance by BHEL engineer/ customers. All welding /pre heating, post heating various NDT tests etc. shall be carried out as per BHEL /Customer approved drawing/doc. Contractor has to arrange for regular evaluation of radiographs without accumulation of any backlog.
5.7	Preheating and post-heating, if required, shall be treated as part of erection work and shall be performed by the contractor in accordance with the instructions of BHEL engineer.
5.8	All low hydrogen electrodes shall be baked and dried up to 350 deg C for an hour in an electric electrode drying oven and shall be kept at 150 deg C before they are used in erection work, and all welders including high pressure welders shall have a portable electrode drying oven at the work spot.
5.9	All butt joints of piping shall be carried out by arc welding only. All the electrodes of BHEL/ customer approved quality and make, required for the piping and structural works etc to be arranged by the vendor within his quoted price.
5.10	The technical particulars, specifications and other general details of work shall be in accordance with AWS 0.1.1.72, Clause 6.11 or ASME Section IV, V & IX or ANSI B 16.25 as specified by BHEL.
5.11	Contractor shall note that NDT requirement should be compiled as per approved welding schedule. Generally, 10% minimum radiography shall be done on the welding joints of various piping system followed by hydro test. However, percentage may be increased depending upon the quality of joints at the discretion of BHEL/Customer.
5.12	Low speed high contrast fine grain films (D-7 or equivalent) in 10 cm width only should be used for weld joint radiography. Film density shall be between 1.5 to 2.0.
5.13	All radiographs shall be free from mechanical, chemical or process marks to the extent they shall not confuse the radiographic image. Radiography should be taken only after removal of cleats etc by grinding from tubes wall for getting better image.
5.14	Penetrameter as per ASME/ ISO, shall be used for all exposures.
5.15	Lead numbers and letters (generally of 6 mm size) are to be used for identification of radiographs. Contract no, joint identification, source used, welder's identification, SFD used are to be noted down in the paper cover of radiography. Load intensifying screens for front & back of the film shall be used as per instructions of BHEL engineer.
5.16	The weld joint is to be marked with permanent mark A, B, C, etc to identify the segments. For this, a low stress stamp shall be used to stamp the pipe on the down stream side of the weld. For multiple exposures on pipes, an overlap of about 25 mm of film shall be provided.
5.17	If the contractor does not carry out radiography work in time due to non-availability of film, chemicals, etc, BHEL may get the work done through some other agency at the risk and cost of the contractor.
5.18	All the radiographs shall be properly preserved in air-conditioned rooms and shall become the property of BHEL.
5.19	The defects as pointed out by BHEL engineer/ inspecting agency, shall be rectified immediately to the satisfaction of engineer and re-radio graphed. The decision of engineer regarding acceptance or otherwise of the joint shall be final and binding on the contractor.
5.20	Radiography of joints shall be so planned after welding that the same is done either on the same day or next day of the welding to assess the performance of high pressure welders. If the performance of the welder is unsatisfactory, he shall be replaced, immediately.

5.21	The contractor shall also be equipped for carrying out other NDT, like liquid penetrant inspection, magnetic particle inspection and ultrasonic testing as & when required for work within the quoted rates.
5.22	For carrying out ultrasonic testing of welded joints large size pipes, it will be necessary to prepare the surface by grinding to a smooth finish and contour as desired by BHEL engineer. The contractor's scope of work include such preparation and no extra charges are payable for this.
6.0	**CLEANING /HYDRO TESTING /PNEUMATIC TESTING OF PIPING SYSTEM**
6.1	The cleaning operation is in the scope of contractor and shall be carried out as per BHEL instruction mainly consisting of (a) Mechanical cleaning; (b) Air blasting (by rupture method); (c) Water flushing; (d) Steam blowing etc as per guidelines of BHEL engineers.
6.2	In case, Hydro test of all piping is not possible to carry out maintaining over all schedule and other site logistics, it shall be conducted as per BHEL instructions. Necessary Hand pump, filling hoses, gauges etc shall be arranged by the contractor at his own cost. Test pressure shall be as per BHEL drawing/ BHEL engineer instruction.
6.3	The contractor shall service, erect, dismantle and return temporary pipes for carrying out cleaning/ hydro test/ pneumatic test as required with no extra charges and no payment shall be paid on item rate for erection of temporary piping. All piping material, valves etc for temporary looping shall be issued to contractor free by BHEL.
7.0	**FIELD PAINTING**
7.1	Painting, as per approved painting schedule and FQP, shall be applied by the successful vendor at site. Touch up primer and touch up finish paint in the worn out/ damaged/ welded/ Left over portion is in the scope of the work.
8.0	**PROCEDURE OF CIVIL WORK FOR BURRIED PIPE**
8.1	Civil work for buried piping shall be done as per approved drawing and document. Payment for the same will be as per applicable item of the rate schedule.
9.0	**EXCLUSION**
9.1	Civil works including excavation, back filling, sand filling etc for buried piping
9.2	All Civil Rack, pedestal for above ground piping
9.3	CW/ACW piping (Carbon Steel) above 800NB Dia.
9.4	All electrical and C&I job.
9.5	Dry out of all Motors.
9.6	Actuators /Limit switches setting, position feedback calibration and operation/commissioning for motor operated valves/dampers / probe, if any.
10.0	**OTHER**
10.1	It is clarified that commissioning assistance, post commissioning assistance, valve servicing, till trial run & handing over of the unit to customer, is included in scope of work.
10.2	All erectable gaskets, fasteners and other hardware shall be supplied by BHEL free of cost. However, temporary gasket, if required during testing, shall have to be provided by bidder. Bidder's quoted rates shall be inclusive of this.
10.3	Bidder shall note that recordable UT machine shall be provided and used by the vendor and all records of UT shall be jointly signed & submitted to BHEL.
10.4	Bidder shall note that water, including DM water, wherever required for hydraulic test, shall be supplied by BHEL.
10.5	Annexure-III is Bill of material of various Piping systems, for general guidance to the bidder for tender purpose. The same may undergo changes during execution. Bidder’s quoted rate shall remain firm and no claim will be entertained against such changes during execution.

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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 to the bidder. Unless otherwise specified, all terms & conditions shall be applicable for entire scope and for each part/ package of the tender.

CLAUSE NO	DESCRIPTION
1.0	**NAME OF WORK**
1.1	PACKAGE-A (UNIT # 1 & COMMON)
	Providing labour, supervision, T&Ps, consumables, etc. for receipt from store/ storage yard, transportation to site, pre-assembly, erection, testing, commissioning, trial run, handing over, etc., as required, 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 steam turbine & its auxiliaries, generator & its auxiliaries, condenser, pump, dosing system LP, Oxygen, NaOH, etc.), condenser on line tube cleaning system, plate heat exchanger, **TG piping, various TG auxiliaries, misc. equipment, etc. including LP piping and Flue Gas De-Sulphurisation (FGD)** of 1x660 MW unit # 1 & common systems at 2x660 MW Maitree STPP, Rampal, Bangladesh.
2.0	**BROAD SCOPE**
	Broad scope of various equipment/ system is elaborated below. Unless otherwise specified, these scope of work are applicable for each unit. Bidder's quoted rate/ price shall be inclusive of this.
2.1	Broad scope includes receipt of materials from BHEL store/ yards/ other designated places, transportation to erection site/ TG floor, erection, testing, commissioning, etc of following major equipment/ systems.
2.1.1	Main turbine (HP, IP, LP- 2 Nos.) with all auxiliaries.
2.1.2	Generator and auxiliaries.
2.1.3	BFPs (Turbo-driven – 2 nos.+ motor driven).
2.1.4	CEPs along with suction pipe from hotwell to CEP's suction inlet flanges and other fittings.
2.1.5	Misc pumps including ACW Pumps, DMCW pumps, cycle make-up pumps, boiler fill pump, sump pumps, intake / raw water pumps etc.
2.1.6	Gland steam condenser, drain cooler, LP heaters, HP heaters.
2.1.7	Condenser with extraction steam piping and air extraction piping inside condenser steam space upto condenser walls including erection, commissioning, load testing of condenser water box handling arrangement. There will be 2 condensers connected with 2 no. LP turbines.
2.1.8	Condenser on load tube cleaning systems, debris filters, self-cleaning strainers for ACW along with skid & panels,
2.1.9	Deaerator and feed storage tank with platform and accessories.
2.1.10	Misc water pumps packages with their accessories as supplied by BHEL-PEM.
2.1.11	Cooling water / CW pumps, motors alongwith all fittings, discharge elbows, piping, BFV s, its actuators, all accessories and fittings upto puddle flange / battery limit of CW pump house building.
2.1.12	Grouting of all equipment along with supply of required materials, machineries and other resources as required carrying out the job.
2.1.13	Misc hoists (both mechanical & electrical), single girder EOT crane, Chain pulley blocks with/ without travelling trolley, Single girder under slung crane / HOT cranes covering unit#1 and common area.
2.1.14	Plate type heat exchangers. COLTCS, Debris filter, travelling water screens.
2.1.15	Auxiliaries of turbine, generator, BFPs and other systems.

2.1.16	Turbine lub oil, governing oil, generator seal oil system, gas system, jacking oil system, control fluid system, primary water system, dirty/ waste fluid system, seal steam, gland steam system, turbine drainage system, condensate spray system - for main turbine and drive turbines of BFPs, turbine governing system with valves and their servomotors, LP bypass system with valves, servomotors and other systems tanks and equipment as per scope.
2.1.17	Vacuum pumps with connected piping and other integral piping.
2.1.18	Various TG Piping system as per relevant annexure including erection of valves, fittings and other associated instruments.
2.1.19	MS, HRH strainers, dummy strainers (if any), coolers, CRH-NRVs, extraction NRVs with associated pipelines, etc., LPBP valves with connected oil piping, skid and associated works.
2.1.20	NaOH dosing system with skids and piping, oxygen dozing system, LP (Ammonia) dozing system, panels, solenoids, actuators. Regular feeding of chemicals, bringing of chemicals from BHEL/ owner's store and regular feeding into system till handing over of unit(s).
2.1.21	Various approach / access / working platforms with staircase and handrailings shall be provided in all the valves, bearing pedestals and equipments installed in this package as per BHEL instructions. For this, structural steel shall be provided by BHEL free of cost.
2.1.22	**Flue Gas De-Sulpharisation (FGD)**
	Erection, testing, commissioning, trial run and handing over of the FGD system of Unit # 1 & various common systems. FGD system mainly consists of Absorber tower along with oxidation blowers, booster fans, Lime stone grinding and slurry preparation system consist of wet ball mills, lime stone silos, slurry pumps, Gypsum dewatering system, associated piping etc. A detail list of material, to be erected, by the successful bidder is attached for reference.
2.2	Statutory load testing of misc hoists (both mechanical & electrical) through accredited agency, authorised to issue such kinds of certificates.
2.3	Preservation of TG & auxiliaries' components after receipt from BHEL store as per BHEL / Siemens preservation instructions. Installed Turbine/ Generators would have to be provided with driers round the clock operation. Necessary arrangement shall have to be made by the successful bidder.
2.4	Chemical cleaning and associated testing plus related activities of different system and normalisation.
2.5	Arrangement of fixing of steam blowing and hydro test blanking devices of Turbine Stop Valves/LP Bypass valves/CRH-NRV etc and restoration.
2.6	Arrangement for hydro test / steam blowing in strainers including removal/ restoration in MS & HRH lines, etc.
2.7	Flushing, steam blowing, related testing, pre-commissioning, commissioning activities of lub oil system, governing oil, gas systems, water lines and other systems of turbine, generator, condenser, BFP and other auxiliaries. This includes preparation for flushing, hydro-test, chemical cleaning, steam blowing, other cleaning activities, actual execution of the activities, normalisation, etc.
2.8	Setting and commissioning of governing system.
2.9	Preparation of MIR, compliance to safety & quality norms, documentation, preparation of material status, up-gradation of activities, network at regular interval.
2.10	Trial run of equipment, systems, as a whole.
2.11	While operation & maintenance of TG hall EOT cranes is excluded from the scope of this tender, successful bidder shall provide manpower assistance, as required, to BHEL/ appointed agency during the contract period, including extension, if any.
2.12	In case of other hoists / EOT cranes under the scope of this tender, successful bidder shall provide necessary operation & maintenance service for operation during the contract period, including extension, if an, without any extra cost. CWPH crane operation for erection of CW pumps shall be performed by vendor.
2.13	Generator stator unloading, placement to TG floor with the help of TG hall EOT cranes and its lifting beam. Bidders to note that all arrangement for tandem

	operation of both EOT cranes including fitting of lifting beams etc. shall be made by the TG erection vendor. Stator lifting slings shall be provided by BHEL. All other required items including skilled manpower shall be arranged by vendor.
2.14	Making arrangement to unload generator rotor, LP rotor, HP turbine, IP module, LPC inner-outer upper half, LPC inner casing assembly (LH), exciter, De-aerator / FST, turbine integral piping directly from the trailer/ wagon (inside project premises) and transport the same to stores/ place of work, etc as directed by engineer. Subsequent re-handling, if required, will also be under the scope of work. Detailed weight schedule is furnished in relevant annexure of tender. Necessary cranes, as required, for this shall be provided by BHEL free of cost. Arranging special low bed trailers, hydraulic trailers etc. of appropriate capacity and size for shifting these items within project premises / taking to erection site shall be in the normal scope of work.
2.15	PG testing of main equipment along with all auxiliaries, completion of punch points and assistance for handing over of unit(s) to BHEL/ owner.
2.16	Supply & application of finish painting including touch up painting. In regard to touch up painting, the paints as supplied by units (if any) shall be provided by BHEL free of cost.
2.17	Arranging & getting statutory co-ordination for BBR related activities. Providing assistance for BBR approval from BBR / OTHER STATUTORY authorities, as applicable, for portion of BBR piping, equipment & system (under the scope of this tender). All welded joints shall be subjected to acceptance by BHEL Engineer/statutory body/customers. Joints coming under the purview of BBR/ASME need to be cleared by Boiler Directorate. Contractor has to arrange for such regular evaluation of radiographs without accumulation of any backlog. Necessary evaluation fees only will be paid by BHEL / Customer in this regard. Repair work and re-sampling also shall be taken up promptly, without piling any backlogs.
2.18	Tie-up external specialized agency for following activities. Successful bidder shall obtain prior acceptance of the identified agency from of BHEL site in this regard.
2.18.1	Condenser tube expansion and cutting
2.18.2	Reaming and honing of coupling holes, machining of coupling bolts for HP-IP, IP-LP, LP-generator couplings.
2.18.3	Voltage drop test and Helium leak test of generator. For conducting Helium leak test, sufficient high purity Nitrogen and Helium shall have to be arranged by the successful bidder without any extra cost to BHEL.
2.18.4	For carrying out grouting of TG components, deployment of specialised grouting / shuttering agency alongwith materials.
2.18.5	For carrying out Radiography , UT testing &other NDTs , tie up is must so that work is carried out un-interruptly.
2.19	TG erection shall be carried out in the supervision of Siemens TFAs. Necessary checkings as per Siemens FQP has to be arranged by the vendor including maintenance of signed protocols. All the openings in TG area (all floors) would have to be properly barricaded with steel works prior to start of TG erection. Necessary steel in this regard shall be made available to vendor by BHEL from scrap / cut pieces on returnable basis. In case of non- availability, same is to be arranged by vendor at their cost. PPEs, housekeeping, earthing, welding cables, flame arrestors & other safety tools/ gadgets, first aid facilities are to be maintained as per international standards. 1 no. portable container office at TG floor with AC facility, drinking water, tea arrangement etc. would have to be provided for Siemens TFA use without any extra cost.
2.20	Getting approval from statutory authorities etc. for systems/ equipment, drawings & documents.
3.0	**GENERAL GUIDELINES FOR SUCCESSFUL BIDDER'S SERVICES**
3.1	The work covered under this tender is of highly sophisticated nature, requiring the

	best quality of workmanship for fabrication, engineering and construction management. Successful bidder should ensure timely completion of work. Successful bidder must have adequate quantity of tools, construction aids, equipment, etc, in their possession. He must also have on their rolls adequate, trained, qualified and experienced supervisory staff and skilled personnel. The entire work under this scope shall be directly executed by successful bidder with their own resources; BHEL engineers shall be available only in advisory capacity. The intent of specification is to provide services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient execution of this work shall not relieve successful bidder of the responsibility of providing such facilities to complete the work without any extra compensation. The terminal points indicated by BHEL should be final and binding on successful bidder for deciding the scope of work and effecting payment for the work done.
3.2	Unloading of generator stator, generator rotor, HP turbine, IP module, LP rotor, LPC inner-outer upper half, LPC inner casing assembly (LH), exciter, turbine integral piping (TIP), its storage, verification and transporting to BHEL stores/ place as directed by BHEL and preservation is under the scope of successful bidder within accepted rate/ price. In case, fronts for taking these items to site are not available, then vendor would have to provide assistance in unloading at designated place and further loading during transportation to site shall also be in successful bidders scope.
3.3	Arranging of containers exclusively for the turbine integral piping storage is also included in the scope of successful bidder within accepted rate/ price.
3.4	Ultra high purity Nitrogen gas required for Generator stator PW system Nitrogen pressurisation test, primary water system flushing, accumulator charging of LPBP and CF systems shall be supplied by successful bidder within quoted rates.
3.5	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 cooperate with personnel of BHEL, BHEL's owner, owner's consultants 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 of the project as a whole.
3.6	Successful bidder shall erect and commission all the equipment 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 successful bidder. No claims for extra payment from successful bidder will be entertained on the ground of deviation from the methods/ sequence adopted in erection of similar sets elsewhere.
3.7	All necessary certificates and licenses, permits & clearances required to carry out this work from the respective statutory/ local authorities are to be arranged by successful bidder at their cost in time to ensure smooth progress of work.
3.8	The work shall conform to dimensions and tolerances specified in the various drawings/ documents that will be provided during various stages of erection. If any portion of work is found to be defective in workmanship, not conforming to drawings or other stipulations due to successful bidder's fault, successful bidder shall dismantle and re-do the work duly replacing the defective materials at their cost, failing which the work will be got done by BHEL and recoveries will be effected from successful bidder's bills towards expenditure incurred including cost of materials and departmental overheads of BHEL. Latest approved drawings shall be used.
3.9	**The successful bidder shall carry out all the work as per relevant approved FQP.** Major FQPs are attached with the tender for reference purpose only. However, work shall be carried out in line with approved FQP and no compensation shall be made to the successful bidder in case of any change in

	approved FQP with respect to FQP provided along with this tender. Successful bidder shall perform any services, tests etc. which may not be specified in the tender specifications but nevertheless required for completion of work, within accepted rate/ price.
3.10	All necessary certificates and licenses required for carrying out this work are to be arranged by successful bidder expeditiously.
3.11	Successful bidder shall execute the work in the most substantial and workmanlike manner. The stores shall be handled with care and diligence.
3.12	BHEL reserves right to recover from successful bidder any loss which arises out of undue delay/ discrepancy/ shortage/ damage or any other causes due to successful bidder's lapse during any stage of work. Any loss to BHEL due to successful bidder's lapse shall have to be made good by successful bidder.
3.13	All cranes, transport equipment, handling equipment, tools, tackles, fixtures, equipment, manpower, supervisors/ engineers, consumables, etc except otherwise specified as BHEL scope of free issue, required for this scope of work shall be provided by successful bidder. All expenditure including incidentals in this connection will have to be borne by them unless otherwise specified in the relevant clauses. Successful bidder's accepted rate/ prices should be inclusive of all such contingencies.
3.14	During the course of erection, testing and commissioning, certain rework/ modification/ rectification/ repair/ fabrication, etc may become necessary on account of feedback/ revision of drawing. This will also include modifications/ re-works suggested by BHEL/ owner/ other inspection group. Successful bidder shall carry out such rework/ modification/ rectification/ fabrication/ repair, etc promptly and expeditiously. Daily log sheets signed by BHEL engineer and indicating the details of work carried out, man-hours, etc shall be maintained by successful bidder for such reworks. Claim of successful bidder if any, for such work will be governed by relevant clause under extra work, provided the reasons for rework are not attributable to successful bidder, as decided by BHEL.
3.15	Successful bidder shall make all fixtures (like bolt stretching devices, alignment devices, gas tightness/ hydraulic test devices, etc), temporary supports, steel structures required for jigs & fixtures, anchors for load and guide pulleys required for the work. Necessary steel and other materials shall have to be arranged by successful bidder within the accepted rate/ price. No separate payment shall be released to successful bidder on this account. Dragging arrangement for heaters and deaerator shells may have to be fabricated by vendor, which they shall do promptly without any extra cost to BHEL.
3.16	Successful bidder shall take delivery of the components, equipment, chemicals, lubricants, etc from the BHEL stores/ storage area after getting the approval of BHEL engineer on standard indent forms of BHEL. Complete and detailed account of the materials and equipment after usage shall be submitted to the BHEL and reconciled periodically. The successful bidder shall check, tally and inspect all material consignment issued to him and shall maintain proper record or the receipt of material received and such reports shall be produced by successful bidder to the engineer for verification. Any deviation from packing list or damage to any component noticed during receipt of material should be immediately brought to the notice of BHEL engineer. Any claim in this regard after receipt of material by successful bidder will not be entertained.
3.17	Successful bidder shall plan and transport equipment, components from storage to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work. Materials shall be stacked neatly, preserved and stored in successful bidder's shed and at work areas in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work areas / site to enable other agencies to carry out their work or for any other reason, same shall be done by successful bidder most expeditiously. No claim for extra payment for such work will be entertained.
3.18	Plant materials shall not be used for any temporary supports/ scaffolding/ preparing pre-assembly bed, etc. All scaffoldings to be used will be made as instructed by

	BHEL. Strict safety norms are to be followed as per safety plan of BHEL/ owner.
3.19	Spring suspension/ constant load hangers may have to be pre-assembled for required load and erection carried out as per instructions of BHEL. Adjustments, removal of temporary arrests/ locks, cutting of excess thread length of hanger tie-rod, etc have to be carried out as & when required. Load setting of spring hangers, as per BHEL's documents/ instructions, during various stages of erection & testing and after floating of piping/ ducting during cold and hot condition will have to be done. This exercise may have to be repeated till satisfactory results are achieved.
3.20	Layout of field routed/ small bore (up to NB 100) piping shall be done as per site requirement. Necessary sketch/ layout for routing these lines should be got approved from BHEL by successful bidder. There is a possibility of changes in routing the above pipelines even after completion of erection which shall be done by successful bidder as part of work without any extra claim.
3.21	Welding of necessary instrumentation tapping points, root valves, condensing vessels, flow metering & measurement devices and control valves, PG test tapping points and instruments, flow nozzles to be provided on TG & its auxiliaries and integral/ TG piping are covered within the scope of this specification. The installation of all the above items will be successful bidder's responsibility even if, either (a) Items are not specifically indicated under the respective product groups as given in the technical specifications or (b) Items are supplied by an agency other than BHEL. Pre-heating, NDE and post weld heat treatment for above shall be done as per the specifications as part of work.
3.22	Certain instrumentation like pressure switches, air sets, filters, regulators, pressure gauges, junction boxes, power cylinders, dial thermometers, flow meters, valve actuators, flow indicators, centrifugal/ speed switches of motors, accumulators etc. are received in assembled condition as integral part of equipment. Successful bidder shall dismount such instruments for calibration and hand over the same to BHEL. Storage/ re-erection, calibration will be done by C&I erection agency. Re-erection has to be done by successful bidder within the accepted rate/ price. This exercise may have to be repeated as per the site requirement. No payment on whatsoever ground on this account shall be entertained by BHEL.
3.23	Fixing and seal welding of thermowells & plugs before hydro test/ steam blowing of equipment or other piping system are within the scope of work. Successful bidder shall also remove the seal welded plugs by process of grinding and fix and seal weld thermo wells after hydro test/ steam blowing of lines as part of work.
3.24	Actuators/ drives, valves, etc may have to be serviced, lubricated, before erection, during pre-commissioning & commissioning, including carrying out minor adjustments required as incidental to the work.
3.25	In installation of various equipment it may become necessary to install these on temporary supports/ hanger due to various reasons including non-availability of suspension materials. Successful bidder shall install such temporary suspensions/ hangers and later on shift the relevant equipment to their respective permanent hangers/ suspensions/ supports as incidental to work. Requisite materials for such temporary arrangements will be provided by BHEL on free of cost and returnable basis. The same shall be returned to BHEL after the use. No extra payment shall be done by BHEL on this account and normalisation is also included in successful bidder's scope of work within the accepted rate/ price.
3.26	All the works such as cleaning, touch up painting, checking, aligning, assembling, temporary erection for alignment, dismantling of certain equipment for checking and cleaning, surface preparation, fabrication of tubes and pipes, ducts, supports, as per general engineering practices at site, cutting, grinding, straightening, chamfering, filing, chipping, drilling, reaming, rapping, shaping, filling up etc and other works, as may be applicable in such erection works which are treated as incidental to the erection works and are necessary to complete the work satisfactorily, shall be carried out by successful bidder as part of the work. All consumables including paints for touch up painting shall have to be supplied by successful bidder within the accepted rate/ price.

3.27	Minor adjustments like removal of ovalties in pipes and opening or closing the fabricated bends of high pressure piping to the layout shall be considered part of the work and successful bidder is required to carry out such work free of cost with specified heat treatment procedures.
3.28	Extra lengths in various fabricated ducts and piping given as erection allowance shall have to be cut to suit site conditions. Fabricated pipes are sent in standard lengths and will be cut to suit the site conditions and the layouts. Tubes or pipes wherever deemed to be convenient will be sent in running lengths with sufficient bends. For any mismatch while matching the joints in tubes, cutting, adjusting, re-welding, addition of spool pieces should be done by successful bidder to match site condition without any extra payment. The pipes and related fittings may have to re-dressed to suit fitting, welding within the accepted rate/ price by successful bidder.
3.29	Dewatering arrangements (Portable pump of 50 HP capacity or above) in condenser pit, low point areas, basement floors and other areas where erection is in the scope of successful bidder are to be arranged by successful bidder within the accepted rate/ price and this facility is to be maintained by successful bidder till handing over of unit(s) to BHEL/ owner. No claims for whatsoever reason on this account shall be entertained by BHEL. In case of non-availability of the same facility at any point of time, the same shall be arranged by BHEL at the risk and cost of successful bidder.
3.30	Successful bidder have to carry out transportation of lube oil, Control Fluid, special consumables, gas cylinders etc from BHEL/ owner's stores, filling of lubricants, gases etc. and filling of oil for flushing, first filling and topping up oil & gasses till handing over is included in the scope of this contract. Successful bidder shall have to return all the empty cylinders, empty and excess drums to the owner/ BHEL stores. Similarly, transport of chemicals for various pre-commissioning activities/ processes mentioned in clauses herein from BHEL/ owner's stores and charging of chemicals into the system for carrying out various pre-commissioning activities and processes mentioned herein and returning of remaining and/or the empty containers of the chemicals to owner/ BHEL stores is successful bidder's responsibility.
3.31	All packing and forwarding material shall be returned to BHEL as soon as the material is unpacked. The location for storage of such materials shall be as indicated by BHEL engineer.
3.32	All Measuring and Monitoring Devices (MMD) used for the work in scope of this tender, shall be calibrated by the accredited agencies that are approved by BHEL or calibration traceability is established up to National Physical Laboratory for proper validity from time to time.
3.33	Successful bidder shall furnish the consumption details of chemicals, lubricants, TIG welding filler wire, welding electrodes and other consumables on monthly basis and take prior approval as specified elsewhere.
3.34	For erection, testing and commissioning of different hoists (mechanical and electrical), single girder cranes, other handling arrangements, successful bidder has to arrange the services of accredited agency (who are authorised to witness and issue certificates by Govt. agency for hoists etc) within their accepted rate/ price for statutory load testing and issuing of certificates for safe use of these items. Necessary loads for carrying out such load testing shall be issued by BHEL/ owner free of cost. However, successful bidder has to arrange necessary transport and handling and return the load testing materials within the accepted rate/ price.
3.35	AREA CLEANING
	Successful bidder has to do area cleaning on every date on daily basis. The cleaning has to be done during start of the day and at the end of the day. Non-compliance of the above cleaning shall call for penal recovery as per provision of the tender on each instance and at the same time, cleaning of the area shall be done by BHEL at the risk & cost of successful bidder. No excuses on this above account shall be entertained by BHEL on whatsoever account.
3.36	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 the personnel of other agencies, co-ordinate their work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.
3.37	All the work shall be carried out as per the instructions of BHEL. BHEL's decision regarding the correctness of the work and method of working shall be final and binding on successful bidder.
3.38	Successful bidder shall at their cost perform any services, tests, etc, although not specified but nevertheless required for the completion of work.
3.39	Successful bidder shall erect and commission all the equipment as per sequence prescribed by BHEL at site. The sequence of execution, methodology will be decided by the BHEL engineers depending upon the availability of material, work fronts etc. No claims for extra payment from successful bidder will be entertained on the grounds of deviation from the methods and sequence of erection adopted in erection of similar TG sets at other places or for any reasons whatsoever.
3.40	All the necessary clearances, certificates and licenses required to carry out this work are to be arranged by successful bidder expeditiously at their cost.
3.41	GENERATOR UNLOADING, PLACEMENT TO TG FLOOR WITH THE HELP OF LIFTING BEAM AND TANDEM OPERATION OF EOT CRANE
	Handling and lifting from special trailer/ resting place in front of A row or along A-row / unloading bay, and placement on TG foundation with the help of TG Hall EOT crane is included in the scope of successful bidder. Successful bidder shall extend all necessary assistance for releasing the special trailer (which will come in front of A-row in site with Generator Stator) treating it as his normal scope of work. Stools for keeping the generator stator after unloading shall be fabricated by successful bidder as per own / BHEL's design. In case the stator is not lifted directly from the wagon / trailer, necessary assistance in unloading of generator stator in front of A row of power house / any other BHEL identified location, from wagon/ trailer, and placement of the same on the designated resting place is included in the scope of work. Concrete slabs as per approved drawings are to arranged by successful bidder during unloading of the stator. Required stools for keeping stator shall be fabricated by vendor (steel shall be provided free by BHEL) without any additional cost.
3.42	Successful bidder has to arrange within accepted rate / price, loading of TG equipment at stores / storage yard, handling, transporting, unloading at erection site, pre-assembly, erection, alignment, hot alignment and required corrections, welding, radiography, levelling, cold pulling, adjusting, heat treatment, hydraulic test, chemical cleaning, passivation, steam blowing, oil flushing, water flushing, air flushing, pre-commissioning tests, trial running of main equipment & auxiliaries covered under the tender and all other activities till handing over of unit(s) to BHEL/ owner including completion of PG test activities. The work shall conform to dimensions & tolerances specified in the various drawings, documents, etc that will be provided during the course of installation. If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications, successful bidder shall dismantle and re-do the work duly replacing the defective materials at their cost, failing which the work will be got done by BHEL by engaging other agencies or departmentally and recoveries will be effected from successful bidders bill payment due either of the present contract or any other contract/ work, etc towards expenditure incurred including BHEL's overhead charges. Arranging suitable low bed / high capacity / hydraulic trailers for transportation of materials within project premises and upto erection site shall be in the normal scope of work.
3.43	The indicative schedule of weight of major equipment given in relevant annexure is meant for providing a general idea only to successful bidder about the magnitude of the work involved.
3.44	During the course of execution of work, certain rework/ modification/ rectification/ repairs/ fabrication, etc will be necessary on account of feedback from various thermal power stations on units already commissioned and/ or unit(s) under

	erection & commissioning and also on account of design discrepancies and manufacturing defects and site operation/ maintenance requirements. Successful bidder shall carryout such rework/ modification/ rectification/ fabrication/ repairs, etc, promptly and expeditiously. Daily log sheets indicating details of work carried out, man-hour, consumables used, etc, shall be maintained by successful bidder and got signed by BHEL engineer every day. Claims of successful bidders, if any, for such works will be dealt as per relevant clauses.
3.45	All tools & tackles, fixtures, equipment, materials, manpower, supervisors/ engineers, consumables etc required for this scope of work shall be provided by successful bidder with accepted rate/ price.
3.46	Successful bidder shall make adequate security arrangements including deployment of security personnel and ensure protection from theft, fire, pilferage, damage and loss of materials/equipment issued to him for the work. Special care will have to be taken to guard against pilferage/ theft of copper cables, copper tubing, brass fittings, brass valves and other costly materials.
3.47	All equipment shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc, shall be used for handling of the equipment without the specific permission of the engineer. Sufficient nylon / non metallic slings of all sizes would have to be arranged by contractor at their cost.
3.48	Successful bidder shall ensure proper housekeeping and remove all scrap materials at least once in a week from various levels of power house, working area of TG, auxiliaries and piping around power station and deposit the same at the place earmarked for this purpose. In case of successful bidder's failure to do the same, BHEL reserves the right to do cleaning and remove scrap at successful bidder's cost and risk.
3.49	Access to site for inspection by BHEL and owner engineers shall be made available by successful bidder at all times. The exercise may have to be repeated till satisfactory acceptance and is treated as normal scope of successful bidder's scope of work within the accepted rate/ price.
3.50	Successful bidder shall mobilise sufficient quantity of wooden/ concrete sleepers for stacking of materials in their custody. Scaffolding materials to carry out jobs are to be arranged by successful bidder within the accepted rate/ price.
3.51	Successful bidder shall weld all thermowell, small length of pipes to all pressure, flow and level tapping points, isolating valves and root valves on all equipment under scope of the tender. All embedded temp measuring elements provided in the bearings will have to be terminated at the junction box by successful bidder. Thermowell, tapping point connections incorporated in the steam service shall be plugged during the pressure testing and steam blow out of piping systems. Upon completion of blow out operation, all thermowell and flow elements with branch pipes be installed and welded. Seal welding of thermowells, even if these are erected by other successful bidders in the erected system of TG successful bidder's scope, are to be done by the TG successful bidder at no extra cost.
3.52	Successful bidder shall have total responsibility for all equipment and materials in their custody at successful bidder's stores, loose, semi-assembled, assembled or erected by him at site. He shall effectively protect the finished works from action of weather and from damages or defacement and shall also cover the finished parts immediately on completion of work as per BHEL Engineer's instructions. The machine surfaces/ finished surfaces should be greased and covered within the accepted rate/ price.
3.53	PRESERVATION & PROTECTION OF COMPONENTS At all stages of work, equipment/ materials in the custody of successful bidder, including those erected, will have to be preserved as per BHEL's instructions. Necessary preservation agents, if required for the above work shall be arranged by successful bidder within the accepted rate/ price.
3.54	Successful bidder shall make suitable security arrangement including employment of security personnel, ensure protection of all materials/ equipment in their custody & installed equipment from theft/ fire/ pilferage and other damages & losses.

3.55	Successful bidder shall collect all scrap materials periodically from various area of work site, deposit the same at one place earmarked at site or shift the same to a place earmarked in BHEL / client's stores. In case of failure of successful bidder in compliance of this requirement, BHEL will make suitable arrangement for removing the same at successful bidder's risk and cost.
3.56	The entire surplus, damaged, unused materials, packaging materials / containers, special transporting frames, gunny bags, empty drums, cylinders etc. shall be returned to BHEL stores/ designated place in the plant premises, by successful bidder, within accepted rate/ prices.
3.57	Successful bidder shall not waste any materials issued to him. In case it is observed at any stage that the wastage/ excess utilization of materials is not within the permissible limits, recovery for the excess quantity used or wasted will be effected with BHEL's standard overhead charges from successful bidder. Decision of BHEL on this will be final and binding on successful bidder.
3.58	For any class of work for which no specifications have been laid down in these specifications, work shall be executed as per the instructions of BHEL within the accepted rate/ price.
3.59	Borescope to be arranged by successful bidder to carry out borescopic inspection of pipes, TG/ TDBFP & their parts, bearings, pedestals at no extra cost to BHEL.
3.60	Any NDT test like UT/ DPT/ MPI, etc to be carried out for bearings of turbine, generator, drive turbine of TDBFP, etc. PMI is to be conducted for piping materials for which machine shall be arranged by successful bidder.
4.0	**COLLECTION AND RETURN OF EQUIPMENT, MATERIAL & CONSUMABLE**
4.1	All equipment of TG & aux are received & stacked by BHEL in closed/ semi-closed sheds and open storage yard. Successful bidder shall take delivery of equipment and all other materials from storage yard/ stores/ sheds of BHEL. He shall also make arrangements for verification of equipment, safe custody, watch & ward of equipment after it has been located & handed over till these are fully erected, tested, commissioned and taken over by BHEL/ owner. Successful bidder should note that transport of equipment to erection site, assembly yards, etc shall be done by prescribed route, without disturbing other works and successful bidders and in most professional manner. Special equipment such as laboratory equipment, measuring & controls equipment, special electrodes, valves, shims, packing materials for joints & seals, lubricants, actuators, etc, shall be stored, when taken over by successful bidder, in appropriate manner as per BHEL's instructions.
4.2	Successful bidder shall take delivery of the components, equipment, lubricants, chemicals, special consumables, steel etc from BHEL or owner's store/ storage area. Successful bidder shall hand over all parts, materials, consumables, etc remaining extra over the normal requirement with proper identification tags to BHEL stores. In case of any misuse or use over actual requirement, BHEL reserves the right to recover the cost with departmental charges of parts/ materials used in excess or misused.
4.3	All material handling equipment required shall be arranged by successful bidder for locating/ loading at storage yard/ stores, transport to site including pre-assembly area, unloading at site/ working area, pre-assembly of equipment at the fabrication yard or at working area, inspection, checking and erection except for the cranes provided by BHEL for purpose specifically identified elsewhere in the tender.
4.4	Approach road for materials movement may not be smooth. If it is required to lay steel plate, the same has to be done by successful bidder for crane/ trailer/ truck movement for transportation of materials/ erection activities by successful bidder at no extra cost. However, required steel plates shall be issued by BHEL on free of cost and returnable basis. Required transportation of steel plates shall be arranged by successful bidder within accepted rate/ prices. Successful bidder cannot claim any compensation of time or money on account of bad approach roads, in any weather conditions. Every attempts shall be made by BHEL to keep all the materials (both erectable, T&P, special tools & tackles required to be used for the purpose of erection and

	commissioning etc) in fashioned manner. However, there are chances of mix up of materials as many materials shall be received from all sources viz. BHEL/ Manufacturing units or successful bidders simultaneously. In these cases, successful bidder has to search/ locate the materials from store/ yard as the case may be. On completion of tracing successful bidder's materials, successful bidder should re-stack the balance materials as per the advise of BHEL representatives to suit BHEL's requirement. Successful bidder has to arrange suitable T&Ps, other means and resources as deemed necessary to meet the above requirement. The above is treated as normal scope of work with no extra cost to BHEL.
5.0	**PREPARATION OF FOUNDATION & GROUTING**
5.1	Buildings, foundations and other necessary civil works for supporting structures, equipment, etc, will be provided by BHEL. The checking of dimensional accuracy, axes, elevation, levels, etc, with reference to bench marks of foundations and anchor bolt pits and also adjustments of foundation level, dressing and chipping of foundation surfaces of all equipment approximately up to 50 mm for achieving proper levels will be within the scope of work/ specification. There could be chances of variation of grout thickness and the successful bidder has to take care of this variation also without any cost implication to BHEL.
5.2	Enlargement of holes/ cut outs/ pockets in foundations, etc at different floors/ walls/ roofs, etc in civil related areas to accommodate equipment/ piping/ system for erection of TG equipment/ piping, etc is included as normal scope of work at no extra cost to BHEL.
5.3	All minor foundations and anchor points required for installing erection equipment like winches, anchors etc are to be cast by successful bidder. Restoration of the same is also included within successful bidder' scope of work.
5.4	Grouting of all equipment under the scope of this tender, is included in the scope of work. Supplying of ordinary portland cement (OPC), sand, stone chips, pea gravels & non-shrink, free-flowing special grout cement of required specification (like Conbextra-GP-2, Pagel, special cementious fluid grouts or equivalent as per BHEL/ BHEL's advisor and/ or owner approval) including arranging the grout mixers for this purpose shall be in the regular scope of successful bidder. Arranging of all supporting materials to carry out grouting activities right from starting, making scaffoldings, shuttering to curing is included in successful bidder's scope of work. Mixer machines and associated materials and T&Ps to carry out grouting job is included in successful bidder's scope of work. Successful bidder should also carry out cleaning of the foundation surfaces, pocket holes, anchor bolt pits and de-watering and making them free of oil, grease, sand and other foreign materials by soda washing, water washing, compressed air and other approved methods will be within the scope of this work within accepted rate/ prices. All required materials for this shall be arranged by successful bidder within accepted rate/ prices. The special cementitious fluid grouts material required to be used for installation of BHEL/ BHEL's advisor steam turbine, generator and gear units, etc is indicated in relevant annexure including their details of their suppliers. These grout materials shall be strictly as per the make & specifications indicated in the relevant annexure. The materials to be supported by manufactures' test & guarantee certificate, certificate towards shelf life. During grouting, one standby mixer machine in addition to one working machine is to be arranged by successful bidder to take care of any unforeseen eventuality. Special care shall be taken for curing of grouts by providing old watered gunny bags or suitable arrangements round the clock. Manpower deployment for pouring water over grouts has to be retained by successful bidder on round the clock basis, till successful completion of the curing, as certified by BHEL. Gunny bags shall be provided by successful bidder. Selection/use regarding brand/ types of cements/grouting materials and other materials shall require prior approval of BHEL/ owner and should have valid test

	certificates. Successful bidder has to arrange Standard CI/ MS moulds/ fixtures in sufficient quantities with IS codes for testing of cubes for grout materials strength. This will involve getting grout materials cubes tested at labs which are approved by owner. Successful bidder has to make necessary arrangement for getting these cubes tested at approved lab at their cost. Successful bidder has to maintain sufficient number of standard moulds for cubes and other associated items like measuring vessels and other items with IS code requirement as applicable . Successful bidder's quoted rates should include this aspect at no extra cost to BHEL. As a standard practice, the manufacturer's representatives (grout material supplier) should be made available during application of special grouting materials during each execution time and this is included in the regular scope of successful bidder's work at no extra cost.
6.0	**EQUIPMENT INSTALLATION – COMMON REQUIREMENT**
6.1	MACHINING OF SHIM, PACKER, COUPLING BOLT AND OTHER ITEMS
	Successful bidder with accepted rate/ price has to either own or have tie up for a work shop for machining/ cutting/ grinding/ polishing of key ways, packer plates, hanger/ support items, machining of Nuts, bolts, studs, tie-rods, coupling bolts, bushes of all equipment, dowel pins, jack bolts, etc and other machining works. The machining scope is elaborated in brief.
6.1.1	During erection, commissioning, handing over of sets, successful bidder within accepted rate/ price has to carry out necessary machining jobs on main equipment and auxiliaries like enlargement of holes by drilling (including flanged faces/ surfaces/ pieces), gas cutting/ grinding/ other machining methods and finishing to achieve proper matching/ parallelism/ proper erection/ leak proof joints, etc, machining/ rectification of key ways, machining of coupling bolts, fabrication/ machining of dowel pins, taking out damaged/ seized bolts, etc and reconditioning, threading, making additional holes as per requirement, dressing up of holes/ cut out, etc and other machining activities as required to carry out the total execution. In case of relocation of holes/ cut outs, successful bidder has to carry out blocking of extra holes/cut outs as per requirement of BHEL. The total machining jobs required during erection, testing, commissioning, handing over of unit to BHEL/ owner is included in successful bidder's accepted rate/ price. Successful bidder within accepted rate/ price has to enlarge, relocate, make additional holes in flanges, parts of equipment for mating flanges treating it as part of their scope, in case of any discrepancy found in flanges. The holes are to be finished with precision as decided by BHEL and necessary threading inside holes and dressing up also is to be done. Closing of existing holes by suitable method as suggested by BHEL is also to be carried out by successful bidder, in case the holes are not required in earlier locations.
6.1.2	BHEL will provide only shim & packer plate (either machined or plain) which are received from BHEL's manufacturing plants and go as permanent part of equipment. Machining of un-machined packer plates sent by BHEL units is included in successful bidder's scope including scrapping, matching, machining, etc. Additional packer plates if required, will have to be arranged and prepared by successful bidder out of steel plates (for thickness lesser than 5.0 mm), steel sheets to meet site requirements and is included within normal scope of work of successful bidder. Necessary steel plates for this purpose (for plate thickness of above 5.0 mm) will be provided by BHEL free of cost. SS shims/ other shims (for thickness of less than 5.0 mm) which are required in addition to supplied quantity of BHEL/ manufacturing units are included in successful bidder's scope at no extra cost to BHEL.
6.1.3	In addition to the above, successful bidder has to arrange machining facilities for carrying out precision machining as required to achieve desired finish for turbine, generator, exciter coupling bolts within the accepted rate/ price. They should

	arrange calibrated balancing machine for weighing of bolts suitable for this work during execution of the above works. Successful bidder's accepted rate/ price should be inclusive of all these type of requirements.
6.1.4	Turbine, generator, exciter coupling holes require precision machining like reaming, honing, etc as per requirement to achieve required finish before bolting of turbines, generator, exciter couplings and other equipment and these are included in successful bidder's scope of work at no extra cost to BHEL.
6.1.5	Enlargement/ relocation of holes/ pockets, making dowel pin holes, arranging threading arrangements in machined holes in the equipment/ system/ piping are included in the scope. Material build up and dressing up in case of patch up on holes/ cut outs by material build ups are also included in successful bidder's scope at no extra to BHEL.
6.2	Filling of lubricants for steam turbine, turbo-generator and other rotating auxiliaries for purpose of oil flushing, initial fill up and subsequent topping up during operation. Successful bidder shall render all above services with manpower, T&P right from taking delivery of these lubricants (which will be in drums from BHEL/ owner's stores) and return the empty drums to BHEL/ owner's stores. After completion of oil flushing operation, the used oil shall be filled in empty drums and which in turn shall be returned to BHEL/ owner's stores. Successful bidder shall be responsible for any shortage of oils/ consumables/ other items issued by BHEL. Owner is very specific for following relevant applicable standard for disposal of waste/ contaminated oils/ lubricants/ fluids/ chemicals. Successful bidder has to go through specific safety/environment standard, relevant laws/ statutory requirement in details.
6.3	CONTINGENCY ARRANGEMENT
	The successful bidder has to arrange for making contingency arrangement, if any, to achieve/ major milestones and for this, additional material shall be issued at free of cost by BHEL. Successful bidder has to do erection/ commissioning activities accordingly. It may so happen that some regular erectable items are not received in time. Successful bidder has to make contingency arrangements with the free materials issued by BHEL as per requirement. The contingency arrangements/ items are to be removed/ replaced with original items received on a later date. For this, advance information shall be given to successful bidder. Successful bidder has to return all the contingencies materials to BHEL/ owner's store. The total activities are treated as regular scope of work. No payment shall be released by BHEL in this account.
6.4	RESCHEDULING OF MILESTONES
	The activities at site will be reviewed at regular intervals and any additional resource mobilisation to reschedule the activities/ milestones from time to time is included in successful bidder's scope of normal work at no extra cost to BHEL. No extra payment on whatsoever account shall be entertained by BHEL.
6.5	ERECTION OF LP HEATER-1
	LP heater 1 is to be erected inside the condenser in rear side, for which successful bidder may have to be cut open the condenser dome plate already erected, in case the cut out is not there. After erection, condenser plates have to be strengthened/ stiffened as per instruction of BHEL/ owner engineer/ applicable drawings, etc.
6.6	Successful bidder within accepted rate/ price has to arrange services of exclusive Valid licensed electricians & supervisors for carrying out electrical, C&I works during normal pre-commissioning, commissioning, trial run, handing over, stabilisation, PG Test are to be maintained by successful bidder till handing over of unit(s) to BHEL/ owner within the accepted rate/ price. This is included in the normal scope of work.
6.7	All works such as cleaning, levelling, aligning, hot alignment, trial assembly, dismantling of certain equipment/components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL's instructions at site, cutting, grinding, straightening,

	chamfering, filling, machining, chipping, drilling, reaming, scrapping, lapping, shaping, fitting-up, drilling of holes, making dowel pins, machining of keys, minor rectification of foundation bolts/holes, machining of coupling holes, machining of hanger & support components etc. which are incidental to the erection/ commissioning and any other work/ activity which is necessary to complete the work satisfactorily, shall be carried out by successful bidder as part of the work.
6.8	Cleaning, servicing, greasing of actuators, pumps, headers, governing system, ESV & IV, control valves, LP bypass and other valves, tanks, vessels, etc during erection and commissioning stages shall be arranged by successful bidder within the accepted rate/ price. However, gaskets/ packing/ special lubricants for replacement will be provided by BHEL free of cost.
6.9	All equipment shall be preserved & protected periodically before & after erection as per advice of BHEL. The journals of steam turbine rotors, generator rotor, HT motors and other rotating machines shall be thoroughly cleaned, greased/painted with preservative agents periodically as instructed by BHEL engineer.
6.10	All pipes and tube ends of TG components kept at site for erection shall be kept protected with plastic caps/steel caps or shall be closed with wooden plugs. These caps/plugs shall be provided by successful bidder without any extra cost to BHEL.
6.11	Successful bidder has to carry out cutting of suspension materials, structures, piping, etc supplied in running lengths to suitable sizes and adjustment as required. This includes pre-assembly of spring suspension/hangers and shock absorber for the required load of piping, etc.
6.12	LP Turbine exhaust hood spray system, CEP seal and bearing cooling water system, central oil purification system equipment, dry air system for Turbine preservation, TG integral piping system are also in successful bidder's scope within accepted rate/ price.
6.13	Successful bidder has to make arrangement for servicing of valves, actuators including supply of lapping compounds. Successful bidder has to maintain a minimum stock of lapping compounds to carry out valve lapping activities within the accepted rate/ price.
6.14	Successful bidder shall carry out scrapping and matching of embedded plates, permanent spacers and all the matching parts of turbine, generator, pumps and other equipment wherever required. Successful bidder has to fabricate necessary scaffoldings to carry out scrapping & matching of embedded plates of Turbine, Generator and Exciter etc within the accepted rate/ price. The support and sole plates matching and concrete surface bedding is also covered in the scope of work. The fine dressing of concrete shall be with Prussian blue-match checks.
6.15	Packer plates shall not only be blue matched with foundations but also inter-packer contact surfaces, contact surfaces between packer and pedestals, contact surface between packer and foundation frame etc. shall also be blue matched and required percentage contact shall be achieved by chipping and scrapping as per engineer's instructions. Necessary arrangements like providing consumables and other resources are also to be done by successful bidder accordingly.
6.16	All necessary checks such as accuracy of levels, centre lines, bolt positions, hanger supports, anchor/ foundation bolt hole/ pit positions; etc sufficiently in advance to ensure correctness of installation of all equipment is covered in successful bidder's normal scope of work.
6.17	Successful bidder within accepted rate/ price has to execute trial run of all motors including checking direction of rotation in uncoupled condition, check alignment and re-couple the motor to driven equipment. Motors de-couplings, greasing/ servicing of equipment/re-couplings are included in successful bidder's scope. Necessry number of Halogen lamps is also to be kept in stock by successful bidder to take care of such kinds of activities.
6.18	Successful bidder has to mount instrumentation on turbine, generator and exciter and auxiliaries which are integral part and main equipment/ skids/ piping/ system etc. and render necessary services for their commissioning. Successful bidder has to provide assistance during dismantling, erection and commissioning of turbo-visory and other electrical and C&I items for turbine, generator, exciter, BFPs, BFP-

	drive turbines and other items. For this purpose, bearing pedestals are to be opened for working by other agencies/ owner. This exercise may have to be repeated till satisfactory functioning of the items and this is treated as normal scope of work at no extra cost to BHEL for working in respective 660 MW units.
6.19	Condenser erection of unit # 1 may be started without EOT crane and for such assy/ preassy BHEL may provide 75T or higher capacity crane as per availability. However, successful bidder will make arrangement for shifting/ dragging as per instruction of BHEL. Condenser internal components/ parts/ surfaces have to be surface protected with steam washable paint as per BHEL standards. The total supply of paints including original paints, primers, thinners including accessories for painting as per specifications/ applicable codes/ drawings/ documents/ BHEL/ owner's instruction are included in successful bidder's scope at no extra cost to BHEL. Inside of water boxes are to be painted (paints to be supplied by successful bidder) as per BHEL specifications, within accepted rate/ prices.
6.20	Successful bidder within accepted rate/ price shall carry out erection, commissioning of connecting piping (permanent & temporary) for oil purification equipment and all operations for cleaning, oil flushing, dismantling of temporary piping during pre and post-commissioning of equipment up to full load and trial run.
6.21	All racks or assembled units like governing rack, protection rack, LP bypass rack, seal oil unit, gas unit, seal oil valve rack, primary water unit, primary water coolers units, gas cylinder racks, Alkaliser unit, CO2 vaporiser, gas valves racks, LLD racks, Gas driers, etc supplied from manufacturing units will be tested in BHEL/ owner stores or at site. This may require transportation, filling of oil, water etc. in these racks for carrying out testing of these racks. Defects noticed during erection, testing, commissioning, handing over of unit(s) of these racks will have to be rectified by successful bidder free of charges. Further, any pipeline/ flanges/ fittings/ equipment not found assembled properly or part of the components received in damaged conditions from BHEL/ manufacturing units, the same have to be rectified/ corrected by successful bidder free of charges. Grouting of these racks is included in successful bidder's scope including supply of required grouting and all related materials.
6.22	Chipping of foundation, placement, levelling, erection, alignment, setting of correct orientation, cleaning during erection & pre/ post commissioning, grouting, fixing of associated instruments with root valves & fittings, impulse piping for equipment, tanks & vessels shall be treated as part of scope of work under this contract at no extra cost to BHEL.
6.23	Drive turbine of TDBFP will come from manufacturing unit in assembled condition. For positioning drive turbine on foundation, some items of this equipment may be dismantled and again re-assembled after installation on foundation at no extra cost to BHEL.
7.0	**PIPING INSTALLATION**
7.1	The scope of work in piping system (air, water, oil, steam, control fluid, gas, drains, vents, etc) will include cutting to required length, laying, edge preparation, fixing and welding of the elbows/ fittings/ valves/ supports/ guides, etc, fixing supports/ hangers/ shock absorbers, etc. This will include carrying out all other activities/ works to complete the erection and also carrying out all pre-commissioning/ commissioning operations mentioned in the tender as per engineer's instructions and/or as per approved drawings. Preparation of mitre bends, tee & reducer, if required, to execute the jobs is included in successful bidder's scope of work at no extra cost to BHEL.
7.2	Successful bidder have to carry out execution of piping as per the tender between equipment constituting terminal points, whether the terminal equipment fall within the scope of the work/ specification or not, is within the scope of the work/ specification. Successful bidder shall complete terminal joints at both ends for all the piping schemes covered in the specification with accepted rate/ price at no

	extra cost to BHEL Erection, commissioning of central oil purification system including oil purifiers, pumps, tanks and associated system are included in successful bidder's scope of work at no extra cost to BHEL. This includes making temporary piping arrangement for oil flushing, chemical cleaning, normalisation etc. Successful bidder of 1st unit has to do erection & commissioning in both units in totality including piping, tank, pumps and other related systems. However, in case of 2nd unit, successful bidder within accepted rate/ price, will have to take piping connection and do necessary erection, commissioning etc from the system for hooking up with the system with 1st unit equipment and systems/ battery limits. Successful bidder of 1st unit shall render all assistance, when activity related to 2nd unit shall be continued and, their staff shall give necessary supports in case the equipment of 2nd unit central oil purification unit/ systems are required to be run. Erection of oil tank with equipment is not to be executed by successful bidder of 2nd unit.
7.3	Successful bidder has to carry out fit up and welding of piping to the terminal points (such as stubs, valves, flanges on terminal points/equipment, stubs on headers, battery limits etc) forming part of the scope of work/specification and stress relieving and radiography of joints so made are also within the scope of work. Also, where the piping connection to the terminal points involves flanged joints as well as terminal equipment matching of flanges are to be done by successful bidder, fixing of gaskets, bolting and tightening as per BHEL engineer's instruction is also in the scope of work/ tender. Permanent fasteners and gaskets will be supplied by BHEL.
7.4	Successful bidder within accepted rate / price has to execute terminal points works of various piping schemes with owner lines and other successful bidder's lines. The terminal points work is inclusive of cutting of existing lines, edge preparation, welding/ blanking and hook up work.
7.5	Following items of work shall be incidental & form part of pipe fabrication & erection and is treated as successful bidder's scope of work at no extra cost to BHEL.
7.5.1	Matching of flanges for achieving parallelism and alignment by resorting to heat correction or other suitable methods as per instructions of BHEL engineers. To locate the cause of vibrations in pumps or other auxiliaries and to carry out necessary corrections in piping and its supports. This may involve cutting, fresh edge preparation, welding, radiography, stress relieving, etc of suction, discharge, re-circulation and other connected piping and its supports at a number of places
7.5.2	Increase or decrease in length of pipes supplied, including edge preparation, fit up and welding to suit site conditions.
7.5.3	Minor adjustment like removal of ovality, correction of bends by suitable method as directed by BHEL engineer.
7.5.4	Fabrication and erection of racks, steel supports, guides, restraints for all the piping including of those of system piping. Steel for this purpose will be supplied by BHEL.
7.5.5	Erection of flow switches, steam traps, filters, flow meters flow nozzles, other metering elements, flow orifices, flow indicators, valves and other instrumentation fittings supplied by BHEL/ owner, forming part of the system. This may involve cutting of pipe lines, fresh edge preparation and welding with stress relieving.
7.5.6	Fabrication/ making of bends for pipes and tubes of diameter upto NB 100 (4") with electro-hydraulic pipe bending machine. Making of bends by heating/ filling sand, cold bending is not allowed.
7.5.7	Matching of all fittings like tees, bends, flanges, reducers valves, socket fittings, etc with pipes for welding. This may involve weld build up, edge preparation, etc.
7.5.8	Servicing including revisioning of equipment, valves and fittings.
7.5.9	Cleaning of all pipes by wire brushing and blowing by compressed air or by any other suitable method as suggested by BHEL.
7.5.10	Removal of welding slag & burrs by hand file, with brushes and/ or flexible grinders.

7.5.11	Welding of root valves with small length of piping to pressure, flow, level tapping points on piping or flow nozzles/ orifices/ metering elements fixed on piping.
7.5.12	Welding of supports/ guides/ restraints as per specifications/ drawings or as per directives of BHEL engineer, to pipes using HP welders.
7.5.13	Welding of blank with stress relieving as required on permanent & temporary basis.
7.5.14	CW pipes in the puddle flange area may be supplied in excess length. To suit fitting of the adjoining pipes/ equipment, successful bidder has to carry out suitable cutting of pipes, edge preparation, fit up etc and suitable method necessary to weld, bolting etc within accepted rate/ price treating it as normal scope of work. CW pipe final welding (4 nos) in front of A-row (approximately 1.0 mtr away outside a row) from terminal point given by owner and CW piping erection inside retaining wall of A-row, are included in the scope of this tender. CW piping inside CW pump house is also included in the scope of work.
7.6	On all steam, oil, instrument, gas, air piping, etc both TIG welding and subsequent arc welding or total TIG welding process is to be adopted as instructed by BHEL engineer. BHEL's decision shall be final and will be binding on successful bidder.
7.7	Pipes/ tubes, which are supplied in random length, may not be in usual standard lengths. Successful bidder shall cut/ join/ dress up the pipe pieces to suit the site requirement.
7.8	Pipelines of oil, air, steam and water of less than NB 100 mm will be field routed as per schemes or as per the instructions of BHEL engineer, and will be supplied in random lengths/ running lengths. Successful bidder shall have to lay the piping according to instructions at sites, after carrying out the necessary bending, fabrication, edge preparation, routing etc. in best professional manner and as per instructions. The supports for field routed piping will be fabricated and erected by successful bidder as per the requirement of the work. The steel required for the supports will be provided by BHEL free of cost.
7.9	Successful bidder shall use only bolted clamps for achieving alignment of piping. Suitable fixtures are to be prepared for the purpose.
7.10	All weld joints including cleat welding/spots on piping shall be ground/ filed/ dressed on completion of welding and before radiography as per instructions of BHEL engineer.
7.11	Successful bidder shall erect piping by doing pre-assembly on ground if possible at the first instant. The pipe laying shall be carried out from the available terminal point/ points or any other area between the terminal points. The erection can be carried out on temporary supports to obtain proper alignment and welding. After fixing the permanent supports, all the temporary supports shall be removed. The alignment, distances and loading of the supports shall be checked and the required spring compression achieved in the case of spring hangers.
7.12	Successful bidder shall carryout edge preparations for welds joints/ piping pressure parts in accordance with BHEL drawings/ BHEL standards/ BHEL engineer's instruction. Flame cutting of piping and high pressure parts shall be strictly done as per BHEL engineer's instructions and in their presence only.
7.13	Certain rerouting of pipelines may come as revision to suit design variation and successful bidder has to execute the erection of the pipelines as desired by BHEL as per the latest requirement, revision of drawings. This is treated as normal scope of work of successful bidder at no extra cost to BHEL.
7.14	The following jobs are also to be performed on the piping in the following fashion.
7.14.1	All drains/ vents/ relief/ escapes/ safety valve piping to various tanks/ sewage/ drain canal/ flash box/ condenser/ sump/ atmosphere, etc from the stubs on the piping and equipment erected by successful bidder is completely covered in the scope of this tender.
7.14.2	The vent/ drain/ escape lines are to be terminated to suitable headers with funnel arrangement at different floors and subsequently to be extended to drains outside TG floor at suitable locations as decided by the owner/ BHEL. Successful bidder has to make headers, funnels and other related arrangement as directed by BHEL to complete the job. For this necessary pipe and other materials required to carry

	out such types of jobs, shall be arranged by BHEL at free of cost. This is included in the scope of successful bidder's work at no extra work to BHEL.
7.14.3	Normally, all the weld neck valves, fittings etc. will be supplied with edges prepared. However, wherever required, in some cases, successful bidder will have to prepare edges at no extra cost.
7.14.4	CEP suction line from condenser hotwell to individual CEPs with all suction strainers, valves, hanger/ supports and other items are included in successful bidder's scope of work. Making of approach platforms for CEP Suction strainers, suction valves ,platform for bearings inspection and gland cooling for CEP along with staircase, ladders, platforms from TG Zero meter floor upto respective equipment is included in bidder's scope at no extra cost to BHEL. Necessary materials will be arranged by BHEL at free of cost for the same. COLTCS erection, commissioning including approach platforms are included in successful bidder's scope at no extra accost to BHEL
7.14.5	Successful bidder has to perform inspection and cutting of pipe lines, dynamic separator cutting and re-welding as per requirement of BHEL.
7.14.6	Erection of ME Bellows, Flow nozzles, flow orifices are included in bidder's scope at no extra cost to BHEL.
7.14.6	Erection, commissioning of Self Cleaning strainers, Simplex strainers and regular inspection and cleaning and restoration is included in successful bidder's scope.
8.0	**CONDENSER INSTALLATION**
8.1	There will be 2 condensers connected with 2 no. LP turbines in each unit. The condenser will be despatched in loose parts mainly comprising of bottom plates, dome valves, front and rear water chamber, front and rear water boxes, side walls, hot well, spring elements, support plates, air extraction pipes, baffles, stiffening rods and pipes etc. The condenser is to be assembled at site in position by welding the different parts. Condenser tubes insertion, tube expansion, tubes cutting is to be done at site by successful bidder, after taking due care to clean all the tube holes. After final alignment and levelling of turbine exhaust and condenser, the same has to be welded to the exhaust position of LP exhaust as per the sequential welding procedure. Condenser Tube material is Stainless Steel. Any hole enlargement/relocation/dressing up of holes in the condenser water box/ main tube plates/tube support plates/ other areas are included as regular scope of work of work at extra cost to BHEL. Cleaning of TSPs, water chambers/ main tube plates and associated parts of condenser with wire bushes / grinding/ chemicals is included in successful bidder's scope including supply/ arranging of wire brushes and other consumables as applicable. Successful bidder within their scope of work has to carry out fixing and welding of steam throw devices with condenser, RE joints with piping upto battery limit both in CW inlet and outlet lines and supports upto 1.0 mtr away from A-row towards transformer yard with facility of inert items, puddle flanges, condenser tube cleaning system, butterfly valves and associated systems. Fixing of manholes, Approach platform in CW piping, CW butterfly valves approach to manholes of water boxes, approach platforms in CW pits for equipment erected by TG successful bidder is included in TG successful bidder's scope at no extra cost to BHEL. Successful bidder within his quoted rate has to do servicing of CW butterfly valves and actuators and this exercise may have to be repeated right from first time erection upto commercial handing over. Necessary scaffolding materials (with proper safety measures) for carrying out condenser erection, commissioning, tubes insertion, tubes expansion, tubes cutting, erection of all works inside condenser steam space, condenser water handling arrangements, butterfly valves, condenser tube cleaning system and to carry out all the works in TG and associated auxiliaries are to be arranged by successful bidder within accepted rate/ price.

8.2	Before insertion of tubes, successful bidder shall clean the holes in the main tube plates and tube support plates to remove paint, corrosion spots, oxide scales etc. Usage of suitable cleaning agent may also be required which has to be supplied by successful bidder. Mock up assembly for tube expansion before starting actual tube expansion with applicable procedures as applicable also has to be done by successful bidder within his accepted rate. For this materials will be supplied by BHEL at free of cost. Condenser floating and grouting (along with supply of all grout materials like Convextra-GP-2 or equivalent materials as per approval of BHEL and as per drawings/ instructions) is included in successful bidder's scope of work with accepted rate/ price.
8.3	The tubes shall be expanded using an automatic electronic torque controlled tube expanding unit. Successful bidder shall provide at least four working sets/ units of tube expanding & cutting machines for each unit. Before start of tube expanding/ cutting, sample testing shall be arranged by successful bidder at site in test piece for checking calibration/setting/ performance of the machine. Tube expansion shall be checked with dial bore gauge. Temporary go-no go gauge may have to be made by successful bidder at no extra cost. The total set up including tube expanders and tube cutting tools for tube cutting etc. for carrying out the complete condenser tube expansion works shall be provided by successful bidder. At least 8 sets of cutting tool/ expanding tools along with sufficient diamond cutting bits sets each with all the normal tools, cutters, spares are to be kept in reserve by successful bidder for continuous progress. In no point of time, the work should suffer due to non-availability of above facility. All such activities shall be within accepted rate/ price of successful bidder.
8.4	Successful bidder shall carry out the condenser neck welding with LP cylinder exhaust hood only after final installation of LP casing. Neck welding shall be subjected to non-destructive testing.
8.5	Hydrostatic testing of steam space and hydraulic testing of water space along with the cooling water lines after assembly of water boxes are also included in the scope. Successful bidder has to arrange florescence powder to conduct tube leak detection test in steam space within their accepted rate/ price. In case of tubes leakage, successful bidder has to supply required brass plugs and exercise may have to be repeated till successful completion of activity. Successful bidder has to arrange U/V lamp (complete set) to conduct this activity within accepted price. Any alternative arrangement for tube leakage test if decided/ approved later on during course of execution has to be done by successful bidder at no extra cost to BHEL.
8.6	Prior to hydraulic testing of water side of condenser, interior surfaces of water boxes shall be painted. Painting of all internal & external surfaces including supply of paints is included in successful bidder's scope within accepted rate/ price. CW piping inside is to be painted by successful bidder. The outside portion of the all the equipment, pipes and fittings, valves, hangers/ supports are to be painted as per applicable standard/ drawings/ BHEL/ owner's instructions by successful bidder within the accepted rate/ price.
8.7	After completion of tubing and tube side hydro test, all water side surfaces of water chambers including tube plate shall be painted and this painting including supply of paints are include in successful bidder's scope at no extra cost to BHEL.
8.8	Condenser water box handling arrangements erection, testing, commissioning and statutory load testing from appropriate authorities are included in successful bidder's scope of work. Supply of all kinds of finish paints, thinners, primers, preservatives & all arrangements , manpower with necessary resources for execution of painting jobs for the entire area/ equipment, systems are included in successful bidder's scope of work at no extra cost to BHEL.
8.9	CW pipe will come generally with inside surface in painted condition from BHEL

	Unit. If any repair is required at site this is to be carried out within this scope. However painting around the welding joint is to be carried out at site after completion of welding and testing within this scope (sample painting schedule enclosed for tender purpose).
8.10	Erection, commissioning of air release valves, RE joints, butterfly valves in condenser CW piping/ system, CW water boxes/ piping is included in successful bidder's scope. Statutory load testing from accredited agencies are included in successful bidder's scope at no extra cost to BHEL.
9.0	**FLUE GAS DE-SUPLURISATION (FGD) INSTALLATION**
9.1	The scope of work for Erection, testing, commissioning, trial operation & handing over of FGD system (Mechanical) broadly consists of but not limited to following:
9.1.1	Taking delivery of the materials from the project storage yard / stores /sheds to erection site.
9.1.2	Checking, dressing, chipping and levelling of foundations.
9.1.3	Pre-assembly, erection, alignment of various equipment's, machining and grouting.
9.1.4	Welding, heat treatment, radiography, UT and other non-destructive tests wherever required as per approved quality plan/drawings/ documents.
9.1.5	Hydraulic testing, air/gas leak test, air tightness test, other pre commissioning tests as per approved quality plan/drawings/ documents
9.1.6	Insulation and finish painting including supply of paints etc.
9.1.7	Erection and dismantling of all temporary system etc. required for above operations and other commissioning activities including post commissioning operations and stabilization of the unit,
9.1.8	FGD system trial run, resolving any deficiencies observed and handing over the FGD system to BHEL/ BIFPCL.
9.2	**BRIEF DESCRIPTION OF THE FGD SYSTEM**
9.2.1	The FGD system shall be based on Wet Limestone Forced Oxidation process. Each unit shall be provided with an independent absorber.
9.2.1	Gas from terminal point on ID fan discharge duct shall be taken directly to the absorber. In the absorber, SO2 in flue gas shall be removed by a spray of recirculating slurry, pumped by slurry recirculation pumps.
9.2.2	Compressed oxidation air shall be blown through the slurry in the oxidation tank, to oxidize the Calcium sulphite to gypsum.
9.2.3	Clean gas from the absorber shall be taken to the Wet Chimney through two stage mist eliminators.
9.2.4	Limestone to the absorbers of the units shall be supplied by a wet limestone grinding system, common for the units. Limestone shall be fed to the Limestone day silos which in turn will feed the Limestone to wet ball mill through a dosing bin, belt weigh feeder belt feeder, crusher,
9.2.5	The gypsum from the absorber(s) shall be pumped by dedicated gypsum bleed pumps to a common Gypsum Dewatering system consisting of two streams (2x100%) of primary and secondary hydrocyclone and vacuum belt filters for gypsum dewatering for each unit. Totally 4 streams of primary and secondary hydro cyclone and vacuum belt filters for gypsum dewatering is provided for both the units. The water removed from the absorber shall be recycled to the absorbers. The waste water from the system shall be collected and shall be pumped at required pressure to FGD waste water treatment plant.
9.3	**The brief list of the major equipment to be erected under the FGD system but not limited to following:**
9.3.1	Absorber System along with supporting structures
9.3.2	Absorber internals- Spray Nozzles, Spray Pipes, Mist Eliminators etc.
9.3.3	Tanks of various sizes and Agitators
9.3.4	Lime stone grinding and slurry preparation system consist of lime stone silos, bunker, gravimetric feeder, wet ball mills, hydro cyclones
9.3.5	Slurry pumps (Absorber Slurry recirculation pumps, Gypsum Bleed pumps , limestone Slurry feed pumps)
9.3.6	Gypsum Dewatering system consists of Vacuum belt filter, hydrocylones

9.3.7	Process water and cooling water storage system
9.3.8	Thermal Insulation and cladding sheets
9.3.9	Sump Pumps
9.3.10	Piping system
9.3.11	Misc. platforms, galleries, handrails
9.3.12	Slurry Piping (CSRL Pipes), Utility Piping & Valves
9.3.13	Any other relevant system/ equipment
10.0	**STATOR, DEAERATOR AND OTHER MISC TANKS INSTALLATION ABOVE TG FLOOR**
10.1	Stator Installation
10.1.1	The generator stator, weighing 326 T (approx), will be delivered to site on a 28-axle special wagon/ trailer. Handling, lifting from special trailer/ resting place in front of A-row / unloading bay, and placement on TG foundation with the help of EOT cranes is included in the scope of successful bidder. Successful bidder shall extend all necessary assistance for releasing the special trailer (which will come in front of A-row in site with generator stator) treating it as their normal scope of work. In case the stator is not lifted directly from the trailer, necessary assistance in un-loading of generator in front of A-row of power house from trailer, and placement of the same on the designated resting place is included in the scope of work. Stator lifting slings as required for handling & lifting of the generator stator shall be arranged by successful bidder within the quoted price.
10.1.2	Stator is to be rested on a temporary stool (to be fabricated by successful bidder) for about 24 hours with a minimum ground clearance of 500 mm at stator bottom, to facilitate blue matching of bottom terminal box for final placement. During this time, loading is to be given only on special insert plates provided on ground alongside of A-row for stator movement. Suitable temporary stools with adequate strength & capacity to bear the load (weight) of generator stator are to be fabricated & placed on insert plates by successful bidder including supply of necessary steel as required. Necessary compaction and concreting of the area beside A-row, where stator will be unloaded & kept on stool temporarily, shall be done by successful bidder within his quoted rate, duly considering load of stator.
10.1.3	It may be noted by successful bidder that during the entire process of lifting/ shifting and Placement of the Stator over Generator Foundation Deck, all ground Loads are to be transmitted over ground level only through the existing foundation anchor points built by BHEL/Owner available thereof. Thus no Load is permitted over the Powerhouse floor at Ground Level except the points stated and the TG Foundation Deck. Any further Civil Works to accommodate resting/positioning of Structural columns are to be done over these foundations only. However for unloading from Railway Wagon, the concrete portion of Railway Tracks can be used for load bearing over multiple points as per direction of BHEL. Any load testing required prior to stator unloading / loading shall be done by Suucessful bidder for which load shall be provided by BHEL.
10.2	BHEL crane of suitable capacity will be issued free of cost to lift deaerator and feed storage tank components to the nearest possible floor/ elevation. Successful bidder has to make their own arrangement of cranes for loading at stores & unloading at site. Necessary arrangements for dragging, placement on foundation/ proper elevation, alignment & welding of deaerator & feed storage tank and all associated components shall be done independently by successful bidder. Necessary rail for dragging has to be arranged by successful bidder. Approach road may not be conducive, it may require filling of earth on approach road, consolidation of approach road, laying of sleeper/ steel plate, etc as required for easy crane movement. All these activities are included in successful bidder's scope.

10.3	Local approach platform & approach ladders, etc for deaerator and FST will be part of successful bidders work. It may be necessary to cut structural steel & other members supplied in random length/ size to required size & profile for this platform. Dressing of platform and painting are included in successful bidder's scope.
10.4	The FST shall be despatched to site in five pieces and shells are to be assembled at site on foundation. Necessary arrangements for assembly, welding, fitting, NDTs, pre-heating, post-heating, PWHT, stress-relieving as applicable as per standard/ applicable code/ drawings/ documents/ QPs to carry out assembly and completion are included in successful bidder's scope. Hydro-test and other allied tests as applicable as per drawings/ QP/ applicable codes of FST/ deaerator are also included in successful bidder's scope within accepted rate/ price.
11.0	**HYDROSTATIC TESTING, PRESERVATION AND OTHER TESTS**
11.1	Successful bidder shall carry out the following tests required to complete the erection and commissioning, trial run, PG test, handing over activity of the TG set.
11.1.1	Hydraulic testing of individual equipment like condenser, coolers, heaters, other auxiliaries and equipment. Required capacity hydraulic test pump/ fill pump and other necessary arrangement shall be provided by successful bidder to carry out hydraulic test of the equipment and piping as part of scope of work under this tender specification.
11.1.2	Ultrasonic test.
11.1.3	Dye penetrant test.
11.1.4	Magnetic particle test.
11.1.5	Radiographic testing.
11.1.6	PMI Testing for avoiding mixing of materials.
11.1.7	All NDTs and welding related facilities for doing welding of MAL (Turbine water Drainage system) drains, gland steam piping, overload piping and other piping with high alloys are included in successful bidder's scope. For this, necessary arrangement for use of induction heating m/c (IHM) (BHEL's supply), PWHT, stress relieving, hardness tests, etc are in successful bidder's scope. Successful bidder shall ensure proper maintenance of IHM for its proper use.
11.1.8	Any other NDTs as required to carry out above jobs and deemed necessary
11.2	All above facilities (men, materials, equipment, consumables, etc) with operating engineer/ experienced person and proper approach wherever required shall be provided by successful bidder for satisfactory completion of the above tests.
11.3	Any re-work for restoration of defective joints/components including arrangement for re-NDT have to be arranged by successful bidder within accepted rate/ price at no extra cost. In case, certain NDTs are required to be carried out additionally as per requirement of BHEL on later date, the same has to be carried out by successful bidder at no extra cost to BHEL.
11.4	Successful bidder shall lay all necessary temporary piping, install pumps, valves, pressure gauge, electric cable and switche, etc, required for the hydro test. After the test is over, all the temporary piping, pumps, etc will be removed. It may also specifically be noted that servicing, erection and dismantling of piping and equipment for conducting hydraulic test will be done by successful bidder. No separate payment shall be made for this purpose.
11.5	All the above tests shall be repeated till all equipment, piping and systems satisfy the technical and statutory requirements. All related works form part of the scope.
11.6	Suitable welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable de-aeration/ venting/ drain points with valves as per BHEL engineer's instruction, for performing hydro test of piping is within the scope of work**.** Required valves, fasteners, blank flanges, blanks or steel for blank flanges will be provided by BHEL. After completion of hydraulic test, welded blanks shall be cut and removed and weld burrs ground finished and cavities/scars of cutting weld filled and ground as per BHEL engineers' instruction.

11.7	Hydro test of piping may have to be repeated several times to meet technical and statutory requirements before application of insulation.
11.8	While conducting hydraulic test of steam lines, water lines, oil lines either individually or grouping a few lines or in portions, blanks/ spools may have to be put up at terminal points, strainers, walls, flanges etc. After conducting the tests, the blanks shall be removed and the lines restored. Also interconnecting piping between boiler and turbine, the hydraulic test may have to be done section wise and sometimes piping of other agencies may have to be combined. Successful bidder shall carry out all such incidental work to satisfactorily conduct the hydro test. Wherever work is involved in the terminal points, Successful bidder shall carryout the same as per instruction of BHEL engineer. The decision of BHEL engineer is final and the same is binding on successful bidder.
11.9	Successful bidder shall carry out any other tests as desired by BHEL engineers on erected equipment covered in the scope of this contract during testing and commissioning to demonstrate the satisfactory completion of any part or whole of work performed by successful bidder.
12.0	**PRE-COMMISSIONING TESTS, COMMISSIONING & POST COMMISSIONING**
12.1	Commissioning scope of successful bidder of the TG and auxiliaries shall involve the following tests and activities of the equipment erected.
12.1.1	THERMAL SHOCK FOR TG AND BFP LUB OIL SYSTEM.
	Successful bidder has to arrange one 10-15 KW pump motor set in skid with electrical starter for thermal shock of TG lub oil system within accepted rate/ price. This will include laying of cables/ maintenance of the pump motor set. BHEL will issue plate, piping, valves and other materials free of cost for making arrangements for thermal shock in each unit separately. For this job, laying of steam lines from the existing plant with insulations, Ordinary/ DM water pipelines for connections to coolers and all associated jobs are included in successful bidder's scope. Nicrome wire heating arrangement with auto cut out facility for temp protection for BFP lub oil system for thermal shocks is included in successful bidder's scope.
12.1.2	Trial run & commissioning of feed pumps, CEP, and various rotating machineries/ pumps and other equipment under the scope.
12.1.3	Trial run of motors for various auxiliaries. de-couplings/ re-coupling are to be done as per requirement.
12.1.4	Hydraulic test of pipelines, closed systems, tanks and vessels.
12.1.5	Flushing of all pipelines by air/ oil/ water/ steam as the case may be. Acid / alkali / detergent cleaning / flushing of pipelines as per BHEL instructions. All temporary arrangements / consumables required shall have to be provided by the contractor.
12.1.6	Servicing of all valves/ actuators and fittings.
12.1.7	Providing continuous manpower for pre-commissioning, testing, commissioning of electrical items by engaging electrician (at least two numbers) and supervisor as per the requirement on normal days including OT hours on normal working days/ Sundays/ holidays.
12.1.8	Arrangements for preparation & commissioning of TG, BFPs and other equipment lub oil, control oil, jacking oil system, seal oil system, gas system, vapour system and other systems are included in successful bidder's scope. The activities include hydro-test and normalisation also. All materials sent by BHEL manufacturing units required to carry out such kind of activities shall be issued at free of cost by BHEL. Successful bidder has to arrange the pump-motor set with starter etc.
12.1.9	Mechanical seal repair/replacement of pumps.
12.1.10	Manual/ mechanical cleaning of miscellaneous vessels, cleaning of oil filters, PHEs, oil and other coolers of turbine and aux, BFP oil/ water filters, CEP strainers, other filters of turbine, generator and auxiliaries, cleaning of oil tanks, condenser (both in steam side and CW side), deaerator, FST, condenser on load tube cleaning system, self-cleaning strainers, various other tanks erected by successful bidder. This may have to be repeated several times during erection/ commissioning process till handing over of unit(s) to BHEL/ owner. Necessary CAF gaskets and

	other resources are to be arranged by successful bidder which may be required are within accepted rate/ price. BHEL will arrange only special gaskets.
12.1.11	Steam blowing, alkali flushing/ water flushing, washing, air blowing, chemical cleaning of piping systems, deaerator and FST as per requirement. Successful bidder shall carry out disassembly and reassembly of vulnerable components like deaerator spray nozzles, gauges, instruments, etc as instructed by BHEL during this process.
12.1.12	Generator gas tightness test: For this, successful bidder will arrange commissioning fixtures including supply of Mercury. This exercise has to be repeated till satisfactory completion of this activity.
12.1.13	Commissioning of PW system.
12.1.14	Commissioning of lub oil, control oil, jacking oil, PW system, gas, vapour system, waste fluids, and other system of turbine, generator, pumps and other auxiliaries.
12.1.15	Commissioning of all other packages under scope of supply.
12.1.16	Putting TG, TD BFPs on barring gear for respective 660 MW unit(s).
12.1.17	Lub oil system optimisation & governing system setting of turbine, BFPs and commissioning.
12.1.18	Preparation of commissioning documentation, log sheet, multiplication, submission in CD Versions photocopies spiral binding of total volumes of protocols/ log sheets for at least six sets. Total computerisation is to be done by successful bidder.
12.1.19	Carry out pre-commissioning, commissioning activities, rolling and synchronisation, handing over of the unit(s) with all auxiliaries.
12.1.20	Attending to all defect/ punch/ stabilisation points for respective unit(s).
12.1.21	Full load operation for respective unit(s).
12.1.22	Trial operation for individual equipment and for respective unit(s) as a whole for the stipulated period.
12.1.23	PG test and submission of total documentation after multiplication and spiral binding for respective unit (s).
12.1.24	The above activities/ tests/ trial runs may have to be repeated till satisfactory results are obtained and also to meet the technical and statutory requirements for respective unit(s).
12.2	Successful bidder shall lay temporary pipelines with fittings & accessories, etc as instructed by BHEL engineer for purpose of pre-commissioning, commissioning activities like hydraulic testing, chemical cleaning, oil flushing, steam blowing, other activities, etc of equipment, piping, system and other equipment as part of scope of work. Temporary installations shall be dismantled by successful bidder and returned to BHEL stores as specified elsewhere in this tender.
12.3	Successful bidder shall carry out necessary jobs for total commissioning jobs including mechanical, electrical and instrumentation and other jobs to the satisfaction of our ultimate owner. Necessary manpower has to be arranged by successful bidder within the accepted rate/ price.
12.4	Successful bidder shall carry out any other test as desired by BHEL engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning and commissioning, to demonstrate the completion of any part or parts of work performed by successful bidder
12.5	In case any malfunctioning and/ or defect is found during tests/ trial runs such as loose components, undue noise or vibrations, bearing temperature rise, any kind of leakages or passing, etc strain on connected equipment etc. Successful bidder shall immediately attend to these defects/ malfunctioning and take necessary corrective measures. If any readjustments, realignments, re-erection and re-works are necessary to attend such problems, till handing over of unit(s) to BHEL/ owner, the same shall be done as per BHEL engineer's instructions, free of cost, treating it as normal scope of work at no extra cost to BHEL for respective unit(s).
12.6	Cleaning of vessels/ oil tank/ other equipment by sand blasting or other methods as per instructions of BHEL engineer, before/ after oil flushing and other cleaning is responsibility of successful bidder.
12.7	Successful bidder shall execute necessary jobs for initial and subsequent fillings of

	gas in generator gas system as and when required for respective unit(s), till the respective unit(s) are/ is handed over to owner at no extra cost to BHEL.
12.8	Successful bidder shall carry out air tightness test on generator gas cooling system and water flushing of primary water system to the satisfaction of BHEL engineer. Necessary fixtures for Air tightness test and other tests including supplying of Mercury is included in successful bidder's scope. This exercise may have to be repeated as per the requirement of BHEL/ owner without any additional cost.
12.9	Replacing/changing mechanical/ other seals, bearings inspection/ replacements, changing and cleaning of all kinds of filters/ strainers, lub oil optimisation of equipment, pumps, turbine, generator and other auxiliaries under the scope, etc during commissioning stage is within the scope of work. This exercise may have to be repeated as per the requirement at no extra cost. Similarly necessary assistance for facilitating opening of bearing pedestal covers for turbovisory inspection and other jobs in connection with opening of turbine. Generator, exciter bearing pedestals may have to be repeated till handing over of unit(s) to BHEL/ owner. Successful bidder has to arrange calibration of turbo-visory instruments within the accepted rate/ price.
12.10	During the stages of commissioning, and till respective unit(s) is/ are handed over to BHEL/ owner, if any part of TG and auxiliaries need repair/ rectification/ rework/ replacement, the same shall be done expeditiously and promptly by successful bidder. Successful bidder's claim if any, for such repair/ rectification/ rework/ replacement, etc for reasons not attributable to successful bidder will be governed by relevant clause of the tender. The parts to be replaced shall however, be provided by BHEL free of cost.
12.11	During this period, though BHEL's and owner's engineers will also be associated with work, successful bidder's responsibility will be to make available resources in their scope till such time respective commissioned unit(s) is/ are taken over.
12.12	In case any malfunctioning and/ or defects are found during tests, trial run such as loose component, undue noise or vibration, bearing temperature rise problem, strain on connected equipment, any kind of leakages etc, Successful bidder shall immediately attend to these defects/ malfunctions and take necessary corrective measures. If any readjustment, realignment or rework for rectification is necessary, same shall be done as per BHEL engineer's instruction. This is included in the normal scope of work at no extra work.
12.13	Pre-commissioning activities will start prior to oil flushing of the TG and various trials, commissioning operations shall continue till the TG and aux is handed over to owner. Simultaneous commissioning checks, activities will be in progress in various areas like trial run of various equipment, checking of erected equipment, making ready for trial runs, filling up of lubricants, chemicals, etc. All these works need availability of successful bidder's engineers, supervisors, with gangs of technicians, supporting electricians, instrument technicians, fitters and other category of manpower, in each area to carry out commissioning jobs as per the requirement of BHEL commissioning staff. Successful bidder shall earmark separate manpower for various commissioning activities. This manpower shall not be disturbed or diverted. Mobilisation of these commissioning gangs shall be sufficient so that planned commissioning activities are taken up in time and also completed as per schedule and the work is to be undertaken round the clock if required including working on normal days, Sunday, holidays, etc in respective 660 MW unit(s).
12.14	Successful bidder shall cut open works/ equipment/ piping/ system if needed as per BHEL engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over, without any extra payment. Servicing and preservation of valves/ actuators and other requirements right from receipt from BHEL Store till handing over of unit(s) including arrangements of lapping pastes and other consumables are included in successful bidder's scope.
12.15	During commissioning, opening of valves/ actuators, changing of gaskets, checking, realigning & greasing of rotating and other equipment, cleaning of all

	kinds of filters/ strainers, filling/ topping up of oils, fluids, filling/ purging of gases, attending to leakages in piping, tanks, etc and adjustments of erected equipment may arise. Valves/ misc pumps/ fans/ actuators/ equipment/ systems shall be repaired/ serviced/ tuned/ readjusted and lubricated to the satisfaction of BHEL engineer during the erection and commissioning as per BHEL's instructions. This is treated as normal scope of work of successful bidder at no extra cost to BHEL. Inspection, cleaning, reassembly of parts/ items of condenser (condenser main, tubes, water boxes, tubes), MOT, feed storage tank, deaerator, TG & TDBFP oil tanks, COPU oil tanks, vessels, different oil coolers, different tanks, PHEs, filters, strainers erected by successful bidder are to be done from time to time which will be repetitive in natures as per requirement right from erection time till handing over of unit(s), is included in successful bidder's scope at no extra cost to BHEL. Arranging petrol, CTC, rubber hoses of different sizes as per requirement gaskets and other standard consumables for opening/ cleaning of condenser, deaerator/ feed storage tank, strainers/ filters, coolers, drain pits & other items are included in successful bidder's scope at no extra cost till handing over of unit(s).
12.16	It is the responsibility of successful bidder to provide for necessary resources till the completion of work under this tender, even in case erection, testing and commissioning of the TG and other equipment are delayed due to reasons not attributable to successful bidder.
13.0	**WELDING AND HEAT TREATMENT**
13.1	All electrodes and filler wires shall be procured by successful bidder within the included scope of work. All electrode/ filler wire supplied by BHEL manufacturing unit shall be issued free of cost by BHEL. Successful bidder has to maintain proper accountability of the electrode/ filler wires issued by BHEL.
13.2	The selection and use of electrodes will be as per the standards and specifications of BHEL. Successful bidder should take prior approval from BHEL accordingly.
13.3	Successful bidder should purchase the electrodes as per the recommendations of BHEL engineer, welding manual, welding schedule and other relevant documents. The electrodes shall be purchased only from BHEL approved manufacturers.
13.4	The purchase of electrodes shall be accompanied by proper test certificates and these certificates should be submitted regularly for the scrutiny of BHEL engineer.
13.5	All electrodes shall be stored in a clean dry area. The storage room shall be of permanent nature and damp proof, and the room shall be exclusively meant for storage of welding electrodes and filler wires. Excepting for a vent in the top, it is not preferred to have any other opening like windows or ventilators. The temperature inside the room has to be kept in the range of 8-100 deg c above atmospheric temperature and humidity should be less than 50%. This is to be accomplished by using electric heaters or infrared lamps. The storage room must be provided with hygrometer and thermometer. Temperature and humidity are to be monitored regularly. 15-20 holders, welding cables, connecting cables to equipment and other welding accessories including temporary electrical connection from construction power point to individual equipment like winches, hoisting equipment, welding generators, transformers, heat treatment equipment and other construction equipment shall be arranged by successful bidder.
13.6	All racks & other items used for storage of electrodes shall be of steel and not of wood.
13.7	All electrodes soon after purchase shall be offered for inspection to the BHEL engineer. Successful bidder shall be strictly prohibited from using electrodes not inspected/ approved by BHEL engineer. All related portable baking ovens for storing/ maintaining required temp range for welding electrodes with proper validity certificates of ovens in adequate quantities are to be maintained by successful bidder till completion of the work.
13.8	All welding consumables shall be issued to the welders only by authorised person who is controlled by successful bidder's welding engineer. The necessary baking

	requirements are to be ensured by successful bidder's welding engineer.
13.9	All welders shall be tested and approved by BHEL engineer/ owner before they are actually engaged on work though they may possess the requisite certificate. BHEL reserves the right to reject any welder without assigning any reasons. Statutory requirements like BBR approval for welders are to be complied with before starting of the work. If required, the welders may have to undergo Procedure Qualification test also. The decision of BHEL engineer will be final in this regard.
13.10	All charges for testing of successful bidder's welders including destructive and non-destructive tests conducted by BHEL at site shall have to be borne by successful bidder including supply of test plates for testing of welders. Materials for testing of welders like plates, pipes both for BBR/ non-BBR welders including making fixtures & payment of statutory charges are included in the scope of work at no extra cost.
13.11	BHEL is entitled to stop any welder from their work if their work is unsatisfactory for any technical reason or if there is a high percentage of rejection of joints welded by him, which, in the opinion of BHEL engineers, will adversely affect the quality of welding though the welder has earlier passed the tests prescribed. The fact that the welders have passed the test does not relieve successful bidder from their contractual obligations to check the performance of the welders. Successful bidder shall submit monthly performance record of all welders.
13.12	All welded joints shall be subject to acceptance by BHEL engineer whose decision will be final and binding.
13.13	Pre-heating and stress relieving before and after welding are part of erection work and shall be performed by successful bidder in accordance with instructions of BHEL engineer. Successful bidder has to arrange for the recorders along with accessories and suitable technicians for heat treatment purpose. The temperature recorders and thermocouples shall be duly calibrated. During preheat and stress relieving operations the temperature shall be measured as per the instructions of BHEL engineers by thermocouples and recorded graphs for the heat treatment works carried out shall be the property of BHEL.
13.14	For the purpose of stress relieving, thermocouples have to be attached to the weld joint. The number of temperature measuring points and locations are as per the standards of BHEL. Thermocouples have to be attached using battery operated portable thermocouple attachment unit and not by manual arc welding. Successful bidder shall arrange sufficient number of thermocouple attachment units.
13.15	Wherever necessary, successful bidder should provide temp indicator/ temperature recorder as required by BHEL for measuring preheat temperature for welding or for controlling temperature of metal for hot correction etc. Decision of BHEL engineer on method and of checking preheat temperature or controlling temperature for hot correction and welding shall be final and binding on successful bidder.
13.16	Heat treatment may be required to be carried out at any time (day or night) to ensure the continuity of the process. Successful bidder shall make all necessary arrangements including labour required for the same as per directions of BHEL.
13.17	Heat treatment requirements shall be as per welding schedule of BHEL/ applicable codes/ other documents, etc.
13.18	For weld joints of vessels, equipment, heavy structural items like beams, I-sections, if heat treatment is required, the same shall be carried out as part of the work by successful bidder within accepted rate/ price.
13.19	Checking effectiveness of stress relieving by hardness tests (either by Poldi Hardness Tester or other approved test methods as per BHEL's instruction) including necessary testing equipment is within the scope of work/ specification of successful bidder.
13.20	TIG welding process is to be used for all root pass welds in pipes. Subsequent welding after root pass can be carried out by manual metal arc welding with basic coated electrodes. For the pipe of thickness less than 6 mm, the entire welding has to be carried out by TIG welding. However, BHEL site engineer will have the option of changing the method adopted. For manual arc welding shall be done as per weaving technique and the width of weaving shall not exceed 1.5 times of the

	dia of the electrodes.
13.21	Two pieces to be joined shall be individually checked for the weld edge preparation and profile dimensions and with respect to the template. Dye penetrant check shall be carried out on edge prepared surfaces at random. The percentage shall depend on piping system as specified by BHEL.
13.22	Joint fit up will be a stage for inspection.
13.23	All joints shall be offered for visual inspection after root run. Subsequent welding should be made only after the approval of root run.
13.24	Welding & NDT of high alloy: P91, P22, P11, T91 pipes, tubes, valves, fittings in TG integral piping, power cycle piping, gland steams piping, overload piping. For this, required facilities, like pipe fit ups, preheating, stress relieving, PWHT, hardness testing, related NDT, as applicable is in successful bidder's scope.
14.0	**RADIOGRAPHY**
14.1	Radiographic inspection of welds shall be arranged by successful bidder including all consumables like isotope camera, X-ray film, chemicals, etc. Scaffolding and approaches for taking radiographs. Necessary skilled technician and labourers for taking the radiographs shall be provided by successful bidder. While taking radiographs, successful bidder has to use proper penetrameter/ image quality indicators as instructed by the BHEL engineer. All the processed and accepted films will be the property of BHEL. In this regard, successful bidder has to adhere to the safety rules/ regulations laid by BARC authorities from time to time. It may please be noted that invariably the radiographic work will be carried after the normal working hours.
14.2	Successful bidder shall note that 100% radiography shall be taken on all high pressure welding till such time the welders' performance is found to be satisfactory. Subsequently, subject to consistency in welder's performance, the percentage of radiography will be based on BHEL's standard practice/ BBR/ code/ drawings requirement. The defects shall be rectified immediately and to the satisfaction of BHEL engineer. The decision of BHEL engineer regarding acceptance/rejection of the joints will be final and binding on successful bidder.
14..3	Wherever radiographs are not accepted, on account of bad shot, joints shall be re-radiographed and re-shots submitted for evaluation. Radiographs shall be taken on joints after carrying out repairs. However, if defect persists after first repair, as per radiograph, carrying out repairs and radiography shall be repeated till joint is made acceptable in case, the joint is not repairable, the same shall have to be cut and repaired at successful bidder's cost. Decision of BHEL engineer in all these matters is final and binding on successful bidder.
14.4	100% radiography of weld joints of certain piping has to be carried out as per BHEL standards/ drawings/ specification.
14.5	It may also become necessary to adopt inter-layer radiography/ MPT/ UT depending upon the site/technical requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. Necessary trained personnel shall be deployed for this purpose. Conductance of all kinds of NDTs are in successful bidder's scope including arrangement of support of manpower, consumables and all incidental charges are included as successful bidder's scope of work.
14.6	Successful bidder shall have the exclusive equipment facility for conducting RT/UT/all other NDTs as required to meet site progress and also facility of examining radiography films. Delay in deployment of such facility will attract penal recovery @ Rs. 5000/per day for each occasion of default.
15.0	**CHEMICAL CLEANING/ ACID CLEANING/ ALKALI FLUSHING/ STEAM BLOWING/ OIL FLUSHING/ OTHER BLOWING AND OTHER CLEANING ETC**

15.1	Successful bidder shall lay temporary pipelines with fittings & accessories and also erect/ commission pumps after servicing as per requirements, tanks and other installations, as a system as instructed by BHEL for the purpose of chemical cleaning, steam blowing, steam washing, steam flushing, water flushing, water washing, oil flushing etc. of piping and other equipment which are within the scope of work and also systems in which equipment and piping erected by successful bidder form a part of the scope of work. It shall be specifically noted by successful bidder that all pipes for above works shall be supplied in random length and in loose condition. Successful bidder has to assemble and erect them as per schemes/ drawings provided by BHEL. Further, flanges, bend, etc for completing the scheme shall be machined/ fabricated by successful bidder at their own cost. However, plates/ steel, etc for the same will be provided by BHEL free of charges.
15.2	After the chemical cleaning has been successfully completed, dismantling of all temporary installations as instructed by BHEL is within the scope of work under this specification. The dismantled materials shall be dressed and returned to BHEL as stated elsewhere in this tender.
15.3	Preservation of the cleaned surfaces will be the responsibility of successful bidder under the guidance of BHEL engineer.
15.4	Hydraulic test of temporary piping is to be carried out as per the instructions of BHEL engineer. Carrying out repairs, if any, is in the scope of work/ specification.
15.5	For chemical cleaning of the piping system, successful bidder will have to lay temporary piping to connect the entire system irrespective of whether the equipment/system connected is in the scope of successful bidder or not. Decision of BHEL in this regard will be final and binding on successful bidder.
15.6	During the initial stages of work, trenches for draining water may not be available after alkali flushing or mass flushing for discharging and emptying. Necessary low point drains and temporary piping for this will have to be provided by successful bidder from materials provided by BHEL treating it as normal scope of work.
15.7	Laying effluent discharge line from mixing tank (for acid cleaning or any other chemical cleaning process) as per the instructions of BHEL engineer and dismantling, servicing for preservation and handing over the same to BHEL stores after completion of the job is within the scope of work/specification.
15.8	Radiographic examination of weld joints on temporary pipes as required by the engineer of BHEL should be carried out as a part of normal scope of work.
15.9	Successful bidder shall also carry out the repairs or attend leaks, etc, in the temporary piping and equipment for the above operations/ activities while carrying out the above activities/ operations.
15.10	For chemical cleaning of system which consist of equipment/ piping erected by successful bidder and also equipment/piping erected by other successful bidders of BHEL/ owner, successful bidder has to arrange for workers and supervisory staff as required, supplementing/ complimenting the labour and supervisory staff mobilised by other agencies for chemical cleaning of the portion of equipment erected by them in the system. Decision on the strength of gangs and supervisory staff for deployment of labour and allocation of work for them at site, by BHEL engineer is final and binding on successful bidder.
15..11	Successful bidders accepted rate/ price shall be inclusive of fabrication, cost of consumables, erection, dismantling of temporary piping and servicing of the equipment and valves and handing over to BHEL.
15.12	After carrying out chemical cleaning, acid cleaning/ pickling, hot water flushing, other methods as applicable for control/lubricating and other system(including oil piping, oil tank and other fittings) of rotating machines, oil flushing for lubricating systems as per instructions of BHEL engineer shall be carried out. Cleaning of oil tank of lubricating oil system of rotating machineries, cooler, etc before and after oil flushing is the responsibility of successful bidder.
15.13	For full welding of structures, tans and piping, etc, only welding generators shall be used. Use of welding transformers will be subject to approval of BHEL.

15.14	Spool pipes which have been erected in place of control valves, flow orifice, flow nozzles are to be replaced by normal control valves, flow orifice, flow nozzles after flushing, blowing operations.
16.0	**ELECTRICAL AND INSTRUMENTATION**
16.1	Successful bidder shall mount all flow indicators, centrifugal / speed switches of motors, accumulators, pr regulators, etc which are received loose and which are to be erected/ mounted at site on air lines, water lines, oil lines, steam lines, auxiliaries and firemen floor and other operating floors on boiler/ power house and other equipment. These are to be mounted during erection for finalising routing/ position, etc and to be dismantled after completion of erection work & handed over to BHEL for calibration. After calibration, these instruments shall be remounted by successful bidder in their respective positions just before commissioning.
16.2	Certain instrumentation like, pressure gauges, power cylinders, flow meters, valve actuators, flow indicators, etc are received in assembled condition as integral part of equipment. Successful bidder shall dismantle such equipment at an appropriate stage under the instruction of BHEL and hand them over to BHEL for calibration and storage. Successful bidder shall re-erect them in position just before commissioning of the equipment. Commissioning of the actuator is excluded from the scope of work.
16.3	Seal welding of thermowells, plugs before hydrotest of equipment and piping systems is also within the scope of this work/ specification. Successful bidder shall also remove the seal welded plugs by process of grinding and fix and seal weld thermowells after hydrotest/ steam blowing of lines. Installation of all thermowell is part of TG & FGD erection scope of this tender.
16.4	Welding of all thermowells, draft, pressure and temp instrumentation points, and all other instrumentation points on piping and auxiliaries is within the scope of work.
16.5	All the HT motors shall be preserved with space heaters on, and provided with proper cover till the commissioning of the motors.
17.0	**GENERAL**
17.1	During the course of erection, platforms and floor grills are to be cut at certain places to route steam, oil, water and air piping, cable trays, etc or for accommodating erection, rigging, etc, the cutting of platforms and grills should be minimum and as approved by BHEL engineer. After completion of work, the platform/grills cut shall be made good neatly as instructed by BHEL engineer, at no extra cost to BHEL. Approach platforms for following areas are to be done by successful bidder : a. Miscellaneous valves & equipment approach platforms. b. Central lub oil room (Central oil purification unit) tanks and equipment approach and operating platforms on floors. c. ESV & CV with servomotors, IP stop and control valves with servomotors. d. LP bypass approach platforms. e. Approach to turbine and generator bearing pedestals. f. Overlaod valve with servomotors. g. CRH NRV, extraction NRVs. h. MAL valve, dump valve (HP turbine evacuation valve) with operating platforms. i. Flash tank supporting platforms. j. Monorails of miscellaneous hoists. k. Turbine lub oil room/ governing oil room approach platform. l. Turbine drain valves area approach platform. m. TDBFP oil tank, oil pump area approach platform. n. CEP suction strainers, suction valves, BFP strainers with valves. o. TDBFP & drive turbine valves, aux CV. p. Gland steam piping and butterfly valves, q. PW & Hydrogen cooler temp. control valves. r. Platform below Generator stator and exciter.

	The layout/ GA drawings for these areas shall be provided by BHEL. Successful bidder shall engage a detailer agency for preparation of fabrication drawing, cutting plan, etc. These drawings shall be approved by BHEL and the work shall be done accordingly. In addition to this, other approach platforms for access to valves/ equipment/ systems which are not regular in nature are included in successful bidder's scope of work at no extra cost to BHEL. Necessary materials shall be issued at free of cost by BHEL. All platforms shall have handrails, toe-guards and approach ladder with perfection finishing as permanent platforms. Some of the equipment/ electrical panels received will require site painting and this is included in regular scope of work including supplying, application and arrangement of paints, primers, thinners, etc at no extra cost to BHEL.
17.2	Erection and welding of stainless steel pipes, fittings, valves and other items has to be done by successful bidder including supply of necessary stainless steel welding electrodes and is within successful bidder's scope of the work/ specification.
17.3	No temporary supports should be welded on to the piping. No temporary shed/office with wooden materials are allowed inside the premises.
17.4	Successful bidder shall carry out preservation painting on all items taken from stores. Preservation painting has to be carried out on material taken from stores and also on material erected wherever shop painting has given away. Periodical inspection shall be made as per instructions of BHEL and the portion of items or complete items needing painting shall be carried out to the satisfaction of BHEL. This facility shall be provided by successful bidder till commissioning and handing over of unit(s) to BHEL/ owner. Preservative and touch up painting on equipment covered under this specification stored at stores/ storage yard shall also be carried out by successful bidder at no extra cost.
17.5	Adjustment of spring hangers for piping shall be done by successful bidder during initial erection. After initial commissioning trials, it is possible that spring hangers have to be adjusted repeatedly till correct spring compression is achieved. Successful bidder shall do the same to the satisfaction of BHEL. Marking of cold and hot positions on the hangers shall be done by successful bidder. Necessary arrangements for scaffoldings, etc are to be arranged as per requirement and may have to be repeated upto the satisfaction of BHEL/ owner. This is treated as normal scope of successful bidder's work without any cost implications.
17.6	Successful bidder shall return to BHEL excess materials left over after completion of work, materials issued for temporary pipelines for HT, chemical cleaning, oil drums, containers, packing materials, flushing, blowing, etc and materials issued on returnable basis in neatly dressed condition. Necessary grinding, edge cutting (square facing), edge preparation (vee), painting, etc to the condition similar to the one at the time of issue shall be in scope of work.
17.7	All kinds of NDTs as per document/ drawing/ standards are included in successful bidder's scope of work within accepted rate/ price at no extra cost to BHEL.
17.9	Preparation and cutting of Insert plates/ foundation sleeves/ other embedment items as per requirement which will be required in the area of TG oil canal, TDBFP and other areas where successful bidder will do erection of main equipment are included in successful bidder's scope of work within his quoted rate at no extra cost to BHEL. Steel for this will be provided by BHEL on free of cost basis.
17.10	Erection, commissioning of misc pumps and chain pulley block, hoists/ cranes (both electrical and mechanical) along with electrical/ instrument panels, items are included in successful bidder's scope. Statutory load testing from accredited agencies are included in successful bidder's scope at no extra cost to BHEL.
17.11	Erection, commissioning of sump pumps, submersible pumps along with electrical/ instrument panels, items are included in successful bidder's scope. Statutory load testing from accredited agencies are included in successful bidder's scope at no extra cost to BHEL.
18.0	**PERFORMANCE GUARANTEE TEST**

18.1	Providing services for preparation for performance guarantee test of equipment /systems is in the scope of this contract.
18.2	Providing assistance during conductance of performance guarantee test.
18.3	The scope in general shall include following.
18.3.1	Installation and welding all tapping points for fixing of sensors/ pr-temp gauges/ thermo-couples/ RTDs, etc including laying of connecting wires, impulse pipes, valves fittings, etc.
18.3.2	Providing assistance in calibration test of equipment, as may be required.
18.3.3	Replacement of regular flow nozzles/orifices with PG test flow nozzles/orifices and restoring back regular ones after PG test.
18.3.4	Normalization after PG test (removal of impulse pipings, instruments, thermowell, data logger, temporary fixtures, etc).
18.3.5	Receipt of all test equipment, appliances, etc, its safe handling & storage transportation to site & storage at site.
18.3.6	Manpower assistance for laying of PG test cables after receiving.
18.3.7	Dismantling of various PG test instruments/ appliances/ devices, etc, re-placing in their original cases after re-calibration & handling over to BHEL.
18.3.8	Re-packing of instruments.
18.3.9	Removal/restoration of insulation/sheeting for PG test
18.3.10	Complete restoration of all PG test locations after the test
18.3.11	Condenser tube cleaning with high pressure jet or suitable method & attending of passing valves of the system for PG test if required.
18.3.12	Attending to passing valves and cleaning of passing valves
18.4	The above tests and guidelines mentioned are only to give a brief idea of the type of work involved at site and do not constitute the total scope of work.
19.0	**MISC HOIST AND CHAIN PULLEY BLOCKS**
19.1	All the mechanical and electrical hoists and chain pulley blocks as supplied by BHEL-PEM including mono ail under the scope are to be erected, commissioned by successful bidder (for respective units). Successful bidder has to conduct load test certified by accredited agency for statutory authority certification. The total activity including arranging agency for certification is included in successful bidder' scope at no extra cost to BHEL. Unit#1 & common system hoists / cranes / CPBs are in the scope of work of this TG+ FGD tender.
19.2	Servicing and assembly of general and special valves, actuators, control valves/ regulating valves, fixing of filter elements/ strainers & steam blowing & blanking devices in LP bypass, MS strainer, HRH strainer & and blanking of LP bypass, ESV & IV system, for hydro test, steam blowing, etc is the part of scope of work.
19.3	It may be specifically noted that it should not be construed or claimed by successful bidder that with the technical specification and "exclusions and/or inclusions" detailed in this tender specification, BHEL has covered the entire scope of work and/ or the details thereof to be executed by successful bidder.
19.4	Complete control fluid system of Turbine Governing system with related items and LP bypass system is included in the tender. Successful bidder has to execute all jobs related to erection and commissioning like cleaning of the systems as specified by BHEL engineers, lube oil/ CF flushing, filling and topping up of lube oil, etc shall be part of the work.
19.5	Assembly and installation of strainer elements of MS and HRH system, BFP, CEP strainers, condenser tube cleaning systems, self cleaning strainers, other filters erected by successful bidder is within the scope of work. Cleaning of these strainer elements till handing over of unit(s) during trial operation of machine is also covered under this scope.
19.6	Chipping of foundation, placement, erection, alignment, commissioning, grouting (including supply of all grout materials), mounting of equipment mounted instruments, panels and other fittings of BHEL (PEM bought out items) supplied pumps & packages are in scope of the work. Erection and commissioning of these equipment/ pumps & packages will be required to complete to meet commissioning schedule/ milestone activities of other areas like boiler, DM water treatment plant,

	ash handling plant, service water requirement, fuel oil handling plant, etc. Successful bidder shall plan and complete erection & commissioning of these equipment on priority as per decision of BHEL/ owner requirement.
20.0	**WELD FIT-UP AND WELD JOINT PROTECTIVE PAINT, COMPONENT PRESERVATIVE PAINTING, FINAL PAINTING, ETC**
20.1	All protective paints for the protection of weld joint fit-ups, application of primers on finished weld joints are in the scope of successful bidder.
20.2	Two coats of steam washable paints shall be applied on steam side of LP turbine and condenser components, as advised by BHEL. The steam washable paints, primer and thinner will be arranged by successful bidder and, arrangements for surface preparation and paint application like sand/ shot-blasting, consumables like surface cleaning agents, paint brush, brush cleanser, labour and necessary tools and plants are in the scope of successful bidder.
20.3	All site weld joints falling in steam side shall be painted with two coats of steam washable paint to be arranged by successful bidder.
20.4	Water boxes shall be sandblasted to remove all traces of primer applied at works. Thereafter two coats of epoxide priming paint followed by two/ three coats of high build black coal tar epoxy (eg, “Apcodur CP684” of Asian Paints or equivalent paints from any other BHEL/ owner approved manufacturer with applicable drawings/ documents). Successful bidder shall submit manufacturer’s batch test certificate/ test certificate from BHEL/ owner approved laboratory for primers and paints. Prior approval of BHEL/ owner for each and every batch of the primer & paints shall be mandatory. In order to achieve a desired minimum paint dry film thickness (DFT) as specified in BHEL drawing/ approved by the owner, number of coats may be applied and method of application shall be as recommended by paint manufacturer. Required paints & primers and other consumables with other resources shall be arranged by Successful bidder within their quoted rate.
20.5	All water side surfaces of water chambers including tube plate shall be thoroughly surface prepared / cleaned and painted as per latest approved BHEL- Hardwar drawings. Required primer & paints and other consumables for condenser water box and tube plates shall be provided by Successful bidder within the quoted rate.
20.6	Final painting: The scope shall include supply and application of primer, final paints as required as per BHEL approved painting schedule/ scheme and approved cleaning method specified for the components of turbine, generator, condenser and auxiliaries, pumps packages, equipment, system, piping, etc within the accepted rate/ price. Arrow marking with nomenclature in English/Hindi or in both languages on the erected system are also included in the scope of work. Even painting with bands and arrows with heat resistant paints in high temperature application zones with arrow and nomenclatures are also included in the scope. Successful bidder has to arrange required thinner, paints (primer as well as finish paints) and all other supporting materials with resources within accepted rate/ prices, as normal scope of work. Regarding selection of brands/supplier of paints, types of paints and related items, successful bidder has to take prior approval of BHEL/ owner. Successful bidder has to apply painting as per applicable code/ instruction of BHEL/ owner to achieve required thickness. Successful bidder has to arrange one calibrated “coatmeter” for thickness measuring/ checking.
20.7	The total activity of painting including arrangements of all materials, manpower and accessories to carry out paintings plus making scaffolding as per requirement is included in successful bidder’s scope of work. Before arranging all kinds of materials about paints, successful bidder has to take prior approval from BHEL/ owner regarding grade/ supplier. Valid test certificate also has to be arranged for this purpose by successful bidder.
20.8	Preservation of all components/ equipment during various stages of erection, commissioning till handing over is in successful bidder’s scope. All prescribed methods of surface cleaning prior to application of preservative/ touch up paint shall be followed by successful bidder. Successful bidder has to arrange all primer, paints, other consumables, like wire brush, painting brush required for this work.
20.9	Indicative painting schedule as per relevant annexure is furnished for tendering

	purpose. Successful bidder is required to carry out the painting work as per approved painting schedule which will be furnished during execution.
21.0	**INSPECTION/ QUALITY ASSURANCE/ QUALITY CONTROL/ STATUTORY INSPECTION**
21.1	Various inspection/ quality control/ quality assurance procedures/ methods at various stages of erection and commissioning will be as per BHEL/ owner quality control procedure/ codes/ IBR and other statutory provisions and as per BHEL's instructions.
21.2	Preparation of quality assurance log sheets & protocols with owner's engineers, welding logs and other quality control and quality assurance documentation as per BHEL engineer's instructions, is within the scope of work/ specification. Total documents for erection, commissioning, trial run, handing over, PG test reports has to be compiled, multiplied, spiral bounded in book forms for at least six sets for distribution to owner, different units of BHEL. Non-submission of will call for penal recoveries and BHEL may execute at risk and cost of BHEL. The protocols between successful bidder and owner/BHEL shall be made prior to installation for correctness of foundations, materials, procedures, at each stage of installation, generally as per the requirement of owner/ BHEL. This is necessary to ensure elimination of errors or keeping them within tolerable limits and to avoid accumulation and multiplication of errors.
21.3	A daily log book should be maintained by every supervisor/ engineer of successful bidder on the job in duplicate (one for BHEL and one for successful bidder) for detailing and incorporating alignment/ clearance/ centring/ levelling readings and inspection details of various equipment, 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. Similarly, performance report of all welders shall be furnished for scrutiny of BHEL engineer. All kinds of NDTs are included in successful bidder's scope of work within accepted rate/ price.
21.4	In the course of erection, it may become necessary to carry repeated checks of the work with instruments recently calibrated, re-calibrated. Such instruments, whenever necessary, will be provided by successful bidder/ BHEL as per T&P provision scope.
21.5	Vibration indicators / vibration recorders/ vibration analysers will be provided by BHEL for checking and analysing vibration levels of rotating equipment with necessary operators. Successful bidder shall provide necessary labour with necessary supports for carrying out such tests. This exercise may have to repeated till handing over of unit(s) to BHEL/ owner and is included within accepted rate/ price. For attending vibration / temperature rise issues, it would be required to open/ dismantle bearing housings / pedestals and other connected items and reassemble the same afterwards (which may get repeated also). Such works shall be carried out by successful bidder alongwith necessary labour and supports without additional cost to BHEL.
21.6	Total quality is the watch word of the work and successful bidder 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. Successful bidder shall provide for the services of quality assurance engineer.

22.0	**STAGE INSPECTION BY FES/ QA ENGINEER**
	Apart from day-to-day inspection by BHEL engineers stationed at site and also by owner's engineers, stage inspection of equipment under erection and commissioning at various stages of erection & commissioning by team of engineers from field engineering service of BHEL's manufacturing units and quality assurance teams from field quality assurance unit/ factory quality assurance and commissioning engineers from technical services of BHEL will also be conducted. Successful bidder shall arrange all labour, tools and tackles, IMTEs, etc for such stage inspections free of cost. Stage Inspection shall also be carried out by Siemens / other OEM Engineers time to time. Contractor shall provide all the inputs and supports in this regard.
23.0	**STATUTORY INSPECTION**
23.1	The scope includes getting the approvals from the statutory authorities (like boiler inspector, PF / ESI, labour & other statuory officers). This includes arranging for inspection visits of boiler inspector periodically as per BHEL engineer's instructions, submitting documents, radiographs, etc and following up the matter with them.
23.2	All fees connected with successful bidders for testing their welders/ men/ workers and testing, inspection, calibrating of their instruments and equipment, shall be paid by successful bidder. It shall be successful bidder's responsibility to obtain approval of statutory authorities, wherever applicable, for the conducting of any work which comes under the purview of these authorities. Any cost arising from this shall be successful bidder's account. BHEL shall reimburse only statutory fees, which is required in connection with BBR portion, related piping, equipment, statutory electricity authorities if applicable. In case these inspections have to be repeated due to default / fault of successful bidder, the statutory fees have to be paid again, successful bidder shall have to bear the charges. These would be deducted from their bills.
23.3	BHEL, Power Sector–Eastern Region (PSER) has already been accredited with ISO:9002 certification and as such this work is subject to various audits to meet ISO:9002 requirements. One particular aspect which needs special mention is about arrangement of calibration of instruments by successful bidder. Successful bidder shall ensure deployment of reliable and calibrated MMDs (instrument measuring and test equipment). The MMDs 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. Successful bidder will also have alternate arrangements for such MMDs so that work does not suffer when the particular equipment/ instrument is sent for calibration. Also if any MMDs not found fit for use, BHEL shall have the right to stop the use of such item and instruct successful bidder to deploy proper item and recall ie. Repeat the readings taken by that instrument, failing which BHEL may deploy MMDs and retake the readings at successful bidder's cost.
24.0	**DRAWINGS AND DOCUMENTS**
24.1	The detailed drawings, specifications, quality plans available with BHEL engineers will also form part of this tender. Revision of drawings/ documents may take place due to various considerations as is normal in such large project. Work will have to be carried out as per latest revised drawings/ documents. These documents will be made available to successful bidder during execution of work at site.
24.2	One set of necessary drawings / documents to carry out the erection work will be furnished to successful bidder by BHEL on loan which shall be returned to BHEL after completion of work. Successful bidder's personnel shall take care of these documents given to them.
24.3	The data furnished in various sections and appendices and drawings enclosed with tender describe the equipment to be installed, tested and commissioned under this specification, briefly. However, the changes in the design and in the quantity may be expected to occur as is usual in any such large scale of works.

24.4	If any error or ambiguity is discovered in the specification/ information contained in the documents/ drawings and tender, successful bidder shall forthwith bring the same to the notice of BHEL before commencement of the work. BHEL's interpretation in such cases will be final and binding on successful bidder.
24.5	Multiplication of drawings/ protocols, spiral binding of logsheets/ protocols of at least six sets is included in the successful bidder's scope at no extra cost to BHEL.
25.0	**BRIEF OPERATION DESCRIPTIONS OF EQUIPMENT**
	660 MW TG set with auxiliaries is equipped with condensing turbine with HP, IP and LP turbines connected in tandem and this acts as prime mover to drive the turbo-generator set. The HP turbine receives main steam from boiler super-heater outlet via combined HP stop cum control valves and after doing required work, the steam passes through CRH-NRVs and the steam is sent back to boiler re-heater. Steam after reheating enters IP turbine as HRH steam through combined IP stop cum control valves and after doing work in IP turbine, the exhaust steam from IP turbine enters LP turbine via cross around pipes. The steam from LP turbine after doing work enters into the steam space of condenser. Condenser cools the exhaust steam with the help of circulating water which passes through condenser tubes and this condensate water is pumped with the help of CEPs for sending to deaerator via drain cooler, LP heater-1,2,3. The condensate is heated in heated in deaerator with the help of pegging steam and this water is fed to BFPs for further pumping. The BFPs further increases pressure with the help of booster pumps and BFPs via HP heaters. This feed water is fed to the boiler via boiler economiser, which in turn helps in generation of steam and sent to turbine for doing necessary work and the cycle is repeated. The turbine, generator, BFPs are having lub oil system for bearing lubrication. turbine has governing system run with the help of control fluid system which operates both total governing system and LP bypass system. The turbine has regenerative / extraction steam system and has NRVs (both mechanical and servomotor operated). The condenser CW system gets CW from CW pumps via condenser tube cleaning system and the CW pipes have butterfly valves for isolations at condenser end. The cooling water for TG, BFPs lub oil, CF system, generator seal oil, H2 coolers, exciter coolers, BFP working oil system for MDBFPs and other equipment are pumped by different miscellaneous pumps. DM cooling waters system is cooled by ACW system which is pumped by ACW pumps. The DMCW water is cooled both at boiler and TG side with the help of PHEs.
26.0	**EXCLUSION**
	The following are specific exclusions from the scope of work of this tender.
26.1	Civil works to the extent not specifically provided for in this tender.
26.2	Thermal insulation of BFPs and their drive turbine, main turbine, ESV, IV, LPBP valves, insulation of various power cycle heat exchangers & piping.
26.3	Supply of materials for temporary piping (pipe, valve, etc) required for hydraulic test, chemical cleaning, flushing or water/ steam/ air blowing of the pipelines.
26.4	Supply of chemicals and lube oil/ control fluid etc. during pre-commissioning and commissioning activities/ operation.
26.5	Erection of sound proof / acoustic enclosure for main turbine.
26.6	Testing & commissioning of all HT/ LT motors and actuators. However, halogen heating and manpower assistance to attain IR/ PI value of HT/ LT motors are included in the scope of this tender. Bearing lubrication and its testing / repair / replacement is included in the scope.
26.7	Electrical testing of generator, Exciter and PMG (during rolling & synchronisation).

26.8	PG test impulse piping from root valve, cabling of field instruments for PG test. However, all assistance of issue of materials, return after PG test, assistance during PG test is included in the scope of this tender. System isolation, flushing of root valves, etc during PG test is included in the scope of this tender.
26.9	Regular Operation and maintenance of TG hall EOT crane for complete contract period (including extension, if any).
26.10	Elevator erection and commissioning in FGD package. Electrical and C&I works of FGD package. However, commissioning of FGD shall form part of scope of work.
27.0	**TERMINAL POINTS**
	The followings are the broad guide lines about the Terminal points however the actual Terminal points shall be guided by the work scope indicated in the respective approved drawings.
27.1	For CW pumps, Intake water pumps & other horizontal / vertical pumps in the scope of this tender (filter water, service water, drinking water, intake water, raw water etc.), Pump house puddle flange / external wall of the respective pump / power house building shall be the terminal point. All piping inside these pump house / buildings, including supports, valves, strainers, actuators, fittings shall be erected by TG vendor
27.2	BFP and Booster pump suction strainers along with its operating platform is to be installed by TG vendor only.
27.3	CRHNRV, LPBP valves including spray valves and station and extraction NRVs are to be installed by TG vendor.
27.4	For Hydrogen cooler, Lube oil cooler & Primary water coolers pipelines, all the materials supplied by BHEL- Hardwar shall be erected by TG vendor.
27.5	Lube oil temp. control valve, PW temp. control valve and H2 cooler Temp. control valves shall be erected by TG vendor.

FIELD QUALITY PLAN
FOR
AUXILIARY COOLING WATER 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-PC-QA-300043-PSE, REV. NO. : 0

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-ST-48
REV. No.: 0

FOR TENDER PURPOSE ONLY

FIELD QUALITY PLAN
FOR
COOLING WATER SYSTEM

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-PC-QA-300043-PSE, REV. NO. : 0

PREPARED BY	ENGR./ QLY, BHEL-PSER	APPROVED BY	HEAD / QLY, BHEL-PSER

FQP NO.	**QPE-MTE-660-ST-48**
ORIGINAL DATE OF ISSUE	30/01/2019
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ISSUED BY (SIGNATURE & DESIGNATION)	Digitally signed by Arup Ratan Paul DN: cn=Arup Ratan Paul, o=BHEL-PSER, KOLKATA, ou=ENGR./QLY, email=arpaul@bhel.in, c=IN Location: BHEL, PS:ER, Kolkata Date: 2019.01.31 15:32:18 +05'30' ENGR. / QLY, BHEL- PSER

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BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

PSER	FIELD QUALITY PLAN FOR COOLING WATER SYSTEM	FQP NO: MAITREE-00-PC-QA-300043-PSE BHEL Doc. No. : QPE-MTE-660-ST-48
		REV. NO. : 0
		SHEET 1 / 1 SHEET

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STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 30/01/2019	The document is similar to NTPC SFQP No. 0000-999-QOM-I-004, Rev-00 for erection of Station Piping with additional checks for rubber lining as per NTPC-approved QP no. 4410-001-110-QVM-Q-169 / 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	FQA of BIFPCL / OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	Head FQA of BIFPCL / OE
'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/ OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BIFPCL Erection Engineer/ OE
'C'	BHEL Engineer	BHEL Engineer	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BHEL HOS

Abbreviations used:

HOS – Head of Section

Note:

1. **Erection & commissioning of Pumps shall be done under supervision of OEM's representative**
2. 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.
3. Wherever log sheet is not called for, suitable record shall be maintained in protocol / Site register.
4. 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.
5. Owner's Engineer is authorized to carry out surveillance in any of B & C category of checks at his discretion.
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. : 0
		SHEET 01 / 10 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	COOLING WATER SYSTEM
Sub-system :	AUXILIARY COOLING WATER SYSTEM
Area :	RECEIPT, STORAGE & 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. For FQP of CW system, refer to document number MAITREE-00-PA-QA-300042-PSE
4. Latest revision of Standards & Specification shall apply.
5. Materials shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
6. 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
7. Only approved welding 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 Consumables.
9. NDT shall be carried out by Qualified Personnel with compliance to Approved NDT procedures and unless noted otherwise in the FQP, the Acceptance Norms shall be as per ASME Sec- V.
10. The Agency carrying out RT shall be approved by Local Authorities.
11. Field Radiography shall be carried out in compliance with Local Statutory requirements and safety precautions by Approved Agency.
12. Radiography Source handling and control procedure shall be established as per Local Statutory requirements and complied.
13. Preheating and Post Weld Heat treatment shall be in compliance with Approved Procedures.
14. Gauges and measuring Instruments, with valid calibration only shall be used
15. Cleaning, preservation and Painting of products shall be carried out as per Approved Painting Schedule.
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	FIELD QUALITY PLAN FOR **AUXILIARY COOLING WATER SYSTEM** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-PC-QA-300043-PSE BHEL Doc. No. : QPE-MTE-660-ST-48 REV. NO. : 0 SHEET 02 OF 10
SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: AUXILIARY COOLING WATER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*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 MMR damaging incident	Owner's Technical Specifications & Drawing	The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	SR & Calibration Report	√	- 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 / erection 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**									
B.01	Verification of documents : (i) shipping list/ packing list/ loading advice/ delivery challan (ii) Despatch clearance/ MDCC	R	Records	B	100%	Packing slip / Delivery challan / MDCC & Approved BBU	Compliance w.r.t. column 7	Stock Register		Delivery condition of wrapping coating material should comply with requirement of Sec.-6 of AWWA C203
B.02	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	B	100%	Work instructions for site Operations	Work instructions for site Operations	MDR		
B.03	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 STORAGE**									
C.01	Steel plate/ pipes/ structural steel (angle/ beams/ channels/ flats etc)	V	-	B	Once every three months	Annex-I	Compliance to storage level - A as per Annex-I	SR		for pipes - end caps shall be used during storage
C.02	Wrapping Coating Material	V	-	B	Once every three months	Annex-I	Compliance to storage level - C as per Annex-I	SR		Storage of wrapping coating material should comply with requirement of Sec.-6 of AWWA C203

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SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: AUXILIARY COOLING WATER SYSTEM	AREA: RECEIPT, STORAGE & ERECTION

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*
C.03	Pump components (including foundation material, hardware etc.) & Motor	V	-	B	Once every three months	Annex-I	Compliance to storage level - C as per Annex-I	SR		Check for damage & condition of painting / preservatives
C.04	valves. strainers, hoses, pressure regulating station etc, as applicable	V	-	B	Once every three months	Annex-I	Compliance to storage level - C as per Annex-I	SR		provide end caps
C.05	instruments viz. level switch, flow switch, flow meters, level indicator gauge, etc	V	-	B	Once every three months	Annex-I	Compliance to storage level - D as per Annex-I	SR		
D	**WELDING & NON DESTRUCTIVE EXAMINATIONS**									
D.01	Ensure availability of applicable qualified WPS	R	-	A	100%	Drawing / EWS	ASME BPVC SEC-IX	WPS	√	
D.02	Review of MTC of welding electrodes & other consumables	R	-	A	100%	Relevant AWS specifications as per applicable WPS	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	ASME BPVC SEC-IX	WQR	√	
D.04	Adoption of correct procedure, approved electrodes and methods.	V	-	A	100%	Drawing / EWS & WPS	Drawing / EWS & WPS	SR		
D.05	Checking drying / baking of electrodes (where ever applicable)	V & R	-	B	Random in each shift	WPS	Recommendation of electrode manufacturer	SR		
D.06	Pre heating of field weld joints, as applicable.	V & M	Non-contact type Thermometer	A	As per WPS	WPS	ASME B31.1	SR		
D.07	Ensure proper sequence of welding, as applicable	V	-	C	100%	Drawings & WPS	Drawings & WPS	SR		

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SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: AUXILIARY COOLING WATER SYSTEM	AREA: RECEIPT, STORAGE & ERECTION

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1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*		*10*
D.08	PWHT of field weld joints, as applicable.	V/M	Time-Temp. Recorder	A	As per WPS	WPS	ASME B31.1	SR	√	
D.09	Review of qualification of NDT inspectors	R	-	A	Once before engagement of each inspector	ASNT CP-106 or equivalent	Level-II or above	NDT Inspector Register		
D.10	Visual Inspection of All weldments (field weld)	V & M	As required	B	100%	Drawing & ASME BPVC SEC-V	ASME B31.1	SR		
D.11	DPT on field double-V butt welds after back gouging	T	DPT Kit	B	100%	ASME BPVC SEC-V	ASME B31.1	SR		
D.12	Volumetric NDT of butt welds field joints : RT	T	RT Kit	A	5%*	ASME BPVC SEC-V	ASME B31.1	UT report	√	* 1. Random 5% RT on joints 2. 100% RT may be done in place of hydro-test at site
D.13	DPT nozzle welds & all finished welds	T	DPT Kit	B	Random 10%	ASME BPVC SEC-V	ASME B31.1	SR		
D.14	Preservation of field welded area	V	As required	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen		SR		
E	**WRAPPING & COATING OF EXTERNAL SURFACE OF UNDER GROUND PIPES (AS APPLICABLE)**									
E.01	Wrapping & Coating Material for external surface	R	Review of MTC & shop inspection reports	A	100%	Drawing & Annex-II	AWWA C 203	SR	√	the MTC should contain reports of tests of all the relevant parameters as per AWWA C 203
E.02	Check Surface Preparation for external coating	V	Power tool *viz.* rotary wire brush	B	100%	Drawing & Annex-II	AWWA C 203	SR	√	
E.03	Inspection external coating for overlap, air pockets, thickness	V & M	As required	B	100%	Drawing & Annex-II	AWWA C 203	SR		
E.04	Holiday Test of external coating	T	Holiday detector	A	100%	AWWA C 203 & NACE SP0188	AWWA C 203	SR	√	The coating manufacturer may be consulted for proper test equipment and Inspection voltage.

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1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*D**	*10*
E.05	Adhesion Test of external coating	T	As required	A	One test for each shift	AWWA C 203	AWWA C 203	SR	√	
F	**RUBBER LINING OF PIPES (AS APPLICABLE)**									
F.01	Raw material inspection : 1. Tensile strength & elongation 2. Chemical resistance (resistance to bleeding)	M	As required	A	One sample per vulcanisation lot	1. ISO 37 : 2011 2. Sample is to be kept in 33% HCL, 48% NaOH & DM water for 72 hours	1. TS > 120kg/cm2 & % elongation > 350 2. No discolouration. Weight gain limit : -0%, +2%	SR	√	
F.02	Thickness of rubber sheet	M	Thickness gauge	B	100%	Approved drawing / datasheet	Approved drawing / datasheet	SR		
F.03	In process inspection 1. Surface preparation 2. sparktest before vulcanisation 3. Curing of rubber	V & M	As required	C	100%	ASTM D 7602 & Recommendations of rubber lining manufacturer	Approved drawing / datasheet	SR		
F.04	Final Inspection after vulcanisation : 1. Shore Hardness 2. Spark Test 3. Lining Thickness 4. Adhesion 5. Surface defects 6. Completeness	V & M	As required	A	100%	ASTM D 7602 & Recommendations of rubber lining manufacturer	Approved drawing / datasheet	SR	√	* lining thickness shall be checked randomly
G	**CHECKS FOR BURIED PIPE ERECTION**									
G.01	Excavation before laying of pipe	Checks shall be done as per checks in Sl. No. B.01 to B.06 of FQP for Civil works (MAITREE-00-U-QA-300001-PSE)								
G.02	Welding & NDT of site fabricated pipes	As per Sl. No. 'D'								
G.03	Rubber lining of site fabricated CS pipes, as applicable	As per Sl. No. 'F'								
G.04	Check diameter of pipe before laying	M	Measuring tape	C	100%	Drawing	Drawing	SR		

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1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*D**	*10*
G.05	Visual inspection of internal surface of rubber lined pipe before laying	V	-	C	100%	Approved Drawings	No damage	SR		If any rectification is required, shall be done as per the recommendations of rubber lining manufacturer and checks shall be done as per Sl. No. F
G.06	Wrapping & Coating of external surface of pipe before placement in the trench. NOTE: Holdback of min. 150mm width at both ends in external surface of the assembled piece shall be left uncoated for welding in trench, as applicable	As per Sl. No. 'E'								
G.07	Placement of pipes in trenches. Check the followings- i) Level ii) slope	P	Optical surveying & levelling instrument	B	100%	Drawing & Method Statement	Clause no. B0.6.17.2 of Owner's Technical Specifications	SR		The coated pipe shall always be handled with equipment. such as wide belt slings and wide padded skids, designed to prevent damage to the coating.
G.08	Edge preparation & alignment of two pipes after placement in trench, as applicable	M	Measuring tape	C	100%	Drawing	ASME B31.1	SR		
G.09	Welding & NDT of field joint in trench, as applicable	As per Sl. No. 'D'								
G.10	Bolting check for bolted-flange joints of rubber lined pipes	V	-	B	Each joint	Approved Drawings	Tightness of fasteners	SR		
G.11	Hydro-test of pipe section	T	As required	A	100%	Drawing & Hydro-test scheme	ASME B31.1	HT report	√	100% RT may be done in place of hydro-test at site
G.12	Wrapping & Coating of pipe in holdback area after hydro-test, as applicable	As per Sl. No. 'E'								
G.13	Back filling after completion of all mechanical work, Testing & coating	Checks shall be done as per checks in Sl. No. B.08 to B.14 of FQP for Civil works (MAITREE-00-U-QA-300001-PSE)								
G.14	Cleaning of inside of pipe line	V	-	B	100%	should be free from sludge or muck and other debris.		Joint Protocol	√	

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1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*D**	*10*
H	**CHECKS FOR ABOVE GROUND PIPE ERECTION**									
H.01	Welding & NDT of site fabricated pipes	As per Sl. No. 'D'								
H.02	Rubber lining of site fabricated CS pipes, as applicable	As per Sl. No. 'F'								
H.03	Check diameter of pipe before erection	M	Measuring tape	C	100%	Drawing	Drawing	SR		
H.04	Edge preparation & alignment of two pipes (for welded type field joint), as applicable	M	Measuring tape	C	100%	Drawing	ASME B31.1	SR		
H.05	Welding & NDT of field joint, as applicable	As per Sl. No. 'D'								
H.06	Visual inspection of internal surface of rubber lined pipe before erection	V	-	C	100%	Approved Drawings	No damage	SR		If any rectification is required, shall be done as per the recommendations of rubber lining manufacturer and checks shall be done as per Sl. No. F
H.07	Bolting check for bolted-flange joints	V	-	B	Each joint	Approved Drawings	Tightness of fasteners	SR		
H.08	Hydro-test of pipe section	T	As required	A	100%	Drawing & Hydro-test scheme	ASME B31.1	HT report	√	
H.09	Ensure availability of pipe supports as per drawing. so that piping load should not pass on the pump nozzles.	V	-	C	100%	Support arrangement drawing, Hanger schedule		SR		
H.10	Cleaning of inside of pipes	P & V	-	B	100%	should be free from sludge or muck and other debris.		Joint Protocol	√	
H.11	Check outside surface condition, as applicable	V	-	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen	ISO 8501-1	SR		
H.12	Final Painting of outside surface - thickness, finish, Colour shade, labelling & Marking	V & M	DFT Gauge	B	100%	Drawing, Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & approved colour scheme : MAITREE-00-BFA-FF-100001-GEN		Joint Protocol	√	Paint to be procured from BIFPCL approved source & shall conform to ISO 12944

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1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*D**	*10*
I	**CHECKS FOR ROTATING EQUIPMENT (PUMP, MOTOR & FILTERS)**									
I.01	Check for foundation : disposition & dimensions	M	Measuring tape	B	100%	Approved Drawings	Approved Drawings	SR		
I.02	Erection of base frame	M	Measuring tape	C	100%	Approved Drawing & OEM's Manual	Approved Drawing & OEM's Manual	SR		
I.03	Alignment, levelling & Grouting of base frame	M	Spirit level	C	100%	Approved Drawing & OEM's Manual	Approved Drawing & OEM's Manual	SR		
I.04	Erection of Pump & motor : Alignment, levelling	M	Spirit level	C	100%	Approved Drawing & OEM's Manual	Approved Drawing & OEM's Manual	SR		*OEM's supervision
I.05	Pump Coupling with motor and alignment / eccentricity check	M	Dial indicator	B	100%	Approved Drawing & OEM's Manual	Approved Drawing & OEM's Manual	SR	√	*OEM's supervision
I.06	Electrical checks : Cable termination, IR check of motor	M	IR tester	B	100%	Approved Drawing & OEM's Manual	Approved Drawing & OEM's Manual	SR	√	
I.07	Check direction of rotation & free rotation	V	-	B	100%	Approved Drawing & OEM's Manual	Approved Drawing & OEM's Manual	SR		
I.08	Painting check : Type, shade, DFT, labelling & marking	V	-	B	100%	Drawing, Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & approved colour scheme : MAITREE-00-BFA-FF-100001-GEN		Joint Protocol	√	Paint to be procured from BIFPCL approved source & shall conform to ISO 12944
I.09	Installation of sufficient number of pipe supports	V	-	C	100%	Support arrangement drawing, Hanger schedule		SR		* for pumps : OEM's witness
I.10	Proper Flushing of Suction & Discharge pipelines	V	-	B	100%	Approved Drawings	No dirt and foreign material	SR		* for pumps : OEM's witness
I.11	Commissioning of pump set	V	-	A	100%	O&M Manual	O&M Manual	Joint Protocol	√	*OEM's supervision
J	**HEAT EXCHANGERS, TANKS / VESSELS & STRAINERS**									
J.01	Check for correct location, orientation, elevation and level.	M	Tape, Water level	A	100%	Drawing	Drawing	Log book	√	
J.02	Internal cleanliness of equipment.	V	-	B	100%	No foreign material				

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1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*D**	*10*
J.03	Ensure correct size & grade of fasteners are used and tightened to required torque value, as applicable	V & M	Torque wrench	B	100%	Drawing	Drawing	Log book		
J.04	Ensure correct size & grade of gaskets are used in flange joints wherever applicable.	V		B	100%	Drawing	Drawing			
K	**RUBBER EXPANSION JOINTS (IF APPLICABLE)**									
K.01	Ensure before installation the adjoining pipes shall be cleaned and free from sharp edges/ objects.	V		C	100%	Drawing	Drawing			
K.02	Ensure that the space between the adjoining Pipe's flanges match with pre-set value of Bellow for proper fit.	M	Tape	B	100%	Drawing	Drawing	Log book		
K.03	Ensure that the Rubber Expansion Bellow is protected from falling objects, weld spatter & cutting operation.	V		B	100%	Drawing	Drawing			
K.04	Ensure correct size & grade of fasteners are used and tightened to required torque value.	V & M	Torque wrench	B	100%	Drawing	Drawing	Log book		
K.05	Ensure locking of expansion joints (equalizing rods) during hydraulic test and release after completion of hydraulic test, wherever applicable.	V		B	100%	Drawing	Drawing			
L	**CHECKS FOR VALVES & ACTUATOR**									
L.01	Ensure availability of installation manual and O & M manual (as applicable)	V	-	C	100%	-	-	Log book		
L.02	Identification of the valves for the location	V	-	C	100%	Valve Schedule / Drawing	Valve Schedule / Drawing	Log book		
L.03	Cleanliness of pipelines / valve before fixing / welding.	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		
L.04	Ensure that gland packings, gaskets & washers are put back in valve and also ensure bolts and studs are fitted and tightened properly.	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		
L.05	Direction of flow (arrow mark) is as per the flow direction indicated on the valve body except for safety valve.	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		
L.06	Availability of supports for valves and pipelines.	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **AUXILIARY COOLING WATER SYSTEM** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-PC-QA-300043-PSE BHEL Doc. No. : QPE-MTE-660-ST-48 REV. NO. : 0 SHEET 10 OF 10
SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: AUXILIARY COOLING WATER SYSTEM	AREA: RECEIPT, STORAGE & ERECTION

FOR TENDER PURPOSE ONLY

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*
L.07	Check for tightness of bolts/nuts, as applicable	V	-	C	100%	Approved Drawings	Approved Drawings	SR		
L.08	Matching of valve end and pipe before welding, as applicable	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		
L.09	Ensure valve is kept fully open and valve seat is protected before welding. – Valve body not to be used as earthing, while welding	V	-	C	100%	Installation Manual	Drawing	Log book		
L.10	Parallelism of the matching flange in case of flanged joints.	V	-	B	100%	Installation Manual	Installation Manual	Log book		
L.11	Welding of valve end to pipeline & NDT of erection weld, as applicable	As per Sl. No. 'D'								
L.12	Bolting check for bolted-flange joints	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		
L.13	Identification of the actuator for location	V	-	C	100%	Valve Actuator Data Sheet	Valve Actuator Data Sheet	Log book	√	
L.14	Ensure actuator is firmly supported and free from vibration.	V	-	B	100%	Approved Drawings	Approved Drawings	Log book		
L.15	Size and correctness of power and control cables and proper sealing of unused cable entries.	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		
L.16	Check earthing connection of the motor.	M	Multimeter	C	100%	Approved Drawings	Approved Drawings	Log book		
M	**INSTALLATION OF INSTRUMENT LIKE PRESSURE GAUGE, PRESSURE SWITCH, LEVEL GAUGE, FLOW SWITCH, LIMIT SWITCH, SOL, FIRE ALARM, ETC.**									
M.01	Installation of Instruments and verification of location, Tag No.	V	-	C	100%	Approved Drawings, P&ID	Approved Drawings, P&ID	SR		
M.02	Check for Calibration	P & V	As required	B	100%	Drawing	Technical Specification	Joint Protocol	√	

FOR CATHODIC PROTECTION - REFER SEPARATE FQP

STORAGE LEVEL

SL. NO.	STORAGE LEVEL	DESCRIPTION / REMARKS
1	Storage level 'A'	Outside with no protective cover (Open space / yard on raised surface, properly stacked and free from water logging & loading / undue weight).
2	Storage level 'B'	Outside with protective cover (Open space / yard on raised surface, properly stacked and free from water logging & loading / undue weight, covered with PVC / Tarpaulin).
3	Storage level 'C'	Item stored in Pucca shed / in store and free from water logging & loading / undue weight and there shall not be acid / chemicals in vicinity
4	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).
5	Storage level 'E'	Indoor temperature & humidity controlled – air conditioned (stored in pucca shed, in store with controlled atmosphere)

FOR TENDER PURPOSE ONLY

GUIDELINE FOR WRAPPING & COATING OF UNDERGROUND STEEL PIPING

1.0 Object

The object of this guideline is to elaborate the method of protecting the underground pipelines by the process of wrapping and coating by hot-applied coal tar based anticorrosive tape.

This document does not specifically provide any guideline for safety measures to be taken during wrapping-coating, erection & testing of pipes. Suitable safety analysis & hazard identification is to be done at site as per the project HSE manual.

2.0 Material

2.1 Pipes shall be supplied by BHEL-Piping Centre, Chennai in shot-blasted and painted condition for protection of pipes during transit. All dispatch documents & MDCC to be verified and co-related with BOM at site.

2.2 Primer to be used at site shall conform to the quality and testing requirement of type B as indicated in AWWA C-203 or as specified in project specific customer's Technical Specifications.

2.3 All wrapping material (viz. Coal tar based tape) to be used at site shall conform to the quality and testing requirement indicated in AWWA C-203 or as specified in project specific customer's Technical Specifications..

3.0 Procedure of Work

The job shall be generally involve the following steps -

- Cleaning the external pipe surface.
- Priming with synthetic primer (type B fast drying, synthetic)
- First layer of coal tar impregnated glass fibre tape. (min. 2mm thick)
- Final layer (2nd) of coal tar impregnated glass fibre tape. (min. 2mm thick)
- White wash, as applicable.

3.1 Cleaning the external pipe surface

Pipes which are to be buried will be supplied by manufacturer in shot-blasted surface condition with suitable epoxy/enamel coating outside for protection during transportation. At site, before applying the wrapping-coating, this coating has to be removed by power tool (viz. rotary wire brush). If required, shot blasting at site may be done with suitable arrangement. Care should be taken to remove all the shop-applied coating. Any trace of oil or grease shall be removed by solvent cleaning. The cleaning operation shall be immediately followed by priming with the airless spray priming machine or by brush, as recommended by primer manufacturer.

3.2 Priming with synthetic primer

3.2.1 Materials - Coal Tar Primer:

The primer shall be a type B (fast drying, synthetic) certified to meet AWWA C-203 or any other equivalent international standard as specified in project specific customer's Technical Specifications. The primer shall consist of chlorinated rubber, synthetic plasticiser and solvents suitably blended to produce a liquid coating which may be applied by brushing or spraying. It shall be a liquid that can be applied without heating and shall produce an effective bond between the surface to be protected and subsequent layers of coal tar tape. It should not settle in the container to form a cake that cannot be mixed easily by hand stirring. Primer shall have good spraying and /or brushing properties and minimum tendency to produce bubbles during application. Primer and coal tar tape must be compatible to each other and the primer should

FOR TENDER PURPOSE ONLY

also pass the adhesion test as specified in AWWA C203. Primer should meet the project specific HSE requirement in terms of toxic content and / or highly volatile solvents.

Only BHEL/Customer approved brand of primer to be used. The primer shall be tested in lab condition before dispatch to site and each lot of supply must accompany manufacturer's Test Certificate and Certificate of Compliance.

3.2.2 Priming Operation (Cold applications)

The primer shall be applied on the pipe surface in uniform thin film (single coat) leaving no drips or runs. The entire surface of the pipe should be primed without any patch left out. Any un-primed places shall be re-primed immediately. Any flooded areas or primer applied on improperly cleaned pipe shall be scrapped off and re-primed. The primer shall be cold applied to a clean dry surface, immediately after cleaning operation.

- The surface shall be dry at the time of applying primer coat. Primer shall not be applied during rain or fog or on wet surface.
- Primer which becomes contaminated/mixed with foreign substances or thickened through evaporation of solvent shall not be permitted.
- Freshly primed pipe shall be placed on clean square cut skids and shall not be allowed to come in contact with the ground or with any other foreign matter. It shall remain on skids until lifted or cradled for the coating and wrapping operation.
- All primed pipes which have excessive coat of dust or primer accumulated over them before the primer is dry or where primer has become dead shall be re-primed. Drying time shall be minimum 24 hours. The application of coal tar coating shall be taken up after the primer coat has dried up completely and normally within 24 hours after priming with maximum limit of 5 days. Otherwise a fresh coat of primer shall be applied. BHEL site engineer / Customer Representative shall approve the primer coat before the next coat is applied.
- The primer shall be applied as received from the manufacturer or may be thinned as recommended by the manufacturer.

3.3 Coating and Wrapping

3.3.1 Material - Coal Tar Impregnated Glass Fibre Tape

The outer wrap shall be non-woven, thick, reinforced glass fibre mat uniformly impregnated with coal tar enamel and shall conform to AWWA C-203, Section 2.10.3 with following characteristics :

- Softening point of coal tar component : 65^{o} C - 120^{o} C
- Needle penetration of coal tar component : 1-20 mm (at 25^{o} C /100 g / 5 s)
- Filler content : 20 – 35 % (w/w)
- Breaking load in longitudinal direction (min.)
  - 2.0mm : 3.0 N/mm
  - 3.0mm : 4.0 N/mm
  - 4.0mm : 5.0 N/mm
- Service temperature of tape (max.) : 50^{o} C
- Solubility of coal tar based tape in petrol : Average weight loss max. 5% in 24h

The finished reinforced glass fibre tape outer wrap shall have a smooth, uniform surface free of visible defects. The tape shall have sufficient flexibility at 35^{o} C so as to unwind from roll without disbanding the coal tar component from tape, *i.e.* the outer wrap shall not crack or stick to such

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an extent as to cause breaking or tearing. The wrapping tape shall be supplied in tightly wound tied rolls with a 3" diameter core in widths and lengths as specified at the time of purchase. The rolls shall be packed to exclude dust and dirt during shipping and handling and shall have cardboard separators and end shields adequate to prevent roll damage when stacked. The sides of the rolls shall be clean, smooth and squared cut and shall have no telescoping. The tapes shall be of min. 2mm thickness and min. 500mm width. Dimensional tolerance over the nominal width shall be ±5mm and tolerance on thickness shall be ±10%.

The tapes shall be tested for routine tests *viz.* Adhesion test, Holiday test, Direct Impact test and petrol solubility test as per relevant AWWA standard in lab condition before dispatch to site. These routine tests may be witnessed by BHEL or nominated TPIA. In addition to the routine tests, the tape shall also be subjected to type tests *viz.* Cathodic disbanding test and Microbiological test as per AWWA standard, in a ISO/IEC17025 certified (or NABL accredited) laboratory, at least once in a year. Only BHEL/Customer approved brand of Coal Tar Impregnated Glass Fibre Tape to be used. Each lot of supply must accompany manufacturer's Test Certificate, valid type test reports and Certificate of Conformance.

3.3.2 Application of First Layer of Coal Tar Enamel Coating & Glass Fibre Wrapping

The application of coal tar tape wrapping shall be taken up after the primer coat has dried up completely and normally after 24 hours after priming with maximum limit of 5 days. The surface should be free of dust, oil or grease. If tape is being applied in cold weather, the surface of the pipe shall be preheated to upto 35 ^{o} C. The tape is to be slightly warmed on the side containing more coating compound with either a blow lamp or a gas flame to soften the coating compound. However, care must be taken to ensure that the compound does not melt. The coal tar impregnated glass fibre tape shall be applied in a tight uniform spiral and shall be spirally wound round the pipe with a 12.5mm - 15mm of overlap on each spiral.

3.3.3 Application of Second (Final) Layer of Coal Tar Enamel Coating & Glass Fibre Wrapping

Immediately after application of the 1st layer of coal tar tape, outer wrap of coal tar impregnated glass fibre shall be applied in a tight uniform spiral and shall be spirally wound round the pipe with a a 12.5mm - 15mm of overlap on each spiral. The thickness of double coating & wrapping in dividing outer wrap shall be minimum 4.0 mm. The coating and wrapping must be free of pin holes, bubbles or holidays. BHEL / Customer Representative shall cut samples from the coating from time to time to determine the thickness and bond of coating.

The adhesion test and holiday test shall be carried out as per 3.4, only after minimum 72 hours of curing time. Application of coating & wrapping of first pipe must be done under the guidance of manufacturer's expert. Involvement of manufacturer's expert during subsequent wrapping & coating application shall be decided by BHEL engineer-in-charge as the site condition and the condition of the contract.

3.3.4 Primer & Wrapping Application for Field Joints of Pipes after Laying at Site.

– Primer shall be applied with brushes after cleaning the pipe thoroughly (Joints portion etc.) as per 3.1.

– When the primer has dried 1st layer of coal tar tape wrap shall be spirally wound round the pipe. Final layer of coal tar tape shall be applied so that total thickness of coating and wrapping shall be maintained minimum 4.0 mm. The overlaps for the coal tar tape shall be minimum 100 mm over the original coating and wrapping including tapering portions, if any.

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GUIDELINE FOR WRAPPING & COATING OF UNDERGROUND STEEL PIPING

– No wrinkling in the wrapper shall be allowed and all the overlaps shall be cemented down with hot coal tar enamel to secure a firm wrapping. This coating must be absolutely free of pinholes, bubbles and holidays.

– Adhesion test & holiday test shall be carried out as per 3.4.

3.4 Inspection

3.4.1 The work shall be done under supervision of experienced supervisor and surveillance of BHEL engineer. The entire procedure of applying the protective coating material as herein specified will be rigidly inspected as per approved FQP from the time the bare pipe is received until the coated pipe is laid in the trench and back-filled and / or installation of coated pipe is complete.

3.4.2 If at any time it is found that the procedure of applying the protective coating and wrapping material is not in accordance with these guidelines, all such coating work may be rejected. The coating and wrapping work will be inspected in stages namely after cleaning of the pipes, application of primer coat, application of coal tar enamels, fibre glass inner wrap and outer wrap, coal tar impregnated glass fibre.

3.4.3 Prior to approval of the contractor's material, samples of materials submitted by the contractor for various tests (refer 3.3.1) as per the relevant standards and if any sample is found not to conform to these specifications, material represented by such samples will be rejected. In addition to above, the contractor shall submit manufacturer's certificates in original and copy of type test report (refer 3.3.1), for each batch of materials used on the job..

3.4.4 The Field Adhesion Test Procedure:

– Quantum of check shall be initially one test per piece of pipe (10m to 12m length). Later on, the frequency of test may be increased by BHEL Site Engineer, with the consent of the customer, depending upon the results of the past test results.

– The temperature of the tape and the pipe to be tested shall be between 10°C and 27”C. If the temperature is outside this range, hot or cold water as required shall be poured over the test area until temperature in the desired range is attained. In addition the adhesion test shall be carried out only after 72 h of curing. The tape shall pass the adhesion test.

– A suitable test area shall be selected where the tape is smooth for 15 cm in longitudinal direction of the tape.

– Two knife cuts, each of 15 cm length and which are 5 cm apart, shall be made in the tape.

– A flat blade shall be used to pry up 5 cm long flap. This flap of fabric shall be grasped firmly in one hand and shall be pulled with a quick motion in the direction of the remaining 10 cm of the 15 cm knife cut.

– The adhesion shall be deemed satisfactory if the tape tears at the point of stripping or the fabric strips from the underlying coal tar component, leaving exposed the primed or the bare metal of not more than 10 % of the total area of the flap adhering, that is, 50 cm^2.

3.4.5 The Field Holiday Test Procedure:

– All coated and wrapped pipes shall be tested with an approved high voltage holiday detector preferably equipped with an audio-visual signalling device to indicate any faults, holes, breaks or conductive particles in the protective coating. Quantum of check shall be initially one test per piece of pipe (10m to 12m length). Later on, the frequency of test may be increased by BHEL Site Engineer, with the consent of the customer, depending upon the results of the past test results.

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GUIDELINE FOR WRAPPING & COATING OF UNDERGROUND STEEL PIPING

– The applied output voltage of the holiday detector shall have a spark discharge of thickness equal to at least twice the thickness of the coating to assure adequate inspection voltage and compensate for any variation in coating thickness. The electrode shall be passed over the coated surface at approximately half the spark discharge distance from the coated surface only one time at the rate of approximately 10 to 20 m/min. The edge effects shall be ignored. Excessive voltage shall be avoided as it tends to induce holidays in the coated surface thereby giving erroneous readings.

– While selecting test voltages, consideration shall be given to the tolerance on coating thickness and the voltage should be selected cm the basis of maximum coating thickness likely to be encountered during testing of a particular pipe. However, ***coal tar tape manufacturer shall be consulted for choosing the test voltage.***

Thickness of Coating (mm)	Max.Test Voltage, (kV)
2	10
3	12
4	15

– The electrical equipment used to test tape wrapping shall be a portable, low amperage, adjustable voltage, pulse type holiday detector. It shall be furnished with a coil spring electrode or a suitable brush type electrode. The primary input wattage shall not be higher than 20 W and the minimum pulse at crest voltage shall be 20 per second.

3.5 White Washing

3.5.1 If the pipeline is exposed to direct sunlight at an ambient temperature of more than 40 ^{o} C for more than 5 days, the surface of the coated pipes may be given a whitewash (as per 3.5.2) to reduce the blackness of the coted surface. This will reduce excessive heating of the coating arising out of absorption of solar radiation; particularly where sun is very strong and the coated pipe remains over ground for long.

3.5.2 To prepare white wash the sequence of operation shall be:

- Mix salt and water, then slowly and simultaneously add linseed oil and quick lime.

Ingredient	Quantity
Water	189 litre
Boiled linseed oil	3.86 litre
Quick lime	68 kg
Salt	4.5 kg

- The ingredients shall be thoroughly mixed and the mixture then allowed to stand for 72 h before use.

3.6 Repairs

3.6.1 All pinholes, voids, holidays, air bubbles, cracks and other breaks, shall be carefully marked. Repairs may be made immediately following the coating and wrapping operation or may be

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deferred but in any case shall be repaired and re-inspected prior to installation. All coating repairs shall be made with the wrap smoothly applied and without wrinkles or buckles. Repair shall be at-least equal in effectiveness to the coating applied to the principal part of the line. All repairs must successfully pass a test by the electronic holiday detector.

3.6.2 The thickness of coating and wrapping shall be checked after repair.

3.7 Handling and Supporting coated pipes

3.7.1 The piping Contractor shall develop the method of stock piling and loading out coated pipes and shall receive approval from BHEL/customer prior to handling of coated pipes.

3.7.2 The coated pipes shall be carefully handled so as not to damage them in any way. No wire ropes or chains shall be used to lift the coated pipe. Canvas or rubber belts of minimum 300mm width and sufficient strength shall be used. The use of tongs, bare pinch bars, chain slings, protruding rivets, pipe hooks without proper padding or any other handling equipment that may injure the coating is not permitted.

3.7.3 One pipe should not be placed above another during transit in wagon or truck. The pipes shall be carried on suitable paddle skids mounted on the wagon or truck to ensure that the coating will not be damaged in any way.

3.7.4 Pipes shall be stored in the field under covered protection during rains. Pipe shall be kept on clean padded wooden skids protected with fibre glass mat, felt or straw (as allowed as per HSE plan) until ready to be lowered in the trench.

3.7.5 The handling and transporting the pipe shall conform to standards as set out in AWWA C-203 section 4.1.

4. Abbreviations

AWWA : American Water Works Association

TPIA : Third Party Inspection Agency

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PSER

RECORD OF QUALITY CHECKS

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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-ST-48
PROJECT					REV. NO. : 0
UNIT NO.					LOG SHEET NO. : **L- 00**
RATING					PAGE **1** OF **1**

PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

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			NAME	SIGNATURE & DATE	FQP NO.:QPE-MTE-660-ST-48
PROJECT		INSPECTED BY			REV. NO. : 0
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

	SUPPLIER'S NAME AND ADDRESS:	REFERENCE FIELD QUALITY PLAN					TO BE FILLED IN BY NTPC		
CORP. QUALITY	**BHEL** BHEL House Siri Fort New Delhi-110 049	SYSTEM / EQUIPMENT: **Drive Turbine for BFP** SUB SYSTEM: **Drive Turbine for BFP**	QP NO.: QPE-ST-004 REV. 0 DATE : 01.10.2005 PAGE : 1 of 6		SIGNATURE OF SUPPLIER (Koushik Maitra)	**RFQP NO: 4000-999-QVM-T-021** REV: 0 DATE: 12/06/2006 **VALID UPTO: 12/06/2009**	REVIEWED BY RCS RAJU K RAJASEKHAR OP NIRANJAN	APPROVED BY ANIL GUPTA	
SL. NO.	**ACTIVITY AND OPERATION**	**CHARACTERISTICS / INSTRUMENTS**	**CLASS# OF CHECK**	**TYPE OF CHECK**	**QUANTUM OF CHECK**	**REFERENCE DOCUMENT**	**ACCEPTANCE NORMS**	**FORMAT OF RECORDS**	**D***	**REMARKS**
1.	2.	3	4	5	6	7	8	9		10
	MATERIAL RECEIPT									
1.0		Check the availability of the following:	B	Visual	100%		Availability of documents			
1.1		Shipping List								
1.2		Packing Slip (PS) / Loading Advice Slip (LAS) / RR / LR								
1.3		M D C C								
2.0		Verify the components / items received for the following:	C	Visual	100%	Packing Slip / Lorry Advice Slip	Packing Slip / Lorry Advice Slip			
2.1		Work order No. & loading advice								
2.2		Product group main assembly								
2.3		DU No. / DESS No. / Part No.								
3.0		Check the components / items on receipt for the following:	B	Visual	100%	Packing Slip / Lorry Advice Slip	Packing Slip / Lorry Advice Slip			
3.1		Packing condition								
3.2		Physical damage								
3.3		Shortage / Excess of components								
4.0		Ensure non-conforming & rejected components are identified and reported for rectification / replacement.	B	Visual	100%	Shipping list	Shipping list	MDR		

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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' & 'C' SHALL BE WITNESSED BY NTPC ERECTION / CONSTRUCTION DEPTT.

CORP. QUALITY	SUPPLIER'S NAME AND ADDRESS:	REFERENCE FIELD QUALITY PLAN				TO BE FILLED IN BY NTPC			
	BHEL BHEL House Siri Fort New Delhi-110 049	SYSTEM / EQUIPMENT: **Drive Turbine for BFP** SUB SYSTEM: **Drive Turbine for BFP**	QP NO.: QPE-ST-004 REV. 0 DATE : 01.10.2005 PAGE : 2 of 6		SIGNATURE OF SUPPLIER (Koushik Maitra)	**RFQP NO: 0000-999-QVM-T-021** REV: 0 DATE: 13/06/2006 **VALID UPTO: 12/06/2009**	REVIEWED BY RCS RAJU K RAJASEKHAR OP NIRANJAN	APPROVED BY ANIL GUPTA	

SL. NO.	ACTIVITY AND OPERATION	CHARACTERISTICS / INSTRUMENTS	CLASS# OF CHECK	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	D*	REMARKS
1.	2.	3	4	5	6	7	8	9		10
5.0		Ensure control of receipt & issue of all components.	C	Visual	100%	Shipping list	Shipping list	Stock register		
	MATERIAL STORAGE									
6.0		Ensure storage of materials as per requirements.	B	Visual	100%	STG Storage Instructions	STG Storage Instructions			
7.0		Ensure 'Shelf life' of materials is displayed, wherever found necessary.	C	Visual	100%	STG Storage Instructions	STG Storage Instructions			
8.0		Ensure cannibalisation records are maintained unit wise.	B	Visual	100%	DP:SOX	DP:SOX	Report		
9.0		Ensure preservation of materials as per storage instructions	B	Visual	100%	STG Storage Instructions	STG Storage Instructions			
10.0		Periodic inspection of stored items for their condition and preservation	B	Visual	100%	STG Storage Instructions	STG Storage Instructions			
11.0		Ensure customer supplied materials are identified and stored separately.	C	Visual	100%	DP:SOX	DP:SOX			
	ERECTION									
		FOUNDATION:								
12.0		Marking of longitudinal and transverse axes of turbine.- Plumb bob	B	Measure	100%	Drawing	Drawing	Logbook		
13.0		Positioning and levelling of packer plates on grout.-Tape/ spirit level	B	Measure	100%	Drawing	Drawing	Logbook		

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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' & 'C' SHALL BE WITNESSED BY NTPC ERECTION / CONSTRUCTION DEPTT.

SUPPLIER'S NAME AND ADDRESS:	REFERENCE FIELD QUALITY PLAN			TO BE FILLED IN BY NTPC		
CORP. QUALITY **BHEL** BHEL House Siri Fort New Delhi-110 049	SYSTEM / EQUIPMENT: **Drive Turbine for BFP** SUB SYSTEM: **Drive Turbine for BFP**	QP NO.: QPE-ST-004 REV. 0 DATE: 01.10.2005 PAGE: 3 of 6	SIGNATURE OF SUPPLIER (Koushik Maitra)	**RFQP NO: 0000-999-QVM-T-021** REV: 0 DATE: 15/06/2006 **VALID UPTO: 12/06/2009**	REVIEWED BY RCS RAJU K RAJASEKHAR OP NIRANJAN	APPROVED BY ANIL GUPTA

SL. NO.	ACTIVITY AND OPERATION	CHARACTERISTICS / INSTRUMENTS	CLASS# OF CHECK	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	D*	REMARKS
1.	2.	3	4	5	6	7	8	9		10
14.0		Levelling of sole plates on packing plates.	B	Measure	100%	Drawing	Drawing	Logbook		
15.0		Check correctness of turbine foundation.	B	Visual	100%	Drawing	Drawing	Logbook		
16.0		Wrapping of foundation bolts with bitumen felt & filling the spaces around with scaling mortar.	C	Visual	100%	Drawing	Drawing	Logbook		
		ASSEMBLY OF TURBINE:								
17.0		Ensure that reference dimensions of turbine assembly are as per shop protocol - Measuring Tape, Micrometer	B	Measure	100%	Shop protocols	Shop protocols	Log sheet QA/IDT/095	✓	
18.0		Check Journal levels.-Spirit level (front journal level to be up w.r.t. rear journal level by 0.02mm)	B	Measure	100%	Drawing	Drawing	Protocol	✓	
19.0		Check centering of turbine casing w.r.t. rotor.-Dial Gauge	B	Measure	100%	Drawing	Drawing	Log sheet QA/IDT/100	✓	

FOR TENDER PURPOSE ONLY

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 FOA, 'B' & 'C' SHALL BE WITNESSED BY NTPC ERECTION / CONSTRUCTION DEPTT.

CORP QUALITY	SUPPLIER'S NAME AND ADDRESS:	REFERENCE FIELD QUALITY PLAN					TO BE FILLED IN BY NTPC			
	BHEL BHEL House Siri Fort New Delhi-110 049	SYSTEM / EQUIPMENT: **Drive Turbine for BFP** SUB SYSTEM: **Drive Turbine for BFP**	QP NO.: QPE-ST-004 REV. 0 DATE : 01.10.2005 PAGE : 4 of 6			SIGNATURE OF SUPPLIER (Koushik Maitra)	**RFQP NO: 0000-999-QVM-T-021** REV: 0 DATE: 13/06/2006 **VALID UPTO: 12/06/2009**	REVIEWED BY RCS RAJU K RAJASEKHAR OP NIRANJAN		APPROVED BY ANIL GUPTA
SL. NO.	**ACTIVITY AND OPERATION**	**CHARACTERISTICS / INSTRUMENTS**	**CLASS# OF CHECK**	**TYPE OF CHECK**	**QUANTUM OF CHECK**	**REFERENCE DOCUMENT**	**ACCEPTANCE NORMS**	**FORMAT OF RECORDS**		**REMARKS**
1.	2.	3	4	5	6	7	8	9	D*	10
20.0		Check alignment of turbine rotor with BFP & gearbox and distance between coupling faces.- Dial Gauges & Micrometer	A	Measure	100%	Drawing	Drawing	Log sheet QA/IDT/100	✓	
21.0		Check Rotor float.- Dial gauge, Feeler Gauge, Slip gauge	A	Measure	100%	Drawing	Drawing	Protocol	✓	
22.0		Secondary grouting of foundation bolts.	B	Visual	100%	Drawing	Drawing	Protocol	✓	
23.0		Tightening and stretching of foundation bolts by Angle or dial gauge method.-Dial Gauge	B	Measure	100%	Drawing	Drawing	Protocol	✓	
24.0		Floating of turbine foundation on spring	B	Visual	100%	Drawing	Drawing	Protocol	✓	
25.0		Free run-out at turbine journals and vibration probe areas.-dial gauge	B	Measure	100%	Drawing	Drawing	Protocol	✓	
26.0		Bolt tightening of inlet and outlet flange connections of turbine	C	Visual	100%	Drawing	Drawing	Protocol	✓	
27.0		Check Parallelism of steam piping & turbine flanges.-Dial Gauges	B	Measure	100%	Drawing	Drawing	Protocol	✓	

FOR TENDER PURPOSE ONLY

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LEGEND TO BE USED: CLASS #: A= CRITICAL, B=MAJOR, C=MINOR; 'A' SHALL BE WITNESSED BY NTPC FQA, 'B' & 'C' SHALL BE WITNESSED BY NTPC ERECTION / CONSTRUCTION DEPTT.

CORP. QUALITY	SUPPLIER'S NAME AND ADDRESS:	REFERENCE FIELD QUALITY PLAN					TO BE FILLED IN BY NTPC		
	BHEL BHEL House Siri Fort New Delhi-110 049	SYSTEM / EQUIPMENT: **Drive Turbine for BFP** SUB SYSTEM: **Drive Turbine for BFP**	QP NO.: QPE-ST-004 REV. 0 DATE : 01.10.2005 PAGE : 5 of 6		SIGNATURE OF SUPPLIER (Koushik Maitra)	**RFQP NO: 0000-999-QVM-T-021** REV: 0 DATE: 13/06/2006 **VALID UPTO: 12/06/2009**	REVIEWED BY RCS RAJU K RAJASEKHAR OP NIRANJAN	APPROVED BY ANIL GUPTA	

SL. NO.	ACTIVITY AND OPERATION	CHARACTERISTICS / INSTRUMENTS	CLASS# OF CHECK	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	D*	REMARKS
1.	2.	3	4	5	6	7	8	9		10
28.0		Recheck centering of turbine casing w.r.t. rotor after final connection of steam piping.	A	Measure	100%	Drawing	Drawing	Protocol	✓	
29.0		Turbine insulation thickness.- Poking rod	B	Measure	100%	Drawing	Drawing	Protocol	✓	
30.0		Gap between bedplate under exhaust hood & exhaust hood .- Feeler gauge	B	Visual	100%	Drawing	0.03mm feeler should not go	Protocol	✓	
31.0		**Check the following clearances.- feeler gauge**	B	Measure	100%	Drawing/ Shop Protocols	Drawing/ Shop protocols	Log sheet QAI/IDT/102 & 103	✓	
31.1		Rotor oil gland collar to casing front.								
31.2		Front journal bearing								
31.3		Rear journal bearing								
31.4		Thrust bearing								
31.5		Front journal bearing to bracket								
31.6		Rear journal bearing to bracket / bearing cover (0.03 mm max.)								
31.7		Front oil gland radial clearance								
31.8		Front oil gland axial clearance								
31.9		Rear oil gland radial clearance								
31.10		Rear oil gland axial clearance								

FOR TENDER PURPOSE ONLY

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LEGEND TO BE USED: CLASS #: A= CRITICAL, B=MAJOR, C=MINOR; 'A' SHALL BE WITNESSED BY NTPC FQA, 'B' & 'C' SHALL BE WITNESSED BY NTPC ERECTION / CONSTRUCTION DEPTT.

CORP QUALITY	SUPPLIER'S NAME AND ADDRESS:	REFERENCE FIELD QUALITY PLAN					TO BE FILLED IN BY NTPC			
	BHEL BHEL House Siri Fort New Delhi-110 049	SYSTEM / EQUIPMENT: **Drive Turbine for BFP** SUB SYSTEM: **Drive Turbine for BFP**	QP NO.: QPE-ST-004 REV. 0 DATE : 01.10.2005 PAGE : 6 of 6			SIGNATURE OF SUPPLIER (Koushik Maitra)	**RFQP NO: 0000-999-QVM-T-021** REV: 0 DATE: 12/06/2006 **VALID UPTO: 12/06/2009**	REVIEWED BY RCS RAJU K RAJASEKHAR OF NIRANJAN		APPROVED BY ANIL GUPTA
SL. NO.	**ACTIVITY AND OPERATION**	**CHARACTERISTICS / INSTRUMENTS**	**CLASS# OF CHECK**	**TYPE OF CHECK**	**QUANTUM OF CHECK**	**REFERENCE DOCUMENT**	**ACCEPTANCE NORMS**	**FORMAT OF RECORDS**		**REMARKS**
1.	2.	3	4	5	6	7	8	9	D*	10
31.11		Pedestal holding down bolt spring load								
31.12		Front pedestal holding down bolt clearance								
31.13		Outer casing & exhaust hood holding down bolts expansion clearances								
31.14		Over speed trip lever radial clearance								
31.15		Over speed trip level axial clearance								

NOTE: Use logsheetssupplied from BHEL Hyderabad as appropriate (protocols formats enclosed).

FOR TENDER PURPOSE ONLY

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' & 'C' SHALL BE WITNESSED BY NTPC ERECTION / CONSTRUCTION DEPTT.

Power Sector – Quality

RECORD OF QUALITY CHECKS

FOR TENDER PURPOSE ONLY

SHEET NO. OF QPI	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	CHECKED BY SIGN. & DATE	ACCEPTED BY SIGN. & DATE	REMARKS

Note : Any protocol made is to be numbered & mentioned in "Format of Record" column.

		SYSTEM	SUB-SYSTEM	AREA	DOC. NO. QPE-ST-004
PROJECT					REV. NO. R 00
UNIT NO.					LOG SHEET NO. L-00
RATING					SHEET / SHEETS

FIELD QUALITY PLAN
FOR
BOILER FEED PUMPS

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-LAC-QA-300027-PSE, REV. NO. : 0

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-ST-45
REV. No.: 0

FIELD QUALITY PLAN
FOR
BOILER FEED PUMPS

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-LAC-QA-300027-PSE, REV. NO. : 0

PREPARED BY	ENGR./ QLY, BHEL-PSER	APPROVED BY	HEAD / QLY, BHEL-PSER

FQP NO.	**QPE-MTE-660-ST-45**
ORIGINAL DATE OF ISSUE	01/03/2019
REVISION NO. & DATE	0, Dt. 01/03/2019
COPY NO.	01
ISSUED TO	BIFPCL / FICHTNER
DATE OF ISSUE	01/03/2019
PURPOSE :	FOR REVIEW & COMMENTS / APPROVAL
ISSUED BY (SIGNATURE & DESIGNATION)	ENGR. / QLY, BHEL- PSER

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

PSER	FIELD QUALITY PLAN FOR BOILER FEED PUMPS	FQP NO: MAITREE-00-LAC-QA-300027-PSE BHEL Doc. No. : QPE-MTE-660-ST-45
		REV. NO. : 0
		SHEET 1 / 1 SHEET

CONTENTS

S. No.	Description	No. of Sheets
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3.0	Authorization for checks and nonconformity disposition	01
4.0	Statement of Checks	09
5.0	Annex-I (Installation Instructions)	12
6.0	Log Sheets	21

PSER	FIELD QUALITY PLAN FOR BOILER FEED PUMPS	FQP NO: MAITREE-00-LAC-QA-300027-PSE BHEL Doc. No. : QPE-MTE-660-ST-45
		REV. NO. : 0
		SHEET 1 / 1 SHEET

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 01/03/2019	The document is prepared as per FTS of BIFPCL. Checks in this FQP are similar to NTPC FQP No. 4410-001-110-QVM-G-604/ Rev-0 for erection of BFP NTPC-approved FQP no. 4410-001-110-QVE-Q-543 / R-0 for HT motor.

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	FQA of BIFPCL / OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	Head FQA of BIFPCL / OE
'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/ OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	Head Erection of BIFPCL / OE
'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

PSER	FIELD QUALITY PLAN FOR BOILER FEED PUMPS	FQP NO: MAITREE-00-LAC-QA-300027-PSE BHEL Doc. No. : QPE-MTE-660-ST-45
		REV. NO. : 0
		SHEET 01 / 09 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	FEED WATER SYSTEM
Sub-system :	BOILER FEED PUMPS
Area :	RECEIPT, STORAGE & 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. For FQP of Boiler Feed Water system, refer to doc. number MAITREE-00-L-QA-300071-PSE
4. Latest revision of Standards & Specification shall apply.
5. Materials shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
6. 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
7. Only approved welding 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 Consumables.
9. NDT shall be carried out by Qualified Personnel with compliance to Approved NDT procedures and unless noted otherwise in the FQP, the Acceptance Norms shall be as per ASME Sec- V.
10. The Agency carrying out RT shall be approved by Local Authorities.
11. Field Radiography shall be carried out in compliance with Local Statutory requirements and safety precautions by Approved Agency.
12. Radiography Source handling and control procedure shall be established as per Local Statutory requirements and complied.
13. Preheating and Post Weld Heat treatment shall be in compliance with Approved Procedures.
14. Gauges and measuring Instruments, with valid calibration only shall be used
15. Cleaning, preservation and Painting of products shall be carried out as per Approved Painting Schedule.
16. Format of record identified with “tick” (√) mark in column no. ‘D*’ shall be essentially included in QA documentation.

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **BOILER FEED PUMP** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-LAC-QA-300027-PSE BHEL Doc. No. : QPE-MTE-660-ST-45 REV. NO. : 0 SHEET 02 OF 09
SYSTEM: FEED WATER SYSTEM	SUB-SYSTEM: BOILER FEED PUMP	AREA: RECEIPT, STORAGE & 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**	*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 MMR damaging incident	Owner's Technical Specifications & Drawing	The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	SR & Calibration Report	√	- 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 / erection 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**									
B.01	Check availability of Bill of materials (BOM) / packing slip, dispatch documents.	V	-	C	100%	-	-			
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 / MDCC / Packing slip	Logbook			
B.03	Check components/ boxes carefully for physical condition - a) In case of external damage to boxes, remove the top cover so that contents can be seen thoroughly. If the contents are sealed / intact, cover the contents / packing with original plastic sheeting / additional tarpaulin cover. b) 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.04	V	-	C	100%	Dispatch documents/ MDCC / Packing slip	Logbook			
B.04	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	Work instructions for site Operations	MDR			
B.05	Control of receipt and issue of all components	V	-	C	100%	Work instructions for site Operations	Register			

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **BOILER FEED PUMP** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-LAC-QA-300027-PSE BHEL Doc. No. : QPE-MTE-660-ST-45 REV. NO. : 0 SHEET 03 OF 09
SYSTEM: FEED WATER SYSTEM	SUB-SYSTEM: BOILER FEED PUMP	AREA: RECEIPT, STORAGE & 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**	*10*
C	**STORAGE & PRESERVATION**									
C.01	Storage & Preservation of components at site	V & P	As required	C	as per Section-IV of reference doc.	MAITREE-00-M-DC-300067-PSE		SR		Storage of Drive motor shall be done as per Sl. No. EA
D	**PUMP ERECTION**									
D.01	Check for Material identification/ damage before erection.	V		C	100%	MDCC / Packing List	No damage	Site Register		
D.02	Check elevation of foundation & check that depth and verticality of each pocket.	M	Optical surveying & levelling instrument, Water level	B	100%	Drawing & OEM's Installation Instructions	elevation within +5mm/-10mm	L-01 / L-02		**Note :** Loose concrete on the top surface of the foundation to be removed by chipping.
D.03	Check distance from fixed reference axis e.g. A-row, B-row columns.	M	Optical surveying & levelling instrument, Water level	B	100%	Drawing & OEM's Installation Instructions	1mm/meter, ± 5mm max	L-01 / L-02		
D.04	Marking of equivalent axes on foundation.	M	Plumb Bob	C	100%	Drawing & OEM's Installation Instructions	Drawing & OEM's Installation Instructions	Site Protocol		
D.05	Placing, levelling & grouting of packers	V & M	Levelling instrument & Water level	C	100%	Grout Manufacture's Instructions	Drawing & OEM's Installation Instructions	-		
D.06	Grouting of Foundation bolts, check that nut has full contact with foundation frame after tightening.	V	-	C	100%	Grout Manufacture's Instructions	Drawing & OEM's Installation Instructions	SR		
D.07	Ensure that machined surfaces and surfaces exposed to grouting in foundation frame are free from paint, rust, scale.	V	-	C	100%	Drawing & OEM's Installation Instructions	Drawing & OEM's Installation Instructions	Site Protocol		
D.08	Blue matching of packers to have a minimum of 80% of contact area between each other and with bottom of foundation frame (if required)	V	-	C	100%	Drawing & OEM's Installation Instructions	Drawing & OEM's Installation Instructions	SR		
D.09	Fitting of half couplings to all equipment after ensuring corresponding fits. For taper coupling, ensure around 80% contact between shaft & coupling.	M	Micrometer	B	100%	Drawing & OEM's Installation Instructions	Drawing & OEM's Installation Instructions	Site Protocol		
D.10	Blue matching the top surface of foundation frame with corresponding bottom surfaces of equipment with around 80% contact, as applicable	V	-	B	100%	Drawing & OEM's Installation Instructions	Drawing & OEM's Installation Instructions	Site Protocol		

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **BOILER FEED PUMP** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-LAC-QA-300027-PSE BHEL Doc. No. : QPE-MTE-660-ST-45 REV. NO. : 0 SHEET 04 OF 09
SYSTEM: FEED WATER SYSTEM	SUB-SYSTEM: BOILER FEED PUMP	AREA: RECEIPT, STORAGE & 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**	*10*
D.11	Positioning and alignment of all equipment on the foundation. Measure distance between coupling half faces of: • Booster Pump and motor • Motor and Hydraulic Coupling • Hydraulic Coupling and BFP	M	Vernier, Micrometer & Measuring Tape	B	100%	Drawing & OEM's Installation Instructions	Drawing & OEM's Installation Instructions	L-03		**Applicable for MD-BFP only**
D.12	No load test on motor has to be necessarily carried out to establish/ensure rotor magnetic center and magnetic center shall be correctly marked on the rotor.	T	As required	B	100%	Motor OGA drawing	Drawing & OEM's Installation Instructions	SR		- **Applicable for MD-BFP only** - Checks for motor shall be done as per sl. No. E
D.13	Positioning and alignment of all equipment on the foundation. Measure distance between coupling half faces of: • Booster Pump and Gearbox • Gearbox and Drive turbine • Drive turbine and BFP	M	Vernier, Micrometer & Measuring Tape	B	100%	Drawing & OEM's Installation Instructions	Drawing & OEM's Installation Instructions	L-04		**Applicable for TD-BFP only**
D.14	Grouting of Foundation Bolts. Check that nut has full contact with foundation frame after tightening.	V		C	100%	Grout Manufacture's Instructions	Drawing & OEM's Installation Instructions	Site Protocol		
D.15	Levelling of equipment.	M	Spirit level	B	100%	Drawing	within 0.1 mm / M	Site Protocol		
D.16	Drilling and tapping of all holding down bolt holes and tightening of holding down bolts (if required)	V	-	C	100%	Grout Manufacture's Instructions	Drawing & OEM's Installation Instructions	Site Protocol		
D.17	Foundation frame grouting.	V	-	B	100%	Grout Manufacture's Instructions	Drawing & OEM's Installation Instructions	Site Protocol		
D.18	Alignment (lateral and angular) between Booster pump & Motor, Motor & Hydraulic coupling, Hydraulic coupling & BFP. Measure distances between coupling flanges.	M	Dial Gauge & Micrometer	A	100%	Drawing & OEM's Alignment diagram	Drawing & OEM's Alignment diagram	L-05		**Applicable for MD-BFP only**
D.19	Alignment (lateral and angular) between booster pump & gearbox, gearbox & Drive turbine shaft, Drive turbine shaft & BFP, Measure distances between coupling flanges.	M	Dial Gauge & Micrometer	A	100%	Drawing & OEM's Alignment diagram	Drawing & OEM's Alignment diagram	L-05		**Applicable for TD-BFP only**
D.20	Ensure that the entire pipeline is supported by permanent supports before making the last four joints of: • Booster pump suction • Booster pump discharge • BFP Suction • BFP Discharge (NOTE: Ensure that the pipe hangers, supports and restraints are erected strictly as per the PEM isometric drawing. Ensure that the piping doesn't exercise any pull on pump nozzles. This is extremely important in the case of BFP suction & discharge, which are welded joints)	V	-	A	100%	Drawing & Piping OEM's Installation Instructions	Drawing & Piping OEM's Installation Instructions	SR		Refer to FQP for ping

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **BOILER FEED PUMP** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-LAC-QA-300027-PSE BHEL Doc. No. : QPE-MTE-660-ST-45 REV. NO. : 0 SHEET 05 OF 09
SYSTEM: FEED WATER SYSTEM	SUB-SYSTEM: BOILER FEED PUMP	AREA: RECEIPT, STORAGE & 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**	*10*
D.21	Distances and alignment readings between coupling half faces of BFP & Hydraulic coupling, Hydraulic coupling & motor, Motor & Booster pump after completing pipe connections.	M	Vernier, Dial Gauge, Micrometer	A	100%	Drawing & OEM's Alignment diagram	Drawing & OEM's Alignment diagram	L-04		**Applicable for MD-BFP only**
D.22	Distances and alignment readings between coupling half faces of Booster Pump & Gear box, Gear box & Drive turbine shaft, Drive turbine shaft & BFP after completing pipe connections.	M	Vernier, Dial Gauge, Micrometer	A	100%	Drawing & OEM's Alignment diagram	Drawing & OEM's Alignment diagram	L-04		**Applicable for TD-BFP only**
D.23	Welding of key block on base frame after ensuring specified clearance between guide slips & key (At the bottom of pump casing).	V	-	B	100%	Drawing & WPS	Drawing & WPS	SR		- Qualified WPS to be used - Welders to be qualified at site
D.24	Welding & NDT of Joints as per FWS. Ensure post- weld-heat-treatment as required.	V	-	B	As per Drg / FWS	Drawing / FWS & WPS	Drawing / FWS & WPS	SR		
D.25	Cleaning of bearings of Booster Pump, BFP & Motor.	V	-	C	100%	Drawing & OEM's Installation Instructions	Drawing & OEM's Installation Instructions	SR		
D.26	Installation of all instruments and correctness of wiring connections.	V	-	B	100%	P&I Drawing & Wiring diagram	Drawing & OEM's Installation Instructions	SR		
D.27	Cleaning of Carbon Steel oil pipe lines NOTE: Ensure proper isolation of the pumps from the loop before flushing and cleaning of pipe lines by proper blanking of the pump nozzles, to prevent accidental entry of foreign material into the pumps.	V	-	B	100%	Approved Procedure : MAITREE-00-LAV-DC-300109-PSE & MAITREE-00-LAV-DC-300115-PSE		SR		
D.28	Oil flushing of oil piping.	V	-	B	100%	Approved Procedure : MAITREE-00-LAV-DC-300109-PSE & MAITREE-00-LAV-DC-300115-PSE		Site Protocol		
D.29	Ensure thermal clearances of holding down bolts of BFP & BP, as applicable	V	-	B	100%	Drawing & OEM's Alignment diagram	Drawing & OEM's Alignment diagram	SR		
D.30	Ensure cleanliness/flushing of mechanical seal water lines, cooling water lines and inspection of magnetic filters of mechanical seals for damage of filter mesh.	V	-	B	100%	Drawing & OEM's Installation Instructions	Drawing & OEM's Installation Instructions	SR		
D.31	Bumping and Trial Run of BFP Motor. Check and ensure correctness of magnetic center marked on rotor, during trial run. Mark actual magnetic if there is an error in marking in shop.	V		A	100%	Drawing & OEM's Installation Instructions	Drawing & OEM's Installation Instructions	Site Protocol		Checks for drive motor shall be done as per Sl. No. E

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*
D.32	Flood BFP and Booster Pump once again check alignment and DBCF of BFP train and then couple the Pumps.	M	Dial Gauge	A	100%	Drawing & OEM's Alignment diagram	Drawing & OEM's Alignment diagram	L-05		
D.33	Ensure availability of conical suction strainer element in the circuit during flushing of BFP suction line (NOTE: During commissioning, differential pressure across suction strainer is to be strictly monitored to take care of all the foreign material that may be flushing out from the pipe lines.	V		B	100%	Drawing & OEM's Alignment diagram	Drawing & OEM's Alignment diagram	SR		
E	**CHECKS FOR DRIVE MOTOR**									
EA	STORAGE & PRESERVATION (UPTO COMMISSIONING)									
EA.01	Ensure that the motors with anti friction bearings are not stored in close proximity of the vibrating machinery or on a vibrating floor	V	-	C	100%	Drawing & Instruction Manual	Instruction Manual	-		
EA.02	Boxes should be stored in original packing on raised platform to avoid ingress of water, moisture, dust & mud and away from chemicals gases, acid and batteries.	V	-	B	100%	Instruction Manual	Instruction Manual	Logbook		
EA.03	For motors stored outdoor, following should be ensured - a) Wooden boxes are covered with tarpaulin OR b) Temporary sheds of required size are provided	V	-	B	100%	Instruction Manual	Instruction Manual	Logbook		
EA.04	Ensure that space heaters are switched 'ON' whenever motor is idle and subjected to moisture and condensate	V		B	100%	Instruction Manual	Instruction Manual	Logbook		NOTE: This check is not applicable for motors packed in original packing
EA.05	Ensure that motor shaft is rotated by a quarter of revolution every month. NOTE: - Protective axial locking cover on shaft extension should be used while rotating shaft. - This check is not applicable for motors packed in original packing	V		B	100%	Instruction Manual	Instruction Manual	Logbook		NOTE: This check is not applicable for motors packed in original packing
EA.06	In case of long storage of motors, IR value should be checked periodically. NOTE: This check is not applicable for motors packed in original packing	M	2.5kV / 1kV IR Tester	B	Once in 3 months	Instruction Manual	IEEE 43	Logbook		If IR value is less than specified, the motor to be dried before erection
EA.07	Ensure that loose components wrapped in foils are stored in such a way that foil is not damaged.	V	-	B	100%	Instruction Manual	Instruction Manual	Logbook		
EA.08	Ensure display of shelf life of materials as applicable.	V	-	B	100%	Instruction Manual	Instruction Manual	Logbook		

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **BOILER FEED PUMP** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-LAC-QA-300027-PSE BHEL Doc. No. : QPE-MTE-660-ST-45 REV. NO. : 0 SHEET 07 OF 09
SYSTEM: FEED WATER SYSTEM	SUB-SYSTEM: BOILER FEED PUMP	AREA: RECEIPT, STORAGE & 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**	*10*
EA.09	Ensure periodic preservation of components	V	-	B	100%	Instruction Manual	Instruction Manual	Logbook		
EA.10	Other materials should not be stacked over the boxes	V	-	C	100%	Instruction Manual	Instruction Manual	-		
EA.11	Check that boxes are placed in such a way that their identification number is visible	V	-	C	100%	Instruction Manual	Instruction Manual	-		
EA.12	Check for paint condition & arrange for touch-up, if required. NOTE: This check is not applicable for motors packed in original packing	V	-	B	Once in 3 months	Instruction Manual & Approved painting schedule	Approved painting schedule	Logbook		
EB	PRE-ERECTION CHECKS									
EB.01	Check availability of relevant drawings, OEM Instruction Manual and O & M manual.	V	-	B	100%	Instruction Manual	Instruction Manual	Logbook		
EB.02	Ensure that all parts and assemblies of motor are available as per drawing / shipping list.	V	-	B	100%	Instruction Manual	Instruction Manual	-do-		
EB.03	Check IR value of motor winding at erection site but before placement on foundation.	M	2.5kV / 1kV IR Tester	A	100%	Instruction Manual & IEEE 43	IEEE 43	L-09	√	If value is less than acceptable standard, then arrange for dry-out as per OEM's Instruction Manual
EC	MOTOR ERECTION									
EC.01	Check foundation location with reference to drawing	M	Measuring Tape	B	100%	Drawing	Drawing	Logbook		
EC.02	Ensure that packing/ locking used for transportation is removed.	V	-	C	100%	Drawing	Drawing	Logbook		
EC.03	Ensure that packing/ locking used for sleeve bearings during transportation is removed and sleeve bearings are clean.	V	-	C	100%	Instruction Manual / Drawing	Instruction Manual / Drawing	Logbook		
EC.04	Ensure minimum 80% contact area in between the following surfaces: a. Packer to Packer. b. Motor Sole plate (base plate) with packer / pump flange	V	-	B	100%	-do-	-do	Logbook		Note: i) Total thickness of shims between motor feet and bedplate should not exceed 3 mm and number of shims should not be used more than 4 Nos. ii) The size of all shims & packers should be with in 1 CM more than size of motor feet in length & width.

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **BOILER FEED PUMP** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-LAC-QA-300027-PSE BHEL Doc. No. : QPE-MTE-660-ST-45 REV. NO. : 0 SHEET 08 OF 09
SYSTEM: FEED WATER SYSTEM	SUB-SYSTEM: BOILER FEED PUMP	AREA: RECEIPT, STORAGE & 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**	*10*
EC.05	Grouting as per drawing. Note: Non shrinking free flow high strength grout mix to be used. Check tightness of all bolted joints and cover plates on stator frame	V	-	B	100%	Drawing & Grout Manufacturer's Instructions	Grout Manufacturer's Instructions	Logbook		
EC.06	Axial clearances in case of sleeve bearings on DE side	M	Feller Gauge	A	100%	Instruction Manual & Drawing	Instruction Manual & Drawing	L-11	√	
EC.07	Check levelling of the motor stool.	M	Precision Level	A	100%	-do-	level within 0.05 mm/meter.	Logbook		
EC.08	Ensure contact area between motor bottom flange and top flange of motor stool is 80% minimum.	V	-	B	100%	-do-	80% contact	Logbook		
EC.09	Ensure that insulated bolts and washers are used for fixing of non-driving end housing with end shields in case of insulated bearing.	V	-	B	100%	-do-	Instruction Manual & Drawing	Logbook		
EC.10	Termination of power cables, space heater cables, RTD Cables and control cables. Check for clearance, tightness, cable size, lug size, crimping tightness etc. Check for use of proper gland size and proper mounting of it.	V	-	B	100%	-do-	-do-	Logbook		
EC.11	Ensure that stator body and base frame and terminal box are connected to earth. Check for double earthing provision with suitable earth strips and ensure tightness of it.	V	-	B	100%	-do-	-do-	Logbook		
EC.12	Ensure that DE pedestal is connected to earth with base plate in case both pedestals are insulated.	V	-	B	100%	-do-	-do-	Logbook		
EC.13	Freeness of motor rotor by manual rotation. (with anti friction bearing only)	V	-	B	100%	-do-	-do-	Logbook		
EC.14	IR value and PI value of motor winding. NOTE : if IR value is more than 5 Giga-ohm in 1 minute then PI value need not be checked.	M	2.5kV / 1kV IR Tester	A	100%	Instruction Manual	IEEE 43	L-09	√	If value is less than acceptable standard, then arrange for dry-out as per OEM's Instruction Manual and follow EC.16
EC.15	IR value (after 60 Seconds) for the following: A. Space Heater & cable B. RTD and Cable C. NDE side bearing insulation	M	500V/250V IR Tester	A	100%	Instruction Manual	Instruction Manual	L-09	√	

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **BOILER FEED PUMP** STATEMENT OF CHECKS	FQP NO.: MAITREE-00-LAC-QA-300027-PSE BHEL Doc. No. : QPE-MTE-660-ST-45 REV. NO. : 0 SHEET 09 OF 09
SYSTEM: FEED WATER SYSTEM	SUB-SYSTEM: BOILER FEED PUMP	AREA: RECEIPT, STORAGE & 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**	*10*
EC.16	Dry out motor in case IR/ PI values are less than required & retest, as applicable	P	-	A	100%	Instruction Manual	IEEE 43	L-10	√	
EC.17	Check resistance of motor winding and compare with shop value	M	Micro Ohm Meter.	A	100%	Instruction Manual	Value should be comparable	L-09	√	
EC.18	Ensure mounting of local instruments.	V	-	B	100%	Drawing	Drawing	Logbook		
EC.19	Tightening and locking of anchor bolts to required torque value	P	Torque wrench	A	100%	Drawing	Drawing	Logbook		
F	**INSULATION & PAINTING (UN-INSULATED PARTS)**									
F.01	Completion of Insulation & cladding, as applicable	V	-	B	100%	Drawing & Insulation Schedule	Drawing & Insulation Schedule	Logbook	√	
F.02	Touch-up of paint in damaged portions of equipment, if required (Batch TC from manufacturer to be reviewed & invoice to be co-related for each lot of supply, by FQA)	V & R	-	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & MAITREE-00-BFA-FF-100001-GEN		SR		- Primer / paints to be procured from BIFPCL/OE approved source (MTC to be reviewed & invoice to be co-related)
F.03	Final Painting inspection : Check Colour shade, marking & labelling of pipes & equipment	V	-	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & MAITREE-00-BFA-FF-100001-GEN		JOINT PROTOCOL	√	
G	**ERECTION COMPLETION CHECKS**									
G.01	Erection Completion Check for each equipment / system, Handing over for commissioning & Handing over of erection inspection records, Logsheets & protocols as per the Contract.	V & R	-	A	100%	Drawings	Drawings	JOINT PROTOCOL	√	Review of all Inspection records, Log Sheets, protocols for completeness and disposition status of NCRs (if any)

RECORD OF QUALITY CHECKS

SHEET NO. OF QPI	CHECK NO.	RESULTS ACHIEVED OK/ NOT OK	REFERENCE DRAWING/ DOCUMENT	FORMAT OF RECORD	CHECKED BY SIGN. & DATE	ACCEPTED 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-ST-45
PROJECT					REV NO.: 00
UNIT NO.					LOG SHEET NO.: **L-00**
RATING					SHEET:

PSER		
	INSTRUMENT REG.	
	□ATE OF INSPECTION	
	□RA□ ING □□OCUMENT REF.	

□□□□□□□□L

			NAME	SIGNATURE & □ATE	FQP NO.: QPE-MTE-660-ST-45
PROJECT		INSPECTE			REV NO. : 0
UNIT NO.		CLEARE□			PROTOCOL NO.
RATING		CUSTOME			PAGE:

FIELD QUALITY PLAN
FOR
CONDENSER

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-MAG-QA-300024-PSE, REV. NO. : 1

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-ST-42
REV No.: 1

FOR TENDER PURPOSE ONLY

FIELD QUALITY PLAN
FOR
CONDENSER

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-MAG-QA-300024-PSE, REV. NO. : 1

PREPARED BY	DE/QLY, BHEL-PSER	APPROVED BY	HEAD / QLY, BHEL-PSER
FQP NO.		**QPE-MTE-660-ST-42**	
ORIGINAL DATE OF ISSUE		25/01/2018	
REVISION NO. & DATE		1, Dt. 22/02/2018	
COPY NO.		01	
ISSUED TO		BIFPCL / FICHTNER	
DATE OF ISSUE		22/02/2018	
PURPOSE :		FOR REVIEW & COMMENTS / APPROVAL	
ISSUED BY (SIGNATURE & DESIGNATION)		Digitally signed by Arup Ratan Paul DN: cn=Arup Ratan Paul, o=BHEL, ou=PSER/QLY, email=arpaul@bhel.in, c=IN Location: BHEL, PS:ER, Kolkata Date: 2018.02.22 12:57:21 +05'30' DE/QLY, BHEL, PSER	

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

PSER	FIELD QUALITY PLAN FOR CONDENSER	FQP NO: MAITREE-00-MAG-QA-300024-PSE BHEL Doc. No. : QPE-MTE-660-ST-42
		Rev. No. : 1
		SHEET 1 / 1 SHEETS

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5.0	Annex-I	01
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FOR TENDER PURPOSE ONLY

PSER	FIELD QUALITY PLAN FOR CONDENSER	FQP NO: MAITREE-00-MAG-QA-300024-PSE BHEL Doc. No. : QPE-MTE-660-ST-42
		Rev. No. : 1
		SHEET 1 / 1 SHEETS

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 25.01.18	Document prepared as per the owners technical specifications
02	All	1, Dtd.: 22.02.18	Document revised & aligned with NTPC approved FQP of Condenser for NTPC-Gadarwara Stage-I (2x800MW) as per the comments dated 21/02/2018 from BIFPCL/OE

FOR TENDER PURPOSE ONLY

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

FOR TENDER PURPOSE ONLY

PSER	FIELD QUALITY PLAN FOR CONDENSER	FQP NO: MAITREE-00-MAG-QA-300024-PSE BHEL Doc. No. : QPE-MTE-660-ST-42
		Rev. No. : 1
		SHEET 01 / 08 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	STEAM TURBINE & AUXILIARIES
Sub-system :	CONDENSER
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. 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
4. Latest revision of Standards & Specification shall apply.
5. Materials shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
6. Welding shall be carried out by Qualified Welders, with traceable WPQR, in line with approved WPS and Qualified PQR, as per ASME Section IX
7. Only approved welding 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 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. The Agency carrying out RT shall be approved by Local Authorities.
11. Field Radiography shall be carried out in compliance with Local Statutory requirements and safety precautions by Approved Agency.
12. Radiography Source handling and control procedure shall be established as per Local Statutory requirements and complied.
13. Preheating and Post Weld Heat treatment shall be in compliance with Approved Procedures.
14. Gauges and measuring Instruments, with valid calibration only shall be used

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **CONDENSER** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MAG-QA-300024-PSE** BHEL Doc. No. : QPE-MTE-660-ST-42 REV.NO.: 1 SHEET 02 / 08 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: CONDENSER	AREA: ERECTION

FOR TENDER PURPOSE ONLY

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 & erection welding schedule.	R	-	A	100% for each component before start of activity	List of Latest Revision of Approved Drawings and Owner's Technical Specifications	SR	
A.03	Ensure availability of permanent benchmark.	V & P	As required	A	Before start of erection	Owner's Technical Specifications	Joint Protocol	
B	**MATERIAL RECEIPT**							
B.01	Check availability of Bill of materials (BOM) / packing slip, dispatch documents.	V	-	C	100%	-	-	
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	Logbook	
B.03	Check components/ boxes carefully for physical condition - a) In case of external damage to boxes, remove the top cover so that contents can be seen thoroughly. If the contents are sealed / intact, cover the contents / packing with original plastic sheeting / additional tarpaulin cover. b) 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.04	V	-	C	100%	Dispatch documents/ Packing slip	Logbook	
B.04	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	Work instructions for site Operations	MDR	
B.05	Control of receipt and issue of all components	V	-	C	100%	Work instructions for site Operations	Register	

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **CONDENSER** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MAG-QA-300024-PSE** BHEL Doc. No. : QPE-MTE-660-ST-42 REV.NO.: 1 SHEET 03 / 08 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: CONDENSER	AREA: ERECTION

FOR TENDER PURPOSE ONLY

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	**STORAGE & PRESERVATION**							
C.01	Storage & Preservation of components at site	V & P	As required	C	as per Section-IV of reference doc.	MAITREE-00-M-DC-300067-PSE	SR	
D	**WELDING & NON DESTRUCTIVE EXAMINATIONS**							
D.01	Ensure availability of correct WPS, Welding & Heat Treatment Schedule from BHEL-Haridwar at site	R	-	A	100%	Drawing / EWS	-	WPS endorsed by 3rd party inspector shall be reviewed at site
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 & ASME BPVC Sec.-IX	WQR	
D.04	Adoption of correct procedure, approved electrodes and methods.	V	-	B	100%	Drawing / EWS & WPS	SR	
D.05	Drying / baking of electrodes (where ever applicable)	V & R	-	B	Random in each shift	Recommendations of electrode manufacturer	SR	
D.06	Pre heating of weld joints, as applicable.	V/M	Thermo-chalk or Non-contact type Thermometer	A	As per EWS / WPS	Drawing / EWS & WPS	SR	
D.07	Ensure proper sequence of welding.	V	-	C	100%	Construction drawings	SR	
D.08	Visual Inspection of All weldments	V & M	As required	B	100%	Drawing & ASME BPVC Sec-V	SR	
D.09	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	
D.10	Non Destructive Testing of welds	T	As required	A	As per EWS	Drawing / EWS & ASME BPVC Sec-V	NDT Report	
D.11	Repair of weld & retesting	T	As required	A	As per Annex-I	Annex-I & ASME BPVC Sec-V	NDT Report	

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **CONDENSER** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MAG-QA-300024-PSE** BHEL Doc. No. : QPE-MTE-660-ST-42 REV.NO.: 1 SHEET 04 / 08 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: CONDENSER	AREA: ERECTION

FOR TENDER PURPOSE ONLY

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.12	Preservation of welded area	V	As required	B	100%	Owner's Tech Specifications, Drawing & Approved Painting Schedule	SR	
E	**DISPOSITION OF FOUNDATION & SUPPORTS**							
E.01	Location of foundation of Condenser with reference to Turbine Longitudinal axis.	M	Tape	A	100%	Drawing	Protocol	
E.02	Top elevation of foundation	M	Water Level & Scale	A	100%	Drawing	Protocol	
E.03	Spacing between foundation pedestal and its diagonals	M	Tape	A	100%	Drawing	Protocol	
E.04	Check location and elevation of embedded plates on foundation	M	Tape ,water level	B	100%	Drawing	Protocol	
E.03	Check centerline of fixed & guide point w.r.t bottom plate centerline	M	Tape	B	100%	Drawing	Protocol	
E.06	Location and orientation of guide point and fixed Point	M	Tape	B	100%	Drawing	L01	
E.07	Location and orientation of bearing supports w.r.t. fixed Point.	M	Tape	B	100%	Drawing		
E.08	Top level of support (Bearing supports, guide point and fixed Point).	M	Water Level & Scale	B	100%	Drawing	L01	
E.09	Horizontality & flatness of bearings on foundation.	M	Water Level & Scale	B	100%	Drawing & Approved Erection Procedure	Log book	
F	**ERECTION CHECKS**							
F.01	Level & alignment of bottom plates relative to turbine axis / centre lines.	M	Plumb, Measuring Tape, Water Tube gauge and Steel scale, Spirit Level	B	--	Drawing & Approved Erection Procedure	L-01	
F.02	Position of Hot well w.r.t. Transverse and longitudinal axes of turbine as well as front & Rear water box ends of condenser and bottom plate openings	M	Plumb, Tape and water level.	B	100%	Drawing & Approved Erection Procedure	Protocol	

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **CONDENSER** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MAG-QA-300024-PSE** BHEL Doc. No. : QPE-MTE-660-ST-42 REV.NO.: 1 SHEET 05 / 08 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: CONDENSER	AREA: ERECTION

FOR TENDER PURPOSE ONLY

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.03	Level and alignment of bottom plate relative to turbine axes.	M	Plumb, Tape and water level.	B	100%	Drawing & Approved Erection Procedure	Protocol	
F.06	Check the sag of tube plates / waviness of flanges in Water box / water chamber.	M	Steel Scale, Water tube gauge, Feeler gauge & outside micrometer	B	100%	Drawing & Approved Erection Procedure	L-02 & L-03	
F.07	Verticality of centerlines of water chamber assembly.	M	Plumb, Water Tube gauge and Tape	B	100%	Drawing & Approved Erection Procedure	Protocol	
F.08	Check the sag of tube plates / waviness of flanges in Water box / water chamber.	M	Steel Scale, Water tube gauge, Feeler gauge & outside micrometer	B	100%	Drawing & Approved Erection Procedure	L-02 & L-03	
F.09	Verticality of centerlines of water chamber assembly.	M	Plumb, Water Tube gauge and Tape	B	100%	Drawing & Approved Erection Procedure	Protocol	
F.10	Both left & right halves of chamber assembly is in level. (Horizontal centerline is in level)	M	Plumb, Water Tube gauge and Tape	B	100%	Drawing & Approved Erection Procedure	Protocol	
F.11	Check 0.5 degree inclination of chamber flanges w.r.t. Bottom plate.	M	Plumb, Water Tube gauge and Tape	B	100%	Drawing & Approved Erection Procedure	Protocol	
F.12	Length in between Tube Plate at locations, covering full area of tube plates before welding with bottom plate.	M	Tape	B	100%	Drawing & Approved Erection Procedure	L-04	
F.13	Distance between sidewalls and height & verticality of Sidewalls.	M	Tape, Plumb	B	100%	Drawing & Approved Erection Procedure	Protocol	
F.14	Check 0.5 degree inclination in between flats and all tube support plates.	M	Plumb/Tape/	B	100%	Drawing & Approved Erection Procedure	L-05	
F.15	Verticality of hinge door assembly. Tolerance in verticality to be within 1 mm/M or Drawing,	M	Plumb	B	100%	Drawing & Approved Erection Procedure	Protocol	
F.16	Dimensions and diagonals of condenser shell.	M	Tape and Plumb	B	100%	Drawing & Approved Erection Procedure	Protocol	
F.17	Position of Support Plates	M	Tape	B	100%	Drawing & Approved Erection Procedure	Protocol	

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **CONDENSER** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MAG-QA-300024-PSE** BHEL Doc. No. : QPE-MTE-660-ST-42 REV.NO.: 1 SHEET 06 / 08 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: CONDENSER	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	Hole alignment of tube plates and tube support plates.	M	Vernier, tape, Piano Wire	A	100%	Drawing & Approved Erection Procedure	L-06	
F.19	Alignment of L.P Cylinder opening with Condenser.	M	Tape, Plumb	B	100%	Drawing & Approved Erection Procedure	Protocol	
F.20	Dimensions of the dome walls from turbine longitudinal and transverse axes	M	Tape	A	As per Ref. Doc.	Drawing & Approved Erection Procedure	L-07	
F.21	Nozzle orientations as per drawing.	V		B	As per Ref. Doc.	Drawing & Approved Erection Procedure		
F.22	CHECKS FOR L.P HEATERS							
F.22A	Check position, level and alignment of heater	M	Tape, Water tube gauge.	B	100%	Drawing & Approved Erection Procedure	Protocol	
F.22B	Fit up, welding of pipe lines, and NDT	As per checks in Sl. No. D						
F.22C	Anchoring of fixed supports & availability of free expansion of moving supports.	M	Tape	B	100%	Drawing & Approved Erection Procedure	Protocol	
F.23	Welding & NDT of Dome Wall & Stiffening Pipes.	As per checks in Sl. No. D						
F.24	Welding & NDT of Dump Tube	As per checks in Sl. No. D						
F.25	Gap between exhaust-hood of L.P Cylinder and condenser neck.	M	Tape	B	-Do-	Drawing	Protocol	
F.26	Ensure proper sequence of neck welding (as per BHEL-HXE/HEEP guideline)	As per checks in Sl. No. D						
F.27	RT & DP Testing of welding between neck and L.P Cylinder exhaust.	As per checks in Sl. No. D						

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **CONDENSER** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MAG-QA-300024-PSE** BHEL Doc. No. : QPE-MTE-660-ST-42 REV.NO.: 1 SHEET 07 / 08 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: CONDENSER	AREA: ERECTION

FOR TENDER PURPOSE ONLY

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.28	Cleaning of tube holes from dust, grease and moisture. Visually inspect tube holes for de-burring before insertion	V		B	100%		Log book	
F.29	EXPANSION OF TUBES:							
F.29A	Setting of expander for required tube thinning as per the procedure given at Clause 7.0 and Annexure-I & II of Product Std. HE 07001 REV 01. Note: Check setting of expander before starting expansion job, On change of expansion tool (Torque control unit) & On observing shift in parameter revealed by routine checks.	M	Bore dial, Pressure Gauge, Spherical / Pointed Tip micrometer, 3 Pin Micrometer	A	As per Ref. Doc.	HE 07001 REV 01 & Drawing	Log book	
F.29B	Mock up test on separate tube plate for tube expansion, including air leak test on mock up set under following conditions: * Before starting Tube expansion	M & V	Bore dial, Pressure Gauge	A	* See Note against F.29A	Product Std. HE 07001 REV 01	Log book	
F.29C	Check adequacy & condition of tube expanding equipment	V	-	B	100%	Product Std. HE 07001 REV 01		
F.29D	Sequence of tube expansion	V	-	B	Each shift	Product Std. HE 07001 REV 01		
F.29E	Record thinning of first 10 tubes daily and 5% of total number of joints on daily basis. Note: Tube end after expansion shall be cut regularly.	M & V	Bore dial, Spherical / Pointed Tip micrometer, 3 Pin Micrometer	B	first 10 tubes daily and 5% of total number of joints on daily basis	Product Std. HE 07001 REV 01 & MAITREE-00-MAG-DC-300075-PSE	Log book	
G	**ERECTION COMPLETION**							
G.01	Check for erection completion & Review of all Log Sheets, protocols and disposition status of NCRs (if any)	V & R		A	As per Ref. Doc.	MAITREE-00-MAG-DC-300075-PSE	L-08	
H	**WATER FILL TEST OF SHELL SIDE**							
H.01	Water fill test of shell side of condenser for 24 hours.	V		A	As per Ref. Doc.	MAITREE-00-MAG-DC-300112-PSE	L-09	

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **CONDENSER** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MAG-QA-300024-PSE** BHEL Doc. No. : QPE-MTE-660-ST-42 REV.NO.: 1 SHEET 08 / 08 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: CONDENSER	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*
I	**HYDRAULIC TEST OF WATER BOX**							
I.01	Hydraulic test on cooling water side using blanking flange on inlet/outlet of C.W flange joint or as per conditions	M	Pressure gauge	A	As per Ref. Doc.	MAITREE-00-MAG-DC-300112-PSE	L-09	
J	**PAINTING**							
J.01	Visual inspection of surface to be painted	V	-	C	100%	No rust, oil & other foreign materials	SR	Temporary weldings are to be gouged off & ground smooth.
J.02	Review of MTC of Paints (MTC to be reviewed & invoice to be co-related)	R	-	A	Each batch of paint	Drawing, Approved painting schedule & ISO 12944	JOINT PROTOCOL	Paints to be procured from BHEL approved source
J.04	Touch-up of primer / paint in damaged portions (if required)	V	-	B	100%	Drawing & Approved painting schedule	SR	
J.05	Checking of final painting dry film thickness & acceptance	M & V	Digital DFT Gauge	B	100%	Drawing & Approved painting schedule	JOINT PROTOCOL	

FOR TENDER PURPOSE ONLY

ANNEXURE - I

METHODOLOGY FOR SAMPLING FOR TESTING OF REPAIRED WELD JOINTS IN ADDITION TO THE REQUIREMENTS OF THE TECHNICAL SPECIFICATION

Wherever the quantum of check in any NDT is other than 100%, following guidelines for sampling / re-sampling procedure for NDT have been formulated by BHEL & BIFPCL jointly including following features:

1) The group of welds for sampling shall be based on welding done by a welder in specified continuous time (say work done in a shift or in a day). For further analysis, acceptance or rejection, this group shall be treated as an entity.

2) From above weld group, the selection of weld joint / weld spot shall be done by BIFPCL as per the quantum of check specified.

3) For acceptance of the weld group, all samples selected in this group should meet the acceptance norms. In case of any sample (s) found beyond acceptance norms, following actions shall be taken:

3.1) Rectification of defective welds and re-testing of the repair.

3.2) Re-sampling by BIFPCL from the same group of welds, with quantum of NDT being double of originally specified quantum (with minimum 2 welds for every defective weld).

In case of RT on T-joints, if defect found on L-seam done at manufacturing works of pipe produced as per IS-3589, pipe defects shall be rectified and no resampling is envisaged.

4) In case of any weld from the re-sample as per 3.2 above found beyond acceptable norms, following action shall be taken:

4.1) NDT of all the welds of the group which were not tested in first and second samples.

4.2) Repair and re-testing of all defective welds.

4.3) Necessary action on process control and on welder for eliminating recurrence of defectives.

5) For the purpose of sampling, the weld group shall be defined as number of welds in case of smaller diameter of tubes / pipes (or small welds on structures) while for very large diameter pipes e.g. CW piping or for vessels / long welds, the length of weld may be taken as basic unit. Sampling shall also be accordingly in terms of No. of weld joints or length of weld.

6) From the time of readiness of weld group, suitable time limits shall be prescribed for first sampling testing, re-sampling, repairing, re-testing etc. (normally not more than 1 day's backlog should be piled up at every step).

Illustration: Radiography of welds: Welding completed on day 1 should be tested by day-2 and repair and re-sampling of the group should be done by day – 3 and further testing / repair should be by day – 4.

7. Sampling and re-sampling procedure shall be applicable for all the NDT viz RT, UT, DPT, MPI.

Note: In case of RT of tube welds with double wall double image (elliptical view) number of exposure shall be as per relevant code / plant standard and will not be less than two exposures for each weld.

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0006

RECORD OF QUALITY CHECKS

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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-ST-42
PROJECT					REV. NO. :1
UNIT NO.					LOG SHEET NO. : L-00
RATING					SHEET 1 / 1 SHEETS

	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

FOR TENDER PURPOSE ONLY

			NAME	SIGNATURE & DATE	FQP NO.: QPE-MTE-660-ST-42
PROJECT		INSPECTED BY			REV. NO. : 1
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

FIELD QUALITY PLAN
FOR
COOLING WATER PUMPS

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-PAC-QA-300078-PSE, REV. NO. : 0

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-ST-50
REV. No.: 0

FIELD QUALITY PLAN
FOR
COOLING WATER PUMPS

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-PAC-QA-300078-PSE, REV. NO. : 0

PREPARED BY	ENGR./ QLY, BHEL-PSER	APPROVED BY	HEAD / QLY, BHEL-PSER

FQP NO.	**QPE-MTE-660-ST-50**
ORIGINAL DATE OF ISSUE	29/04/2019
REVISION NO. & DATE	0, Dt. 29/04/2019
COPY NO.	01
ISSUED TO	
DATE OF ISSUE	
PURPOSE :	
ISSUED BY (SIGNATURE & DESIGNATION)	ENGR. / QLY, BHEL- PSER

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

PSER	FIELD QUALITY PLAN FOR COOLING WATER PUMPS	FQP NO: MAITREE-00-PAC-QA-300078-PSE BHEL Doc. No. : QPE-MTE-660-ST-50
		REV. NO. : 0
		SHEET 1 / 1 SHEET

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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	06

FOR TENDER PURPOSE ONLY

PSER	FIELD QUALITY PLAN FOR COOLING WATER PUMPS	FQP NO: MAITREE-00-PAC-QA-300078-PSE BHEL Doc. No. : QPE-MTE-660-ST-50
		REV. NO. : 0
		SHEET 1 / 1 SHEET

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 29/04/2019	The document is prepared as per FTS of BIFPCL and BHEL standard practice

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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	FQA of BIFPCL / OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	Head FQA of BIFPCL / OE
'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/ OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	Head Erection of BIFPCL / OE
'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 ONLY

PSER	FIELD QUALITY PLAN FOR COOLING WATER PUMPS	FQP NO: MAITREE-00-PAC-QA-300078-PSE BHEL Doc. No. : QPE-MTE-660-ST-50
		REV. NO. : 0
		SHEET 01 / 06 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	COOLING WATER SYSTEM
Sub-system :	COOLING WATER PUMPS (VERTICAL TYPE)
Area :	RECEIPT, STORAGE & 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. For FQP of Cooling Water system, refer to doc. number MAITREE-00-PA-QA-300042-PSE
4. Latest revision of Standards & Specification shall apply.
5. Materials shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
6. 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
7. Only approved welding 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 Consumables.
9. NDT shall be carried out by Qualified Personnel with compliance to Approved NDT procedures and unless noted otherwise in the FQP, the Acceptance Norms shall be as per ASME Sec- V.
10. The Agency carrying out RT shall be approved by Local Authorities.
11. Field Radiography shall be carried out in compliance with Local Statutory requirements and safety precautions by Approved Agency.
12. Radiography Source handling and control procedure shall be established as per Local Statutory requirements and complied.
13. Preheating and Post Weld Heat treatment shall be in compliance with Approved Procedures.
14. Gauges and measuring Instruments, with valid calibration only shall be used
15. Cleaning, preservation and Painting of products shall be carried out as per Approved Painting Schedule.
16. Format of record identified with “tick” (√) mark in column no. ‘D*’ shall be essentially included in QA documentation.

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **COOLING WATER PUMP** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-PAC-QA-300078-PSE** BHEL Doc. No. : QPE-MTE-660-ST-50 REV.NO.: 0 SHEET 02 of 06
SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: COOLING WATER PUMP	AREA: RECEIPT, STORAGE & 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**	*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 MMR damaging incident	Owner's Technical Specifications & Drawing	The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	SR & Calibration Report	√	- 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 / erection 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		
A.04	Check availability of OEM's Instruction Manual / Erection Manual	V	-	B	100% for each equipment before start of activity	-	Documents should be available before start of erection	-		
B	**MATERIAL RECEIPT**									
B.01	Check availability of Bill of materials (BOM) / packing slip, dispatch documents.	V	-	C	100%	-	Documents to be available during inspection	Stock Register		
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 / MDCC & Approved BBU	BOM / Dispatch documents / Packing slip / MDCC & Approved BBU	Stock Register		
B.03	Check components / boxes carefully for physical condition Note: a) In case of external damage to boxes, remove the top cover so that contents can be seen thoroughly. If the contents are sealed / intact, cover the contents / packing with original plastic sheeting / additional tarpaulin cover. b) 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.04	V	-	C	100%	Dispatch documents/ Packing slip	Dispatch documents / Packing slip	MDR		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **COOLING WATER PUMP** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-PAC-QA-300078-PSE** BHEL Doc. No. : QPE-MTE-660-ST-50 REV.NO.: 0 SHEET 03 of 06
SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: COOLING WATER PUMP	AREA: RECEIPT, STORAGE & 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**	*10*
B.04	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	BHEL Work instructions for site Operations	BHEL Work instructions for site Operations	MDR		
B.05	Control of receipt and issue of all components	V	-	C	100%	BHEL Work instructions for site Operations	BHEL Work instructions for site Operations			
C	**MATERIAL STORAGE**									
C.01	Storage & Preservation of Pump components at site	V & P	As required	C	as per Section-IV of reference doc.	MAITREE-00-M-DC-300067-PSE		SR		
C.02	Storage & Preservation of Motor at site									
C.02A	Motors should be stored in original packing on raised platform to avoid ingress of water, moisture, dust & mud and away from chemicals viz. gases, acid, etc..	V	-	B	Once on receipt & then every six months	OEM's Instruction Manual	OEM's Instruction Manual	SR		
C.02B	For motors stored outdoor, following should be ensured - a) Wooden boxes are covered with tarpaulin b) Temporary sheds of required size are provided	V	-	B	Once on receipt & then every six months	OEM's Instruction Manual	OEM's Instruction Manual	SR		
C.02C	Ensure periodic preservation of components as per OEM's recommendations	V	-	B	As per OEM's Guidelines	OEM's Instruction Manual	OEM's Instruction Manual	SR		
C.02D	Ensure that loose components are stored in such a way that they are not damaged.	V	-	C	Once on receipt & then every six months	OEM's Instruction Manual	OEM's Instruction Manual	SR		
C.02E	In case of long storage of motors, IR value should be checked periodically.	M	1kV/ 2.5kV IR Tester	B	As per OEM's Guidelines	OEM's Instruction Manual	OEM's Instruction Manual	SR		If IR value is less than specified, the motor to be dried before erection
D	**PRE-ERECTION CHECKS FOR MOTOR**									
D.01	Freeness of motor rotor by manual rotation.	V	-	B	100%	OEM's Erection Manual & Assembly Drawing		Logbook		
D.02	Check IR value and PI value of motor winding. (IR value for Motor shall not be less than 200 Mega-ohm in 1 minute and PI should be ≥ 1.5) **NOTE :** 1. if IR value is more than 5 Giga-ohm in 1 minute then PI value need not be checked. 2. If IR value is less than specified, follow check in Sl. No. D.05	M	1kV / 5kV IR Tester	A	100%	OEM's Instruction Manual		L-02	√	

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **COOLING WATER PUMP** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-PAC-QA-300078-PSE** BHEL Doc. No. : QPE-MTE-660-ST-50 REV.NO.: 0 SHEET 04 of 06
SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: COOLING WATER PUMP	AREA: RECEIPT, STORAGE & 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**	*10*
D.03	IR value (after 60 Seconds) for the following: A. Space Heater & cable B. RTD and Cable C. NDE side bearing insulation	M	500V/250V IR Tester	B	100%	OEM's Instruction Manual		Logbook		
D.04	Dry out motor in case IR/ PI values are less than required & retest	P	-	A	100%	OEM's Instruction Manual		L-03	√	
D.05	Check for CT ratio, magnetizing current, polarity (as applicable)	V		B	100%	OEM's Instruction Manual		Logbook		
E	**ERECTION CHECKS FOR PUMP**									
E.01	Check foundation dimensions including floor elevation, position of foundation bolt pockets, pit depth, vortex breaker location, clearance between pump centre and sump wall (side & back) etc. as applicable.	M	Measuring Tape, Auto-level	B*	100%	Approved Drawing		Protocol		*** Customer Hold Point**
E.02	Chipping / dressing and levelling of foundation.	V	-	C	100%	Approved Drawing		Log book		
E.03	Removal of shop paint from foundation ring/ sole plate.	V	-	B	100%	OEM's Erection Manual & Assembly Drawing		Log book		
E.04	Assembly of foundation ring / sole plate and check level of the assembly on foundation. Spirit level	V & M	Master spirit level	B	100%	OEM's Erection Manual & Assembly Drawing		Log book		
E.05	Lowering of Pump in pit - i) record the clearances between Pump C/L and sump wall (side & back wall) & spur (as applicable) ii) record the clearance between Pump Bellmouth, sump invert & vortex breaker.	P & M	Measuring Tape	B*	100%	OEM's Erection Manual & Assembly Drawing		Log book	√	*** Customer Hold Point**
E.06	Ensure proper contact between Lifting column pipe and Inter foundation ring..	V	Blue matching	B	100%	OEM's Erection Manual & Assembly Drawing	Minimum 80% contact	Log book		
E.07	Ensure proper contact between Discharge Elbow and Intermediate foundation ring..	V	Blue matching	B	100%	OEM's Erection Manual & Assembly Drawing	Minimum 80% contact	Log book		
E.08	Tightening of foundation bolts. The level of foundation ring and along with the elevation of pump discharge centreline to be checked.	V & M	Water / spirit level & Measuring tape	B	100%	OEM's Erection Manual & Assembly Drawing		Log book		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **COOLING WATER PUMP** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-PAC-QA-300078-PSE** BHEL Doc. No. : QPE-MTE-660-ST-50 REV.NO.: 0 SHEET 05 of 06
SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: COOLING WATER PUMP	AREA: RECEIPT, STORAGE & 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**	*10*
E.09	Revision of bearing. & Inspection of bearing for freeness.	V	-	C	100%	OEM's Erection Manual & Assembly Drawing		Log book		
E.10	Check total float of Pump shaft and fix Rotor position.	M	-	B*	100%	OEM's Erection Manual & Assembly Drawing		L-01	√	*** Customer Hold Point**
E.11	Ensure proper contact between motor stool and foundation ring. Levelling & centering of motor stool.	V	Blue matching	B	100%	OEM's Erection Manual & Assembly Drawing	Minimum 80% contact	Log book		
E.12	Check distance between coupling halves of Pump & Motor	M	Measuring tape, Feeler gauge	B*	100%	OEM's Erection Manual & Assembly Drawing		L-01	√	*** Customer Hold Point**
E.13	Alignment between Pump & Motor shafts	M	Dial gauge	B*	100%	OEM's Erection Manual & Assembly Drawing		L-01	√	*** Customer Hold Point**
E.14	Grouting of foundation ring / sole plates at each level. The level of foundation ring / sole plates and along with the elevation of pump discharge centreline to be checked before & after grouting. **NOTE:** 3days' & 7days' compressive strength of the grout material of same batch to be tested at site and witnessed by FQA before proceeding to grouting.	V & M	Water / spirit level, Measuring tape & Compressive strength test machine	B	100%	OEM's Erection Manual & Assembly Drawing	Grout Manufacturer's recommendation	Log book		- MTC of grout material to be reviewed by BHEL & BIFPCL / OE - Proper curing to be ensured & recorded
E.15	Termination of power cables, space heater cables, RTD Cables and control cables. Check for clearance, tightness, cable size, lug size, crimping tightness etc. Check for use of proper gland size.	V	-	B	100%	OEM's Erection Manual & Assembly Drawing		Logbook		
E.16	Ensure that stator body and base frame and terminal box are connected to earth. Check for double earthing provision with suitable earth strips and ensure tightness of it.	V	-	B	100%	OEM's Erection Manual & Assembly Drawing		Logbook		
E.17	Ensure mounting of all instrumentation on pump & motor, as applicable.	V	-	B	100%	OEM's Erection Manual & Assembly Drawing		Log book		
E.18	Filling of Bearing Sump as per OEM recommendations, Check for any leakage.	V	-	C	100%	OEM's Erection Manual & Assembly Drawing		Log book		
E.19	Ensure installation of required ladders & platforms as per drawing	V	-	C	100%	Approved drawings		Log book		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **COOLING WATER PUMP** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-PAC-QA-300078-PSE** BHEL Doc. No. : QPE-MTE-660-ST-50 REV.NO.: 0 SHEET 06 of 06
SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: COOLING WATER PUMP	AREA: RECEIPT, STORAGE & 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**	*10*
E.20	Trial Run of Motor : record all data as per OEM's instruction	V & P	-	A	100%	OEM's Erection Manual & Assembly Drawing		Joint Protocol	√	For Motor Trial run- all the parameters of motor like winding temperature, Bearing Temp. and Vibration must be through.
E.21	Check alignment between Pump & Motor shafts after successful trial run of motor and coupling. NOTE: Motor trial run to be done as per OEM's instructions & approved procedure	M	Dial gauge	A	100%	OEM's Erection Manual & Assembly Drawing		L-01	√	
E.22	Touch-up Painting (if required) & labelling - check finish, Colour shade & marking	V	-	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & MAITREE-00-BFA-FF-100001-GEN		Log book		Paint to be procured from BIFPCL approved source & shall conform to ISO 12944
E.23	Handover for commissioning **Note:** The equipment shall be visually checked for completeness of erection as per BOM, drawing & review of all records (i.e. SR, Logbook, Protocols as per FQP) for completeness & status of disposition of all NCR	V & R	-	A	100%	BOM, OEM's Erection Manual & Assembly Drawing		Joint Protocol	√	Commissioning shall be done as per approved procedure & O&M Manual

FOR TENDER PURPOSE ONLY

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-ST-50
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 NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

ALIGNMENT OF PUMP & MOTOR

RADIAL

AXIAL

DISTANCE BETWEEN COUPLING HALVES = ……

TOTAL FLOAT OF PUMP SHAFT = ……

Remarks (If any):

FOR TENDER PURPOSE ONLY

			NAME	SIG./DATE	FQP NO.:QPE-MTE-660-ST-50
PROJECT		CHECKED BY			REV. NO. : 0
UNIT NO.		ACCEPTED BY			LOG SHEET NO. L-01
RATING		CUSTOMER			SHEET: 01 OF 01

PSER	INSTRUMENT REG. NO./TAG NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

IR VALUES

Sl. No.	Description	IR Values			K Factor	PI value
		15 Sec	1 min	10 min		
1.	STATOR WINDING a) Phase to Phase					
	R - Y			xx		xx
	Y - B			xx		xx
	B - R			xx		xx
	b) Phase to Earth					
	R - Earth					
	Y - Earth					
	B - Earth					
2.	H.T. POWER CABLE a) Core to core			IR Values for 1 min.		
	Core 1 - 2					
	Core 2 - 3					
	Core 3 - 1					
	b) Core to earth					
	Core 1 to Earth					
	Core 2 to Earth					
	Core 3 to Earth					

FOR TENDER PURPOSE ONLY

PSER	INSTRUMENT REG. NO./TAG NO.				
	DATE OF INSPECTION				
	DRAWING / DOCUMENT REF.				

IR VALUES

3. IR VALUES AT 1 MINUTE (R_{60})

Sl.No.	POSITION	SPACE HEATER CABLE	CONTROL CABLE	RTD CABLE
1.	Core to core			
2.	Core to earth			

4. WINDING RESISTANCES

PHASE	RESISTANCE (in milliOhms)	Ambient temp/RTD temp (° C)
R		
Y		
B		

5. PEDESTAL INSULATION _____ MOhms

NOTES :

a) Absorption factor (K) = $\frac{\text{IR Value after 1 Minute}}{\text{IR Value after 15 seconds}}$

This value should not be less than 1.25

b) P.I. Value = $\frac{\text{IR Value after 10 Minutes}}{\text{IR Value after 1 Minute}}$

Note: PI value need not be measured with rated voltage 3.3KV & below.

FOR TENDER PURPOSE ONLY

PSER	INSTRUMENT REG. NO./TAG NO.							
	DATE OF INSPECTION							
	DRAWING / DOCUMENT REF.							

MOTOR DRY-OUT

Sl. No.	Date	Time (hrs)	Voltage (Volts)	Current (Amps)	RTDs readings (^{o}C)							IR Value with all phases combined (M ohms)			Remarks
												30 sec	1 min	K factor	

NOTE : 1. Steady state temperature of winding with micalastic insulation to be limited to 60^{o}C maximum in not less than 4 hours.
2. Winding current should be restricted to 50% of rated current

FOR TENDER PURPOSE ONLY

			NAME	SIGNATURE / DATE	FQP NO.:QPE-MTE-660-ST-50
PROJECT		INSPECTED BY			REV NO. : 0
UNIT NO.		CLEARED BY			LOG SHEET NO.: L-03
RATING		CUSTOMER			SHEET 1 / 1 SHEETS

PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

FOR TENDER PURPOSE ONLY

			NAME	SIGNATURE & DATE	FQP NO.:QPE-MTE-660-ST-50
PROJECT		INSPECTED BY			REV NO. R00
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

FIELD QUALITY PLAN
FOR
DEMINERALISED COOLING WATER 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-PG-QA-300044-PSE, REV. NO. : 0

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-ST-49
REV. No.: 0

FIELD QUALITY PLAN
FOR
DEMINERALISED COOLING WATER SYSTEM

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-PG-QA-300044-PSE, REV. NO. : 0

PREPARED BY	ENGR./ QLY, BHEL-PSER	APPROVED BY	HEAD / QLY, BHEL-PSER

FQP NO.	**QPE-MTE-660-ST-49**
ORIGINAL DATE OF ISSUE	13/03/2019
REVISION NO. & DATE	0, Dt. 13/03/2019
COPY NO.	01
ISSUED TO	BIFPCL / FICHTNER
DATE OF ISSUE	13/03/2019
PURPOSE :	FOR REVIEW & COMMENTS / APPROVAL
ISSUED BY (SIGNATURE & DESIGNATION)	ENGR. / QLY, BHEL- PSER

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

PSER	FIELD QUALITY PLAN FOR DEMINERALISED COOLING WATER SYSTEM	FQP NO: MAITREE-00-PG-QA-300044-PSE BHEL Doc. No. : QPE-MTE-660-ST-49
		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	08
5.0	Log Sheets	02

FOR TENDER PURPOSE ONLY

PSER	FIELD QUALITY PLAN FOR DEMINERALISED COOLING WATER SYSTEM	FQP NO: MAITREE-00-PG-QA-300044-PSE BHEL Doc. No. : QPE-MTE-660-ST-49
		REV. NO. : 0
		SHEET 1 / 1 SHEET

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 13/03/2019	The document is similar to NTPC SFQP No. 0000-999-QOM-I-004, Rev-00 for erection of Station Piping.

FOR TENDER PURPOSE ONLY

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	FQA of BIFPCL / OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	Head FQA of BIFPCL / OE
'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/ OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BIFPCL Erection Engineer/ OE
'C'	BHEL Engineer	BHEL Engineer	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BHEL HOS

Abbreviations used:

HOS – Head of Section

Note:

1. **Erection & commissioning (as identified in the statement of checks) of Pumps shall be done under supervision of OEM's representative**
2. 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.
3. Wherever log sheet is not called for, suitable record shall be maintained in protocol / Site register.
4. 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.
5. Owner's Engineer is authorized to carry out surveillance in any of B & C category of checks at his discretion.
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

FOR TENDER PURPOSE ONLY

PSER	FIELD QUALITY PLAN FOR DEMINERALISED COOLING WATER SYSTEM	FQP NO: MAITREE-00-PG-QA-300044-PSE BHEL Doc. No. : QPE-MTE-660-ST-49
		REV. NO. : 0
		SHEET 01 / 08 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	COOLING WATER SYSTEM
Sub-system :	DEMINERALISED COOLING WATER SYSTEM
Area :	RECEIPT, STORAGE & 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. For FQP of CW system, refer to document number MAITREE-00-PA-QA-300042-PSE
4. Latest revision of Standards & Specification shall apply.
5. Materials shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
6. 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
7. Only approved welding 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 Consumables.
9. NDT shall be carried out by Qualified Personnel with compliance to Approved NDT procedures and unless noted otherwise in the FQP, the Acceptance Norms shall be as per ASME Sec- V.
10. The Agency carrying out RT shall be approved by Local Authorities.
11. Field Radiography shall be carried out in compliance with Local Statutory requirements and safety precautions by Approved Agency.
12. Radiography Source handling and control procedure shall be established as per Local Statutory requirements and complied.
13. Preheating and Post Weld Heat treatment shall be in compliance with Approved Procedures.
14. Gauges and measuring Instruments, with valid calibration only shall be used
15. Cleaning, preservation and Painting of products shall be carried out as per Approved Painting Schedule.
16. Format of record identified with “tick” (√) mark in column no. ‘D*’ shall be essentially included in QA documentation.

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **DEMINERALISED COOLING WATER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-PG-QA-300044-PSE** BHEL Doc. No. : QPE-MTE-660-ST-49 REV. NO. : 0 SHEET 02 OF 08
SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: DEMINERALISED COOLING WATER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*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 MMR damaging incident	Owner's Technical Specifications & Drawing	The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	SR & Calibration Report	√	- 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 / erection drawings and OEM's Manual for equipment, 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**									
B.01	Check availability of Bill of materials (BOM) / packing slip, dispatch documents.	V	-	C	100%	-	-	-		
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	BOM / Dispatch documents / Packing slip	Logbook		
B.03	Check components/ boxes carefully for physical condition - a) In case of external damage to boxes, remove the top cover so that contents can be seen thoroughly. If the contents are sealed / intact, cover the contents / packing with original plastic sheeting / additional tarpaulin cover. b) 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.04	V	-	C	100%	Dispatch documents/ Packing slip	Dispatch documents/ Packing slip	Logbook		
B.04	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	BHEL Work instructions for site Operations	BHEL Work instructions for site Operations	MDR		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **DEMINERALISED COOLING WATER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-PG-QA-300044-PSE** BHEL Doc. No. : QPE-MTE-660-ST-49 REV. NO. : 0 SHEET 03 OF 08
SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: DEMINERALISED COOLING WATER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*10*
B.05	Control of receipt and issue of all components	V	-	C	100%	BHEL Work instructions for site Operations	BHEL Work instructions for site Operations	Register		
C	**STORAGE & PRESERVATION**									
C.01	Storage & Preservation of components at site	V & P	As required	C	as per Section-IV of reference doc.	MAITREE-00-H-DC-300066-PSE and MAITREE-00-M-DC-300067-PSE		Register		
D	**WELDING & NON DESTRUCTIVE EXAMINATIONS**									
D.01	Ensure availability of applicable qualified WPS	R	-	A	100%	Drawing / EWS	ASME BPVC SEC-IX	WPS	√	
D.02	Review of MTC of welding electrodes & other consumables	R	-	A	100%	Relevant AWS specifications as per applicable WPS	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	ASME BPVC SEC-IX	WQR	√	
D.04	Adoption of correct procedure, approved electrodes and methods : review of job cards	R	-	A	Random in each shift	Drawing / EWS & WPS	Drawing / EWS & WPS	SR		
D.05	Checking drying / baking of electrodes (where ever applicable)	V & R	-	B	Random in each shift	WPS	Recommendation of electrode manufacturer	SR		
D.06	Pre heating of field weld joints, as applicable.	V & M	Non-contact type Thermometer	A	As per WPS	WPS	ASME B31.1	SR		
D.07	Ensure proper sequence of welding, as applicable	V	-	C	100%	Drawings & WPS	Drawings & WPS	SR		
D.08	PWHT of field weld joints, as applicable.	V/M	Time-Temp. Recorder	A	As per WPS	WPS	ASME B31.1	SR	√	

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **DEMINERALISED COOLING WATER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-PG-QA-300044-PSE** BHEL Doc. No. : QPE-MTE-660-ST-49 REV. NO. : 0 SHEET 04 OF 08
SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: DEMINERALISED COOLING WATER SYSTEM	AREA: RECEIPT, STORAGE & ERECTION

FOR TENDER PURPOSE ONLY

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.09	Review of qualification of NDT inspectors	R	-	A	Once before engagement of each inspector	ASNT CP-106 or equivalent	Level-II or above	NDT Inspector Register		
D.10	Visual Inspection of All weldments (field weld)	V & M	As required	B	100%	Drawing & ASME BPVC SEC-V	ASME B31.1	SR		
D.11	DPT on root run of field butt welds	T	DPT Kit	B	100%	ASME BPVC SEC-V	ASME B31.1	SR		
D.12	Volumetric NDT of butt welds field joints : RT	T	RT Kit	A	Random 5%*	ASME BPVC SEC-V	ASME B31.1	RT Film & report	√	* 1. Random 5% RT on joints 2. 100% RT may be done in place of hydro-test at site
D.13	DPT nozzle welds & all finished welds	T	DPT Kit	B	Random 10%	ASME BPVC SEC-V	ASME B31.1	SR		
D.14	Preservation of field welded area, as applicable	V	As required	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen		SR		
E	**CHECKS FOR PIPE (CARBON STEEL & STAINLESS STEEL) ERECTION**									
E.01	Check diameter of pipe before erection	M	Measuring tape	C	100%	Drawing	Drawing	SR		
E.02	Edge preparation & alignment of two pipes, as applicable	M	Measuring tape	C	100%	Drawing	ASME B31.1	SR		
E.03	Welding & NDT of field joint, as applicable	As per Sl. No. 'D'								
E.04	Ensure erection of pipe supports as per drawing. so that piping load should not pass on the pump nozzles.	V & M	Measuring tape	C	100%	Drawing	Drawing	SR		
E.05	Bolting check for bolted-flange joints	V	-	B	Each joint	Approved Drawings	Tightness of fasteners	SR		
E.06	Hydro-test of pipe section	T	As required	A	100%	Drawing & Hydro-test scheme	ASME B31.1	HT report	√	100% RT of field weld may be done in place of hydro-test, as per site conditions.
E.07	Cleaning of inside of pipes	P & V	-	B	100%	should be free from sludge or muck and other debris.		Joint Protocol	√	

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **DEMINERALISED COOLING WATER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-PG-QA-300044-PSE** BHEL Doc. No. : QPE-MTE-660-ST-49 REV. NO. : 0 SHEET 05 OF 08
SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: DEMINERALISED COOLING WATER SYSTEM	AREA: RECEIPT, STORAGE & ERECTION

FOR TENDER PURPOSE ONLY

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.08	Final Painting of support structures and outside surface of pipes - DFT, finish, Colour shade, labelling & Marking	V & M	DFT Gauge	B	100%	Drawing, Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & approved colour scheme : MAITREE-00-BFA-FF-100001-GEN		Joint Protocol	√	Paint to be procured from BIFPCL approved source & shall conform to ISO 12944
F	**CHECKS FOR ROTATING EQUIPMENT (PUMP, MOTOR & FILTERS)**									
F.01	Check for foundation : disposition & dimensions	M	Measuring tape	B	100%	Approved Drawings	Approved Drawings	SR		
F.02	Erection of base frame	M	Measuring tape	C	100%	Approved Drawing & OEM's Manual	Approved Drawing & OEM's Manual	SR		
F.03	Alignment, levelling & Grouting of base frame	M	Spirit level	C	100%	Approved Drawing & OEM's Manual	Approved Drawing & OEM's Manual	SR		
F.04	Erection of Pump & motor : Alignment, levelling	M	Spirit level	C	100%	Approved Drawing & OEM's Manual	Approved Drawing & OEM's Manual	SR		*OEM's supervision
F.05	Pump Coupling with motor and alignment / eccentricity check	M	Dial indicator	B	100%	Approved Drawing & OEM's Manual	Approved Drawing & OEM's Manual	SR	√	*OEM's supervision
F.06	Electrical checks : Cable termination, IR check of motor	M	IR tester	B	100%	Approved Drawing & OEM's Manual	Approved Drawing & OEM's Manual	SR	√	
F.07	Check direction of rotation & free rotation	V	-	B	100%	Approved Drawing & OEM's Manual	Approved Drawing & OEM's Manual	SR		
F.08	Check touch-up painting (if required), labelling & marking	V	-	B	100%	Drawing, Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & approved colour scheme : MAITREE-00-BFA-FF-100001-GEN		Joint Protocol	√	Paint to be procured from BIFPCL approved source & shall conform to ISO 12944
F.09	Ensure installation of sufficient number of pipe supports	V	-	C	100%	Support arrangement drawing, Hanger schedule		Joint Protocol		* for pumps : OEM's witness
F.10	Proper Flushing of Suction & Discharge pipelines	V	-	B	100%	Approved Drawings	No dirt and foreign material	Joint Protocol		* for pumps : OEM's witness
F.11	Commissioning of pump set	V	-	A	100%	O&M Manual	O&M Manual	Joint Protocol	√	*OEM's supervision

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **DEMINERALISED COOLING WATER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-PG-QA-300044-PSE** BHEL Doc. No. : QPE-MTE-660-ST-49 REV. NO. : 0 SHEET 06 OF 08
SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: DEMINERALISED COOLING WATER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*10*
G	**HEAT EXCHANGERS, TANKS / VESSELS & STRAINERS**									
G.01	Check for correct location, orientation, elevation and level.	M	Tape, Water level	A	100%	Drawing	Drawing	Log book	√	
G.02	Internal cleanliness of equipment.	V	-	B	100%	No foreign material				
G.03	Ensure correct size & grade of fasteners are used and tightened to required torque value, as applicable	V & M	Torque wrench	B	100%	Drawing	Drawing	Log book		
G.04	Ensure correct size & grade of gaskets are used in flange joints wherever applicable.	V		B	100%	Drawing	Drawing			
G.05	Check touch-up painting (if required), labelling & marking	V	-	B	100%	Drawing, Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & approved colour scheme : MAITREE-00-BFA-FF-100001-GEN		Joint Protocol	√	Paint to be procured from BIFPCL approved source & shall conform to ISO 12944
H	**EXPANSION JOINTS (IF APPLICABLE)**									
H.01	Ensure before installation the adjoining pipes shall be cleaned and free from sharp edges/ objects.	V		C	100%	Drawing	Drawing			
H.02	Ensure that the space between the adjoining Pipe's flanges match with pre-set value of Bellow for proper fit.	M	Tape	B	100%	Drawing	Drawing	Log book		
H.03	Ensure that the Rubber Expansion Bellow is protected from falling objects, weld spatter & cutting operation.	V		B	100%	Drawing	Drawing			
H.04	Ensure correct size & grade of fasteners are used and tightened to required torque value.	V & M	Torque wrench	B	100%	Drawing	Drawing	Log book		
H.05	Ensure locking of expansion joints (equalizing rods) during hydraulic test and release after completion of hydraulic test, wherever applicable.	V		B	100%	Drawing	Drawing			
I	**CHECKS FOR VALVES & ACTUATOR**									
I.01	Ensure availability of installation manual and O & M manual (as applicable)	V	-	C	100%	-	-	Log book		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **DEMINERALISED COOLING WATER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-PG-QA-300044-PSE** BHEL Doc. No. : QPE-MTE-660-ST-49 REV. NO. : 0 SHEET 07 OF 08
SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: DEMINERALISED COOLING WATER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*10*
I.02	Identification of the valves for the location	V	-	C	100%	Valve Schedule / Drawing	Valve Schedule / Drawing	Log book		
I.03	Cleanliness of pipelines / valve before fixing / welding.	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		
I.04	Ensure that gland packings, gaskets & washers are put back in valve and also ensure bolts and studs are fitted and tightened properly.	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		
I.05	Direction of flow (arrow mark) is as per the flow direction indicated on the valve body except for safety valve.	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		
I.06	Availability of supports for valves and pipelines.	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		
I.07	Check for tightness of bolts/nuts, as applicable	V	-	C	100%	Approved Drawings	Approved Drawings	SR		
I.08	Matching of valve end and pipe before welding, as applicable	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		
I.09	Ensure valve is kept fully open and valve seat is protected before welding. – Valve body not to be used as earthing, while welding	V	-	C	100%	Installation Manual	Drawing	Log book		
I.10	Parallelism of the matching flange in case of flanged joints.	V	-	B	100%	Installation Manual	Installation Manual	Log book		
I.11	Welding of valve end to pipeline & NDT of erection weld, as applicable	As per Sl. No. 'D'								
I.12	Bolting check for bolted-flange joints	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		
I.13	Identification of the actuator for location	V	-	C	100%	Valve Actuator Data Sheet	Valve Actuator Data Sheet	Log book	√	
I.14	Ensure actuator is firmly supported and free from vibration.	V	-	B	100%	Approved Drawings	Approved Drawings	Log book		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **DEMINERALISED COOLING WATER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-PG-QA-300044-PSE** BHEL Doc. No. : QPE-MTE-660-ST-49 REV. NO. : 0 SHEET 08 OF 08
SYSTEM: COOLING WATER SYSTEM	SUB-SYSTEM: DEMINERALISED COOLING WATER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*10*
I.15	Size and correctness of power and control cables and proper sealing of unused cable entries.	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		
I.16	Check earthing connection of the motor.	M	Multimeter	C	100%	Approved Drawings	Approved Drawings	Log book		
I.17	Check Opening & closing of valves (Gate/Globe, Butterfly, Ball, plug etc.) & actuators.	V	-	C	100%	Approved Drawings	Approved Drawings	Log book		
I.18	Ensure erection of access ladders & platforms as per layout drawing	V	-	B	100%	Approved layout Drawings	Approved layout Drawings	Log book		
I.19	Check touch-up painting (as applicable), labelling & marking	V	-	B	100%	Drawing, Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & approved colour scheme : MAITREE-00-BFA-FF-100001-GEN		Joint Protocol	√	Paint to be procured from BIFPCL approved source & shall conform to ISO 12944
J	**INSTALLATION OF INSTRUMENT LIKE PRESSURE GAUGE, PRESSURE SWITCH, LEVEL GAUGE, FLOW SWITCH, LIMIT SWITCH, SOL, FIRE ALARM, ETC.**									
J.01	Installation of Instruments and verification of location, Tag No.	V	-	C	100%	Approved Drawings, P&ID	Approved Drawings, P&ID	SR		
J.02	Check for Calibration, as applicable	P & V	As required	B	100%	Drawing	Technical Specification	Joint Protocol	√	

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RECORD OF QUALITY CHECKS

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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-ST-49
PROJECT					REV. NO. : 0
UNIT NO.					LOG SHEET NO. : **L- 00**
RATING					PAGE **1** OF **1**

PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

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			NAME	SIGNATURE & DATE	FQP NO.:QPE-MTE-660-ST-49
PROJECT		INSPECTED BY			REV. NO. : 0
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

FIELD QUALITY PLAN
FOR
FGD ABSORBER 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-HT-QA-300079-PSE, REV. NO. : 0

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-BR-50
REV. No.: 0

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FIELD QUALITY PLAN
FOR
FGD ABSORBER SYSTEM

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-HT-QA-300079-PSE, REV. NO. : 0

PREPARED BY	ENGR./ QLY, BHEL-PSER	APPROVED BY	HEAD / QLY, BHEL-PSER

FQP NO.	**QPE-MTE-660-BR-50**
ORIGINAL DATE OF ISSUE	10/04/2019
REVISION NO. & DATE	0, Dt. 10/04/2019
COPY NO.	01
ISSUED TO	BIFPCL / FICHTNER
DATE OF ISSUE	10/04/2019
PURPOSE :	FOR REVIEW & COMMENTS / APPROVAL
ISSUED BY (SIGNATURE & DESIGNATION)	ENGR. / QLY, BHEL- PSER

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

PSER	FIELD QUALITY PLAN FOR FGD ABSORBER SYSTEM	FQP NO: MAITREE-00-HT-QA-300079-PSE BHEL Doc. No. : QPE-MTE-660-BR-50
		REV. NO. : 0
		SHEET 1 / 1 SHEET

CONTENTS

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3.0	Authorization for checks and nonconformity disposition	01
4.0	Statement of Checks	08
5.0	Absorber Erection Guidelines (Annex-I)	27
6.0	Storage & Erection Manual for Absorber Internals (Annex-II)	52
7.0	Vacuum box testing Procedure (Annex-III)	02
8.0	Log Sheets	02

FOR TENDER PURPOSE ONLY

PSER	FIELD QUALITY PLAN FOR FGD ABSORBER SYSTEM	FQP NO: MAITREE-00-HT-QA-300079-PSE BHEL Doc. No. : QPE-MTE-660-BR-50
		REV. NO. : 0
		SHEET 1 / 1 SHEET

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 10/04/2019	The document is prepared as per Technical Specifications and is in line with BHEL standard FQP for FGD Absorber.

FOR TENDER PURPOSE ONLY

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	FQA of BIFPCL / OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	Head FQA of BIFPCL / OE
'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/ OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BIFPCL Erection Engineer/ OE
'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 ONLY

PSER	FIELD QUALITY PLAN FOR FGD ABSORBER SYSTEM	FQP NO: MAITREE-00-HT-QA-300079-PSE BHEL Doc. No. : QPE-MTE-660-BR-50
		REV. NO. : 0
		SHEET 01 / 08 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	COOLING WATER SYSTEM
Sub-system :	FGD ABSORBER SYSTEM
Area :	RECEIPT, STORAGE & 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. For FQP of Pumps & Agitators, refer to document number MAITREE-00-HT-QA-300089-PSE
4. For FQP of Tanks, refer to document number MAITREE-00-HT-QA-300090-PSE
5. For FQP of Process Water & Slurry piping, refer to document number MAITREE-00-HT-QA-300091-PSE
6. For FQP of Electrical and C&I work for FGD System, refer to document number MAITREE-00-HT-QA-300092-PSE
7. Latest revision of Standards & Specification shall apply.
8. Materials shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
9. 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
10. Only approved welding consumables shall be used, as per Approved Welding Consumable list.
11. Procedure shall be established and followed, for Procurement, Storage, Issue and Control of Welding Consumables.
12. NDT shall be carried out by Qualified Personnel with compliance to Approved NDT procedures and unless noted otherwise in the FQP, the Acceptance Norms shall be as per ASME Sec- V.
13. The Agency carrying out RT shall be approved by Local Authorities.
14. Field Radiography shall be carried out in compliance with Local Statutory requirements and safety precautions by Approved Agency.
15. Radiography Source handling and control procedure shall be established as per Local Statutory requirements and complied.
16. Preheating and Post Weld Heat treatment shall be in compliance with Approved Procedures.
17. Gauges and measuring Instruments, with valid calibration only shall be used
18. Cleaning, preservation and Painting of products shall be carried out as per Approved Painting Schedule.
19. 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	FIELD QUALITY PLAN FOR **FGD ABSORBER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300079-PSE** BHEL Doc. No. : QPE-MTE-660-BR-50 REV. NO. : 0 SHEET 02 OF 08
SYSTEM: FGD	SUB-SYSTEM: FGD ABSORBER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*10*
A	**GENERAL REQUIREMENTS**									
A.01	Ensure availability of requisite equipment in good working condition well before commencement of concerned activity. All MMRs to be used in 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 MMR damaging incident	Owner's Technical Specifications & Drawing	The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	SR & Calibration Report	√	- 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 / erection drawings and OEM's Manual for equipment, 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**									
B.01	Check availability of Bill of materials (BOM) / packing slip, dispatch documents.	V	-	C	100%	-	-	-		
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	BOM / Dispatch documents / Packing slip	Logbook		
B.03	Check components/ boxes carefully for physical condition - a) In case of external damage to boxes, remove the top cover so that contents can be seen thoroughly. If the contents are sealed / intact, cover the contents / packing with original plastic sheeting / additional tarpaulin cover. b) 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.04	V	-	C	100%	Dispatch documents/ Packing slip	Dispatch documents/ Packing slip	Logbook		
B.04	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	BHEL Work instructions for site Operations	BHEL Work instructions for site Operations	MDR		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FGD ABSORBER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300079-PSE** BHEL Doc. No. : QPE-MTE-660-BR-50 REV. NO. : 0 SHEET 03 OF 08
SYSTEM: FGD	SUB-SYSTEM: FGD ABSORBER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*10*
B.05	Control of receipt and issue of all components	V	-	C	100%	BHEL Work instructions for site Operations	BHEL Work instructions for site Operations	Register		
C	**STORAGE & PRESERVATION AT SITE**									
C.01	Ensure storage of materials as per OEM's Guidelines with easy traceability.	V	-	B	100% after receipt	Storage & Preservation Instruction from OEM (Annex-II)	Storage & Preservation Instruction from OEM (Annex-II)	Checklist		
C.02	Ensure preservation of materials as per OEM's Guidelines	V		B	As per OEM's Guidelines	Storage & Preservation Instruction from OEM (Annex-II)	Storage & Preservation Instruction from OEM (Annex-II)	Checklist		
C.03	Ensure safe handling & transportation to erection site	V	-	C	100%	Annex-II	Annex-II	-		Trailer, fork lift or crane of adequate capacity to be deployed
D	**WELDING & NON DESTRUCTIVE EXAMINATIONS**									
D.01	Ensure availability of applicable qualified WPS	R	-	A	100%	Drawing / EWS	ASME BPVC SEC-IX	WPS	√	
D.02	Review of MTC of welding electrodes & other consumables	R	-	A	100%	Relevant AWS specifications as per applicable WPS	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 & ASME BPVC SEC-IX	ASME BPVC SEC-IX	WQR	√	
D.04	Adoption of correct procedure, approved electrodes and methods : review of job cards	R	-	A	Random in each shift	Drawing / EWS & WPS	Drawing / EWS & WPS	SR		
D.05	Checking drying / baking of electrodes (where ever applicable)	V & R	-	B	Random in each shift	WPS	Recommendation of electrode manufacturer	SR		
D.06	Pre heating of field weld joints, as applicable.	V & M	Non-contact type Thermometer / Thermo-chalk	A	As per WPS	WPS	AWWA D100	SR		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FGD ABSORBER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300079-PSE** BHEL Doc. No. : QPE-MTE-660-BR-50 REV. NO. : 0 SHEET 04 OF 08
SYSTEM: FGD	SUB-SYSTEM: FGD ABSORBER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*10*
D.07	Ensure proper sequence of welding, as applicable	V	-	C	100%	Drawings & WPS	Drawings & WPS	SR		
D.08	PWHT of field weld joints, as applicable.	V/M	Time-Temp. Recorder	A	As per WPS	WPS	WPS & AWWA D100	SR	√	
D.09	Review of qualification of NDT inspectors	R	-	A	Once before engagement of each inspector	ASNT SNT-TC-1A or equivalent	Level-II or above	NDT Inspector Register		
D.10	Visual Inspection of all weldments (field weld)	V & M	As required	B	100%	Drawing & ASME BPVC SEC-V	AWWA D100& ASME BPVC SEC. VIII, DIV. 1	SR		
D.11	DPT on root run of field butt welds after back-gouging	T	DPT Kit	B	100%	ASME BPVC SEC-V	ASME BPVC SEC. VIII, DIV. 1	SR	√	
D.12	DPT of final welding of the casing panel of absorber	T	DPT Kit	B	100%	ASME BPVC SEC-V	ASME BPVC SEC. VIII, DIV. 1	SR	√	
D.13	RT of butt welds field joints. **NOTE** - For following joints RT need not be done : 1. Welds in roof plates 2. Welds in flat tank bottoms resting directly on grade or foundation 3. Welds joining flat tank bottoms to the first ring of the tank shell 4. Welds connecting appurtenances to the tank	T	RT Kit	A	Random 5%	AWWA D100 & ASME BPVC SEC-V	AWWA D100 & ASME BPVC SEC. VIII, DIV. 1	RT Film & Report	√	
D.14	DPT nozzle welds & all finished welds	T	DPT Kit	B	Random 10%	ASME BPVC SEC-V	ASME BPVC SEC. VIII, DIV. 1	SR	√	
D.15	Preservation of field welded area, as applicable	V	As required	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen		SR		
E	**CHECKS FOR FOUNDATION**									
E.01	Check for foundation : disposition & dimensions	M	Measuring tape, Optical surveying instrument & Water level	B	100%	Drawing	Drawing	SR		
E.02	Inspection of Anchor bolts and embedded items : Check locations and levels	M	Measuring tape & Water level	B	100%	Drawing	Drawing	SR		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FGD ABSORBER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300079-PSE** BHEL Doc. No. : QPE-MTE-660-BR-50 REV. NO. : 0 SHEET 05 OF 08
SYSTEM: FGD	SUB-SYSTEM: FGD ABSORBER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*10*
F	**CHECKS FOR ABSORBER TOWER ERECTION**									
F.01	Packer Liner Setting with respect to Embedded Angle - Check alignment & level	V & M	Optical Surveying Instrument, Measuring tape & water level	B	100%	Drawing	Drawing & Erection Guidelines (Annex-I)	SR		
F.02	Bottom Plate Installation - Check alignment & level	V & M	Optical Surveying Instrument, Measuring tape & water level	B	100%	Drawing	Drawing & Erection Guidelines	SR		Welding checks & NDT shall be as per Sl. No. 'D'
F.03	Ensure installation of scaffolding	V	-	B	100%	Drawing & Erection Guidelines	Project HSE Plan	SR		
F.04	1st Stage Panel Casing Installation - Check alignment & verticality	V & M	Measuring tape & Plumb bob	B	100%	Drawing	Drawing & Erection Guidelines	SR		Welding checks & NDT shall be as per Sl. No. 'D'
F.05	Steel Structure Erection - Check alignment & verticality	V & M	Measuring tape, Plumb bob & water level	B	100%	Drawing	Drawing & Erection Guidelines	SR		Welding checks & NDT shall be as per Sl. No. 'D'
F.06	Upper Casing Panel Installation - Check alignment & verticality	V & M	Measuring tape, Plumb bob & water level	B	100%	Drawing	Drawing & Erection Guidelines	SR		Welding checks & NDT shall be as per Sl. No. 'D'
F.07	Inlet Duct Panel Installation - Check alignment	V & M	Measuring tape, Plumb bob & water level	B	100%	Drawing	Drawing & Erection Guidelines	SR		Welding checks & NDT shall be as per Sl. No. 'D'
F.08	Spray Pipe Support Installation - Check alignment & Verticality	V & M	Measuring tape, Plumb bob & water level	B	100%	Drawing	Drawing & Erection Guidelines	SR		Welding checks & NDT shall be as per Sl. No. 'D'
F.09	Mist Eliminator & Mist Eliminator washing Pipe Support Installation - Check alignment & Verticality	V & M	Measuring tape, Plumb bob & water level	B	100%	Drawing	Drawing & Erection Guidelines	Joint Protocol		Welding checks & NDT shall be as per Sl. No. 'D'
F.10	Ceiling Panel Installation - Check alignment & Verticality	V & M	Measuring tape, Plumb bob & water level	B	100%	Drawing	Drawing & Erection Guidelines	Joint Protocol		Welding checks & NDT shall be as per Sl. No. 'D'

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FGD ABSORBER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300079-PSE** BHEL Doc. No. : QPE-MTE-660-BR-50 REV. NO. : 0 SHEET 06 OF 08
SYSTEM: FGD	SUB-SYSTEM: FGD ABSORBER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*10*
F.11	Check Fit up of Nozzles & manholes and other appurtenance of required size at designed location as per drawing.	V & M	Measuring tape, Plumb bob & water level	B	100%	Drawing	Drawing & Erection Guidelines	Joint Protocol		
G	**TESTING OF ABSORBER TOWER**									
G.01	Vacuum box testing of ceiling panel, Shell & bottom plate welds	T	Vacuum box & Vacuum pump	A	100%	Procedure (Annex-III)	If no leakage is found during the test, the result is OK.	Log book	√	The necessary pressure is 0.06MPa(g).
H	**CHECKS FOR PAINTING (EXTERNAL SURFACE)**									
H.01	Check outside surface preparation, as applicable	V	-	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen	ISO 8501-1	SR		
H.02	Check Priming Coat of outside surface - thickness & finish	V & M	DFT Gauge	C	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen		SR		Primer & Paint to be procured from BIFPCL approved source & shall conform to ISO 12944
H.03	Final Painting of outside surface - thickness, finish, Colour shade, labelling & Marking	V & M	DFT Gauge	B	100%	Drawing, Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & approved colour scheme : MAITREE-00-BFA-FF-100001-GEN		Joint Protocol	√	
I	**CHECKS FOR RUBBER LINING**									
I.01	Check surface preparation, as applicable	V	-	B	100%	Approved Surface Preparation & Application Procedure for Absorber Lining : MAITREE-01-HTD-MDC-200306-RPT		Logbook		
I.02	Application of adhesive coating after surface preparation, as applicable	V	-	B	Random in each shift	Drawing & MAITREE-01-HTD-MDC-200306-RPT		Logbook		
I.03	Application of Rubber lining by Cold Bond Method	V		B	Random in each shift	Drawing & MAITREE-01-HTD-MDC-200306-RPT		Logbook		
I.04	High Voltage & High frequency spark test, as applicable	V & M	Spark test set up	A	Random	MAITREE-01-HTD-MDC-200306-RPT		Joint Protocol		
I.05	Hardness Test - For Rubber Lining	V & M	Durometer	B	Random	MAITREE-01-HTD-MDC-200306-RPT		Joint Protocol		
I.06	Adhesion test on production test piece at site, as aplicable	V & M		A	Random	MAITREE-01-HTD-MDC-200306-RPT		Joint Protocol		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FGD ABSORBER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300079-PSE** BHEL Doc. No. : QPE-MTE-660-BR-50 REV. NO. : 0 SHEET 07 OF 08
SYSTEM: FGD	SUB-SYSTEM: FGD ABSORBER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*10*
J	**CHECKS FOR ABSORBER SPRAY PIPES**									
J.01	Check all concerned absorber dimensions, i.e tolerance of Absorber Casing, support beam location, Absorber Nozzle location, Flange face location, bolt hole location, Size & Spacing etc, before Spray Pipe Installation	V	Measuring tape & water level	B	100%	Drawing & Erection Guidelines (Annex-II)				
J.02	Installation of temporary support / scaffold on Absorber Nozzles for inserting Spray Pipe into Absorber – Check alignment	V & M	Measuring tape & water level	B	100%	Drawing & Erection Guidelines (Annex-II)	Project HSE Plan			1. Padded support shall be used not to damage rubber lining 2. No welding is permitted.
J.03	Spray Pipe Installation using chain block- Check for horizontal level & insert shim plates to adjust the horizontal level within tolerance.	V & M	Measuring tape & water level	B	100%	Drawing & Erection Guidelines (Annex-II)				
J.04	Tightening of Bolts & Nuts – Check as per bolt tightening method during Erection.	V & M	Visual check	B	100%	Drawing & Erection Guidelines (Annex-II)				
I.11	Loosening of Saddle settings bolt & nut to allow thermal expansion of Spray pipes – Check as per procedure.	V & M	Visual check	B	100%	Drawing & Erection Guidelines (Annex-II)				
K	**CHECKS FOR ABSORBER SPRAY NOZZLES**									
K.01	Scaffolding modification for Installation of Spray Pipes – Check alignment during Erection.	V & M	Visual check	B	Random	Drawing & Erection Guidelines (Annex-II)	Project HSE Plan			1. Padded support shall be used not to damage rubber lining 2. No welding is permitted.
K.02	Spray pipe installation over Spray pipe flange & tightening of bolts & nuts – Check alignment & horizontality during Erection.		Visual check	B	100%	Drawing & Erection Guidelines (Annex-II)				
K.03	Before full torque tightening of Spray Nozzle Bolts & Nuts - Check for Spray Nozzle horizontality within tolerance.	V/M	Visual check	B	100%	Drawing & Erection Guidelines (Annex-II)				
L	**CHECKS FOR ABSORBER JET AIR SPARGER (JAS)**									
L.01	JAS Nozzle Orientation – Check for Air Intake Nozzle to be in upright Orientation.	V/M	Measuring Tape & water level	B	100%	Drawing & Erection Guidelines (Annex-II)		Log book		
L.02	JAS Bolt & Washer – Check dimension for double nut installation during Erection.	V & M	Measuring Tape & water level	B	100%	Drawing & Erection Guidelines (Annex-II)		Log book		

FOR TENDER PURPOSE ONLY

	BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FGD ABSORBER SYSTEM** STATEMENT OF CHECKS						FQP NO.: **MAITREE-00-HT-QA-300079-PSE** BHEL Doc. No. : QPE-MTE-660-BR-50		
								REV. NO. : 0		
								SHEET 08 OF 08		
SYSTEM: FGD		SUB-SYSTEM: FGD ABSORBER SYSTEM						AREA: RECEIPT, STORAGE & 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**	*10*
M	**CHCEKS FOR MIST ELIMINATORS**									
M.01	Check all concerned absorber dimensions i.e tolerance of absorber casing, support beam location, bolt hole location size & spacing etc., before installation of Mist Eliminator	V & M	Measuring Tape & water level	B	Random	Drawing & Erection Guidelines (Annex-II)				
M.02	Insert lower washing spray pipe into absorber – No sliding of pipe over support permitted – Check during erection.	V	-	B	100%	Drawing & Erection Guidelines (Annex-II)				
M.03	Insert dedicated shim plates between pipe & pipe support, and fixing U-bands or U- bolts and external flanges.	V	-	B	100%	Drawing & Erection Guidelines (Annex-II)				
M.04	Install the lower panel of Mist Eliminators – Check for alignment during Erection.	V & M	Measuring Tape & water level	B	Random	Drawing & Erection Guidelines (Annex-II)				
M.05	Install the lower down washing spray pipe & upper up washing spray pipe – Check for alignment during Erection.	V & M	Measuring Tape & water level	B	Random	Drawing & Erection Guidelines (Annex-II)				
M.06	Install the upper panels of Mist Eliminators – Check for alignment during Erection.	V & M	Measuring Tape & water level	B	Random	Drawing & Erection Guidelines (Annex-II)				
M.07	Install the upper down washing spray pipe – Check for alignment during Erection.	V & M	Measuring Tape & water level	B	Random	Drawing & Erection Guidelines (Annex-II)				

FOR TENDER PURPOSE ONLY

FIELD QUALITY PLAN

FOR

PUMPS-FGD

(Erection)

2X660MW MAITREE STPP

BHARAT HEAVY ELECTRICALS LIMITED

FOR TENDER PURPOSE ONLY

DOC NO.:
REV. NO.: 00

	STANDARD FIELD QUALITY PLAN FOR **PUMPS-FGD** **(ERECTION)**	FQP NO.: **AA/CQ/SFQP/SCA/FG/09** REV. NO.: 00 Sheet 1 / 1 Sheet

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1.0	Record of revisions	01
2.0	Authorization for different categories of checks	01
3.0	Statement of checks	07
4.0	Documents referred in Field Quality Plan	01
5.0	Protocol	01
6.0	Feedback on Field Quality Plan	01

FOR TENDER PURPOSE ONLY

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RECORD OF REVISIONS

REVISION NO.	DATE OF REVISION	DETAILS OF REVISION
00 (1st Issue)	06.02.19	Made first time as SFQP by the task force.

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **PUMPS-FGD** (ERECTION)	FQP NO.: AA/CQ/SFQP/SCA/FG/09
		REV. NO.: 00
		Sheet 1 / 1

AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECKS

Classification of Check		Checking Authority	Accepting Authority
Symbol	Description		
A	Critical	BHEL & Customer	Customer
B	Major	BHEL	HOS
C	Minor	BHEL	BHEL

Legend : Customer : Customer or any other agency authorized by customer.

BHEL : Concerned engineers of BHEL – Task Performer.

HOS : HEAD OF SECTION for BHEL

NOTE:

1. Quantum of check shall be 100% for all characteristics unless otherwise mentioned in reference documents.
2. Customer shall witness A category checks. He is also authorized to carry out Surveillance in any of the B & C category of checks at his discretion.
3. In case of non-conformity, accepting authority shall ensure dispositioning before accepting and the dispositioning shall be reflected in log sheets / protocols. Dispositioning of non-conformities to be authorized by Head/TSX with intimation to Head/Quality.
4. Instruments with valid calibration to be used for measurements.
4. Changes in authorizations may be done by PS-Regions as per contract.

FOR TENDER PURPOSE ONLY

बी एच ई एल BHEL	STANDARD FIELD QUALITY PLAN FOR **PUMPS-FGD** (ERECTION)	FQP NO.: AA/CQ/SFQP/SCA/FG/09
		REV. NO.: 00
		Sheet 1 / 7

STATEMENT OF CHECKS

Capacity / Type	:	**ALL**
System	:	**FGD**
Sub-System	:	**PUMPS**
Area	:	**ERECTION**

* For checks where log sheets are not called for, suitable records shall be maintained in the form of log book / protocols.

* As an evidence of having carried out the work satisfactorily, a general purpose log sheet L-00 shall be maintained for all the checks.

* Abbreviations used in the column "Type of Check" are :

  R : Record Verification

  M : Measurement

  V : Visual

FOR TENDER PURPOSE ONLY

बी एच ई एल BHEL	**STANDARD FIELD QUALITY PLAN FOR PUMPS-FGD (STATEMENT OF CHECKS)**	FQP NO.: AA/CQ/SFQP/SCA/FG/09 REV. NO.: 00
SYSTEM : FGD	SUB - SYSTEM: **RECIRCULATION PUMPS**	AREA : ERECTION SHEET 2 / 7

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
1	**Recirculation Pumps**								
1.1	Receiving Inspection of equipment	Visual Inspection equipment	B	V	100%	Drawing		IR	
1.2	**Foundation Inspection**	Dimensional Inspection	B	M	100%	Drawing			
1.2.1	Check foundation dimensions including floor elevation, position of foundation bolt pockets etc.		C	M	100%	Drawing			
1.2.2	Chipping / dressing and levelling of foundation		B	V/M		Drawing			
1.2.3	Grouting of foundation bolts. Ensure elevation and levelling of suction and discharge flange		B	V		Drawing			
1.2.4	Curing of foundation bolt grout and tightening of bolts		C	V		Standard Practice			
1.2.5	Levelling & grouting of frame and curing.		B	V/M		Standard Practice			
1.3	**Erection of Equipment**								
1.3.1	Installing the Pump	Visual & orientation	B	V	100%	Drawing			
	Installation of Gear Box (If, applicable)		B	V	100%	Drawing			
1.3.2	Aligning the aggregate		B	V	100%	Drawing			
1.3.3	Installing expansion joints		B	V	100%	Drawing			
1.3.4	Installation of Suction Piping, Discharge Piping and Auxiliary Piping		B	V	100%	Drawing			
1.3.5	Installation of Temporary Strainer		B	V	100%	Drawing			
1.3.6	Installation of Valves at Inlet & Outlet. To Check orientation of both Valves for correctness.		B	V	100%	Drawing			
1.3.7	Installation for Pipe Flushing arrangement.		B	V	100%	Drawing			
13.8	Installation of Motor		B	V	100%	Drawing			

FOR TENDER PURPOSE ONLY

बी एच ई एल BHEL	**STANDARD FIELD QUALITY PLAN FOR PUMPS-FGD (STATEMENT OF CHECKS)**	FQP NO.: AA/CQ/SFQP/SCA/FG/09 REV. NO.: 00
SYSTEM : FGD	SUB - SYSTEM: **RECIRCULATION PUMPS** AREA : ERECTION	SHEET 3 / 7

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
1.4	Blue matching, Preliminary alignment & levelling of pump	Coupling Alignment and levelling of frame	A	M	100%	Drawing		IR	
1.5	Grouting of base	Compressive strength of cube	B	M	100%	Drawing/ Grouting Procedure		Protocol	
1.6	Final adjustment of pump after connection of discharge & suction pipe	Alignment of coupling	B	M	100%	Drawing		IR	
1.7	Alignment of motor with pump	Alignment of coupling Using Dial Gauge/ Micrometer	A	M	100%	Drawing		Protocol	
1.8	Greasing and filling of Bearing Oil Sump, Check for any leakage, Check for correct Oil level.		C	V	100%	Drawing		Protocol	
1.9	Testing	Visual observation	B	V	100%				
1.9.1	Trial Run test for Vibration/noise/Speed		A	M	100%				
1.10	Supervision of Erection & Commissioning		B	V/M	100%	BHEL/OEM representative as and when required			

FOR TENDER PURPOSE ONLY

BHEL	**STANDARD FIELD QUALITY PLAN FOR PUMPS-FGD (STATEMENT OF CHECKS)**	FQP NO.: AA/CQ/SFQP/SCA/FG/09 REV. NO.: 00
SYSTEM : FGD	SUB - SYSTEM: **HORIZANTAL PUMPS** (Gypsum bleed pump, Limestone slurry pump, Sec. Hydrocyclone feed tank pump, Filtrate water tank pump, Waste water tank pump, Aux. Absorbent Tank pump, Process water pump**)** AREA : ERECTION	SHEET 4 / 7

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
2	**HORIZANTAL SLURRY PUMPS**								
	Receiving Inspection of equipment								
2.8	**Foundation Inspection**		B	M	100%	Drawing		IR	
2.8.1	Check foundation dimensions including floor elevation, position of foundation bolt pockets etc	Dimensional Inspection	C	M	100%	Drawing		Protocol	
2.8.2	Chipping / dressing and levelling of foundation		B	V/M	100%	Drawing		Log Book	
2.8.3	Grouting of foundation bolts. Ensure elevation and levelling of suction and discharge flange		B	V	100%	Drawing		Log Book	
2.8.4	Curing of foundation bolt grout and tightening of bolts		C	V	100%	Drawing		Log Book	
2.8.5	Levelling & grouting of frame and curing		B	V/M	100%	Drawing		Log Book	
2.9	**Erection of Equipment**	Visual & orientation							
2.9.1	Installing the Pump		B	V	100%	Drawing		Protocol	
2.9.2	Aligning the aggregate		B	V	100%	Drawing		Protocol	
2.9.3	Installing expansion joints		B	V	100%	Drawing		Protocol	
2.9.4	Installation of Suction Piping, Discharge Piping and Auxiliary Piping		B	V	100%	Drawing		Protocol	
2.9.5	Installation of Permanent Strainer for Water pumps.								
2.9.6	Installation of Temporary Strainer for Slurry Pumps		B	V	100%	Drawing			
2.9.7	Installation of Valves at Inlet & Outlet. To Check orientation of both Inlet & Outlet Valves.		B	V	100%	Drawing			
2.9.8	Installation for Pipe Flushing arrangement.		B	V	100%	Drawing			
2.9.10	Installation of Motor		B	V	100%	Drawing			

FOR TENDER PURPOSE ONLY

बी एच ई एल BHEL	**STANDARD FIELD QUALITY PLAN FOR PUMPS-FGD (STATEMENT OF CHECKS)**	FQP NO.: AA/CQ/SFQP/SCA/FG/09 REV. NO.: 00
SYSTEM : FGD	SUB - SYSTEM: **HORIZANTAL PUMPS** (Gypsum bleed pump, Limestone slurry pump, Sec. Hydrocyclone feed tank pump, Filtrate water tank pump, Waste water tank pump, Aux. Absorbent Tank pump, Process water pump**)** AREA : ERECTION	SHEET 5 / 7

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
2.10	Preliminary alignment & levelling of pump	Coupling Alignment and levelling of frame	B	M	100%	Drawing	As per drawing	IR	Release for grouting
2.11	Grouting of base	Compressive strength of cube	B	M	100%	Drawing	Grouting Procedure:As per Manufacturer & Technical specification	Protocol	
2.12	Final adjustment of pump after connection of discharge & suction pipe	Alignment of coupling	A	M	100%	Drawing	As per drawing	IR	
2.13	Alignment of motor with pump.	Alignment of coupling using Dial Gauge/ Micrometer	A	M	100%	Drawing	As per drawing	IR	
2.14	Greasing and filling of Bearing Oil Sump, Check for any leakage		C	V					
2.15	Run test for Vibration/noise/Speed	Visual observation	B	V	100%				
2.16	Supervision of Erection & Commissioning		B	V/M	100%	BHEL/OEM representative as and when required	Dossier		

FOR TENDER PURPOSE ONLY

BHEL	**STANDARD FIELD QUALITY PLAN FOR PUMPS-FGD (STATEMENT OF CHECKS)**	FQP NO.: AA/CQ/SFQP/SCA/FG/09
		REV. NO.: 00
SYSTEM : FGD	SUB - SYSTEM: **VERTICAL PUMPS**	AREA : ERECTION / SHEET 6 / 7

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
3	**VERTICAL SLURRY PUMPS**								
3.1	Receiving Inspection of equipment	Visual Inspection equipment	B	V	100%	Drawing	As per Drawing	IR	Inspection For transit Damage
3.1.1	Absorber Area Drain Sump Pump	Visual Inspection equipment	B	V	100%	Drawing	As per Drawing		
3.1.2	Ball mill Area Drain Sump Pump	Visual Inspection equipment	B	V	100%	Drawing	As per Drawing		
3.1.2	Gypsum Area Drain Sump Pump	Visual Inspection equipment	B	V	100%	Drawing	As per Drawing		
3.2	**Foundation Inspection**	Dimensional Inspection	B	M	100%	Drawing	As per Drawing	IR	
3.2.1	Check foundation dimensions including floor elevation, position of foundation bolt pockets, pit depth, vortex breaker location etc. as applicable	Inspection using Tape	C	M	100%	Drawing	As per Drawing	Protocol	
3.2.2	Chipping / dressing and blue matching of foundation		B	V					
3.3	**Erection of Equipment**	Visual & orientation	B	V	100%	Drawing	As per Drawing	Protocol	
3.3.1	Removal of shop paint from foundation ring.		B	V	100%				
3.3.2	Assembly of foundation ring and level of the assembly on foundation.	Inspection Using Spirit Level	B	V/M	100%	Drawing	As per Drawing	Protocol	
3.3.3	Assembly of pump on floor. Record clearances between sleeve & shaft, sleeve & cut-less rubber bearing and between wearing rings of casing & impeller.		B	V/M	100%	Drawing	As per Drawing	Protocol	
3.3.4	Lowering of Pump in pit.		B	V					
	Tightening of foundation bolts and grouting of foundation ring. Ensure proper elevation of pump discharge centerline.		C	V/M		Drawing/ Instructions	As per Drawing	Log book	
3.3.5	Revision of bearing.		C	V				Log Book	
3.3.6	Check float of Pump shaft and fix Rotor position.		B	M		As per Drawing	As per Drawing		

FOR TENDER PURPOSE ONLY

बी एच ई एल BHEL	**STANDARD FIELD QUALITY PLAN FOR PUMPS-FGD (STATEMENT OF CHECKS)**	FQP NO.: AA/CQ/SFQP/SCA/FG/09
		REV. NO.: 00
SYSTEM : FGD	SUB - SYSTEM: **VERTICAL PUMPS**	AREA : ERECTION / SHEET 7 / 7

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
VERTICAL SLURRY PUMPS									
3.3.7	Ensure proper contact between motor stool and foundation ring by blue matching. Leveling & centering of motor stool.		B	M					
3.3.8	Check distance between coupling halves of Pump & Motor		B	M		Drawing	As per Drawing		
3.3.9	Alignment between Pump & Motor shafts and their coupling. NOTE: Coupling to be done after Motor trial run.		C	V		Drawing	As per Drawing		
3.3.10	Ensure mounting of all instrumentation on pump as applicable.		C	V		Drawing	As per Drawing	Log Book	
3.3.11	Filling of Bearing Oil Sump, Check for any leakage.		B	V	100%	Drawing			
3.3.12	Installation of Suction Piping, Discharge Piping and Auxiliary Piping					Drawing	As per Drawing		
3.3.13	Grouting of base	Compressive strength of cube	B	M	100%	Drawing	Grouting Procedure:As per Manufacturer & Technical specification	Protocol	
3.3.14	Alignment of pump with motor	Dial Gauge/ Micrometer	A	M	100%	Drawing			
3.3.15	Run test for Vibration/noise/Speed	Visual observation	B	V	100%				
3.3.16	Supervision of Erection & Commissioning		B	V/M	100%	BHEL/OEM representative as and when required	Dossier		

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **PUMPS-FGD**	FQP NO.: AA/CQ/SFQP/SCA/FG/09
		REV. NO.: 00
		Sheet 1 / 1 Sheet

DOCUMENTS REFERRED IN STANDARD FIELD QUALITY PLAN

SL.NO.	Reference Document	Issuing Authority
1	Guidelines for Erection	BHEL, Ranipet

FOR TENDER PURPOSE ONLY

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.: **AA/CQ/SFQP/SCA/FG/09**
PROJECT					REV. NO.: 00
UNIT NO.		FGD	PUMPS	ERECTION	LOG SHEET NO. : L-00
RATING					SHEET 1 / 1 SHEET

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	INSTRUMENT REG.		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT		

PROTOCOL

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			NAME	SIGNATURE & DATE	FQP NO.: **AA/CQ/SFQP/SCA/FG/09**
PROJECT		INSPECTED BY			REV. NO.: 00
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

FEEDBACK ON STANDARD FIELD QUALITY PLAN

In the Field Quality Plan, following Checks / Log sheets may be added / rewritten / deleted (cannot be carried out / not required) due to reasons as mentioned below:

Sheet No. of FQP	Check No. / Log Sheet No.	Proposed Change / Reasons / Remarks

PROJECT		From :	To Head-CQ&BE	FQP NO.: AA/CQ/SFQP/SCA/FG/09
UNIT NO.				REV NO. : 00
RATING				SHEET 1 / 1 SHEET

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **SLURRY AND WATER TANKS** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300090-PSE** BHEL Doc. No. : QPE-MTE-660-BR-54 REV.NO.: 0 SHEET 02 OF 06
SYSTEM: FGD SYSTEM	SUB-SYSTEM: SLURRY AND WATER TANKS	AREA: ERECTION

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. 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 Technical Specifications & 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 / erection 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**									
B.01	Check availability of Bill of materials (BOM) / packing slip, dispatch documents.	V	-	C	100%	-	-	-		
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	BOM / Dispatch documents / Packing slip	Logbook		
B.03	Check components/ boxes carefully for physical condition - a) In case of external damage to boxes, remove the top cover so that contents can be seen thoroughly. If the contents are sealed / intact, cover the contents / packing with original plastic sheeting / additional tarpaulin cover. b) 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.04	V	-	C	100%	Dispatch documents/ Packing slip	Dispatch documents/ Packing slip	Logbook		
B.04	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	BHEL Work instructions for site Operations	BHEL Work instructions for site Operations	MDR		
B.05	Control of receipt and issue of all components	V	-	C	100%	BHEL Work instructions for site Operations	BHEL Work instructions for site Operations	Stock Register		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **SLURRY AND WATER TANKS** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300090-PSE** BHEL Doc. No. : QPE-MTE-660-BR-54 REV.NO.: 0 SHEET 03 OF 06
SYSTEM: FGD SYSTEM	SUB-SYSTEM: SLURRY AND WATER TANKS	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**	*10*
C	**MATERIAL STORAGE**									
C.01	Steel plate/ pipes/ structural steel (angle/ beams/ channels/ flats etc)	V	-	B	Once every three months	Annex-I	Compliance to storage level - A as per Annex-I	Stock Register		
C.02	Fabricated items	V	-	B	Once every three months	Annex-I	Compliance to storage level - B as per Annex-I	Stock Register		
C.03	Valves. strainers, hoses, pressure regulating station etc, as applicable	V	-	B	Once every three months	Annex-I	Compliance to storage level - C as per Annex-I	Stock Register		
C.04	Instruments viz. level switch, flow switch, flow meters, level indicator gauge, etc	V	-	B	Once every three months	Annex-I	Compliance to storage level - D as per Annex-I	Stock Register		
C.05	Pre-vulcanised rubber sheets & adhessives	V	-	B	Once every three months	Annex-I	Compliance to storage level - D as per Annex-I	Stock Register		
D	**WELDING & NON DESTRUCTIVE EXAMINATIONS**									
D.01	Ensure availability of applicable WPS and PQR	R	-	A	100%	Drawing / EWS	Clause no. 9.2 of API Standard 650 & ASME BPVC SEC - IX	WPS	√	
D.02	Review of MTC of welding electrodes & other consumables	R	-	A	100%	Relevant AWS specifications as per applicable WPS	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 & 'Clause no. 9.3 of API Standard 650	ASME BPVC Sec.- IX	WQR	√	
D.04	Adoption of correct procedure, approved electrodes and methods.	V	-	A	100%	Drawing / EWS & WPS	Drawing / EWS & WPS	SR	√	
D.05	Checking drying / baking of electrodes (where ever applicable)	V & R	-	B	Random in each shift	WPS	Recommendation of electrode manufacturer	SR		
D.06	Pre heating of weld joints, as applicable.	V & M	Non-contact type Thermometer	A	As per WPS	WPS	Table 7.1a of API Standard 650	SR	√	

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **SLURRY AND WATER TANKS** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300090-PSE** BHEL Doc. No. : QPE-MTE-660-BR-54 REV.NO.: 0 SHEET 04 OF 06
SYSTEM: FGD SYSTEM	SUB-SYSTEM: SLURRY AND WATER TANKS	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**	*10*
D.07	Ensure proper sequence of welding, as applicable	V	-	C	100%	Drawings & WPS	Drawings & WPS	SR		
D.08	PWHT of weld joints, as applicable.	V/M	Time-Temp. Recorder	A	As per WPS	WPS	API Standard 650	SR		
D.09	Review of qualification of NDT inspectors	R	-	A	Once before engagement of each inspector	Section - 8 of API Standard 650	Clause no. 8.1.3.2, 8.4.3 & 8.5.1 of API Standard 650	NDT Inspector Register		
D.10	Visual Inspection of All weldments	V & M	As required	B	100%	Drawing	Caluse no. 8.5 of API Standard 650	SR		
D.11	DPT on butt welds after back gauging	T	DPT Kit	B	100%	ASME BPVC Section V & API Standard 650	ASME BPVC Sec VIII, division - I, Appendix - 8	site log book	√	
D.12	RT of butt welds joints (covering 100% of 't' joints) of tank	T	RT Kit	A	As per Section - 8 of API Standard 650	ASME BPVC Section V & API Standard 650	ASME BPVC Sec VIII Division - I, UW51/52	RT report & film	√	UT may be done in place of RT fulfilling the requirements in Annex-U of API Std. 650
D.13	DPT nozzle welds & all finished welds	T	DPT Kit	A	As per requirement of API 650	ASME BPVC Section V & API Standard 650	ASME BPVC Sec VIII, division - I, Appendix - 8	site log book	√	
D.14	Preservation of welded area	V	As required	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & Owner's FTS	SR		
E	**CHECKS FOR FOUNDATION**									
E.01	Check for foundation : disposition & dimensions	M	Measuring tape, spirit Level & Auto Level	B	100%	Approved drawing	Approved drawing & Clause no. 7.5 of API Std 650	site log book	√	
E.02	Inspection of Anchor bolts' pockets : disposition & depth	V & M	Measuring tape & water level	B	100%	Approved drawing	Approved drawing & Clause no. 7.5 of API Std 650	site log book	√	
F	**CHECKS FOR TANK ERECTION**									
F.01	Joint fit up / edge preparation	V & M	Measuring tape	B	100%	Approved drawing & WPS	Section - 6 of API Standard 650	site log book		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **SLURRY AND WATER TANKS** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300090-PSE** BHEL Doc. No. : QPE-MTE-660-BR-54 REV.NO.: 0 SHEET 05 OF 06
SYSTEM: FGD SYSTEM	SUB-SYSTEM: SLURRY AND WATER TANKS	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**	*10*
E.04	Assembly and erection of annular plate, bottom plate, shell, roof Center Column, rafters, girders & roof plate . Check following - a. alignment b. circularity c. verticality d. nozzle orientation & dimension (for both shell and roof)	M	Measuring tape & plumb	B	100%	Approved drawing	Section -6 & 7 of API Standard 650	site log book		
E.05	Welding & NDT	As per Sl. No. 'D'								
E.06	complete visual examination of welds of shell to bottom (inside weld)	V	visual	A	100%	approved drawing	Clause no. 7.3.3; 7.3.4 & 8.5 of API Standard 650	site log book		
E.07	Final dimensional check including Verticality, Ovality	M	Measuring tape & plumb	B	100%	approved drawing	Clause no. 7.5 of API Standard 650	site log book	√	
E.08	Ensure fixing of all attachments, as applicable	V	-	B	100%	Approved drawing	Approved drawing	site log book		
E.09	Erection of Platforms, Gratings, Stair Cases & handrails	V & M	Measuring tape & plumb	B	100%	Approved drawing	Approved drawing	site log book		
G	**TESTING**									
G.01	Bottom plate seam testing & annular plate - vacuum box test	T	Vacuum gauge	A	100%	Clause no. 8.6 of API Standard 650		site log book	√	
G.02	Hydrostatic test (water fill test)	T	pressure gauge	A	100%	Clause no. 7.3.6 & 7.3.7 of API Standard 650		site log book	√	If sufficient water is not available, other tests as specifies in Clause no. 7.3.6 of API Standard 650 may be done with approval of EIC
G.03	Roof leakage testing - vacuum box test	T	Vacuum gauge	A	100%	Clause no. 8.6 of API Standard 650		site log book	√	
H	**MARKING & PAINTING (OUTTER SURFACE)**									
H.01	Surface preparation	V	-	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & ISO 8501-1		site log book		
H.02	Marking & Painting - DFT, finish, Colour shade & labelling	V & M	Digital DFT Gauge	B	100%	Approved Painting Schedule & Scheme : MAITREE-00-BFA-FF-100000-Gen & MAITREE-00-BFA-FF-100001-GEN		site log book		Paint to be procured from BIFPCL approved source & shall conform to ISO 12944

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **SLURRY AND WATER TANKS** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300090-PSE** BHEL Doc. No. : QPE-MTE-660-BR-54 REV.NO.: 0 SHEET 06 OF 06
SYSTEM: FGD SYSTEM	SUB-SYSTEM: SLURRY AND WATER TANKS	AREA: ERECTION

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*
I	**RUBBER LINING OF TANKS (AS APPLICABLE)**									
I.01	Material Inspection : Review of TC for Tensile Strength, Elongation & Hardness	R	-	A	Random	Approved drg	As noted in the approved drg	Register		
I.02	Check provision / Erection of tubular scaffolding & platform	V	-	C	100%	HSE Plan	Adequacy as per HSE Plan	SR		
I.03	Surface preparation by abbrassive blasting	As required	As required	B	Random	Approved drg & ISO 8501-1	As noted in the approved drg	SR		Digital Surface Roughness measurement device & ISO Pictorial Surface Preparation Standards shall be used.
I.04	Check application of adhesive coating after blasting	V	-	B	Random in each shift	Approved drg & BS 6374-5		SR		
I.05	Check application of Rubber lining by Cold Bond Method	V	-	B	Random in each shift	Approved drg & BS 6374-5		SR		
I.06	Visual check of the total rubber lined surface	V	-	A	100%	Approved drg & BS 6374-5		Joint Protocol	√	
I.07	Visual- High Voltage & High frequency spark test	V & M	Spark test set up	A	Random	Approved drg & BS 6374-5		Joint Protocol	√	
I.08	Thickness Measurement	V & M	Tape & Gauge	A	Random	Approved drg & BS 6374-5		Joint Protocol	√	
I.09	Hardness Test	V & M	Durometer	A	Random	Approved drg & BS 6374-5		Joint Protocol	√	
I.10	Adhesion Test	V & M	As required	A	Random	Approved drg & BS 6374-5		Joint Protocol	√	

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FIELD QUALITY PLAN

FOR

VACUUM BELT FILTER (FGD)

(Erection)

2x660MW MAITREE STPP

BHARAT HEAVY ELECTRICALS LIMITED

FOR TENDER PURPOSE ONLY

DOC NO.:
REV. NO.: 00

	STANDARD FIELD QUALITY PLAN FOR **VACUUM BELT FILTER (FGD)** **(ERECTION)**	FQP NO.: **AA/CQ/SFQP/SCA/FG/08** REV. NO.: 00 Sheet 1 / 1 Sheet

CONTENTS

Sl.No.	Description	No. of Sheets
1.0	Record of revisions	01
2.0	Authorization for different categories of checks	01
3.0	Statement of checks	05
4.0	Documents referred in Field Quality Plan	01
5.0	Protocol	01
6.0	Feedback on Field Quality Plan	01

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RECORD OF REVISIONS

REVISION NO.	DATE OF REVISION	DETAILS OF REVISION
00 (1st Issue)	13.02.19	Made first time as SFQP by the task force.

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	STANDARD FIELD QUALITY PLAN FOR **VACUUM BELT FILTER (FGD)** (ERECTION)	FQP NO.: **AA/CQ/SFQP/SCA/FG/08**
		REV. NO.: 00
		Sheet 1 / 1

AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECKS

Classification of Check		Checking Authority	Accepting Authority
Symbol	Description		
A	Critical	BHEL & Customer	Customer
B	Major	BHEL	HOS
C	Minor	BHEL	BHEL

Legend : Customer : Customer or any other agency authorized by customer.

BHEL : Concerned engineers of BHEL – Task Performer.

HOS : HEAD OF SECTION for BHEL

NOTE:

1. Quantum of check shall be 100% for all characteristics unless otherwise mentioned in reference documents.
2. Customer shall witness A category checks. He is also authorized to carry out Surveillance in any of the B & C category of checks at his discretion.
3. In case of non-conformity, accepting authority shall ensure dispositioning before accepting and the dispositioning shall be reflected in log sheets / protocols. Dispositioning of non-conformities to be authorized by Head/TSX with intimation to Head/Quality.
4. Instruments with valid calibration to be used for measurements.
4. Changes in authorizations may be done by PS-Regions as per contract.

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बी एच ई एल BHEL	STANDARD FIELD QUALITY PLAN FOR **VACUUM BELT FILTER (FGD)** (ERECTION)	FQP NO.: **AA/CQ/SFQP/SCA/FG/08** REV. NO.: 00 Sheet 1 / 6

STATEMENT OF CHECKS

Capacity / Type	:	**ALL**
System	:	**FGD**
Sub-System	:	**VACUUM BELT FILTER**
Area	:	**ERECTION**

* For checks where log sheets are not called for, suitable records shall be maintained in the form of log book / protocols.

* As an evidence of having carried out the work satisfactorily, a general purpose log sheet L-00 shall be maintained for all the checks.

* Abbreviations used in the column "Type of Check" are :

  R : Record Verification

  M : Measurement

  V : Visual

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बी एच ई एल BHEL	**STANDARD FIELD QUALITY PLAN FOR VACUUM BELT FILTER (FGD) (STATEMENT OF CHECKS)**	FQP NO.: AA/CQ/SFQP/SCA/FG/08
		REV. NO.: 00
SYSTEM : FGD	**SUB - SYSTEM: VACUUM BELT FILTER** AREA : ERECTION	SHEET 2 / 6

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
1	**Receiving Inspection of equipment**	Visual Inspection equipment	B	V	100%	Drawing	Drawing	IR	Inspection For transit Damage
2	**Foundation Inspection of vacuum Belt filter, vacuum pump and wash water pumps.**	Dimensional Inspection	B	M	100%	Drawing	Drawing	IR	
2.1	Check foundation dimensions including floor elevation, position of foundation bolt pockets etc	Dimensional Inspection	C	M	100%	Drawing	Drawing	Protocol	
2.2	Chipping / dressing and levelling of foundation		B	V/M	100%	Drawing	Drawing	Log Book	
2.3	Curing of foundation bolt grout and tightening of bolts (if applicable)		C	V	100%	Drawing	Drawing	Log Book	
2.4	Levelling & grouting of frame and curing		B	V/M	100%	Drawing	Drawing	Log Book	

FOR TENDER PURPOSE ONLY

BHEL	**STANDARD FIELD QUALITY PLAN FOR VACUUM BELT FILTER (FGD) (STATEMENT OF CHECKS)**	FQP NO.: AA/CQ/SFQP/SCA/FG/08 REV. NO.: 00
SYSTEM : FGD	**SUB - SYSTEM: VACUUM BELT FILTER**	AREA : ERECTION SHEET 3 / 6

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
3	**Erection of Equipment**	Visual	B	V	100 %	Drawing	Drawing	Visual	
i.	All floor pads shall be leveled before frame assembly.	Visual	B	V	100 %	Drawing	Drawing	Visual	
ii.	Ensure installation of the feed end frame assembly, check the square alignment & secure alignment & secure all screw cap.								
iii.	Vacuum Belt Filter (VBF) frame straightness	Dimensional Inspection (The frame to be straight +/- 1.6mm the entire length of the frame)	B	V	100%	Drawing	Drawing	Protocol	
iv.	Vacuum Belt Filter (VBF) square alignment	Dimensional Inspection (The frame shall be +/- 3.2mm square aligned)	B	V	100%	Drawing	Drawing	Protocol	
v.	Final assemble and Level the frame	VBF frame shall be level in across the width in +/- 1.6 mm (laterally), and across the length of VBF from 0 mm at the feed end to within 6.4mm higher at the discharge end.	B	V	100%	Drawing	Drawing	Protocol	

FOR TENDER PURPOSE ONLY

बी एच ई एल BHEL	STANDARD FIELD QUALITY PLAN FOR VACUUM BELT FILTER (FGD) (STATEMENT OF CHECKS)		FQP NO.: AA/CQ/SFQP/SCA/FG/08
			REV. NO.: 00
SYSTEM : FGD	SUB - SYSTEM: VACUUM BELT FILTER	AREA : ERECTION	SHEET 4 / 6

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
vi.	Ensure installation of the drip pans	Visual & Orientation	B	V	100%	Drawing	Drawing	Protocol	
vii.	Ensure installation of the drive, tail and take up pulley assembly								
viii.	Ensure installation of the cloth and drainage belt support rolls								
ix.	Ensure installation of the cloth take up assembly	Visual	B	V	100 %	Drawing	Drawing		
x.	Ensure installation of the slide deck assembly	Visual	B	V	100 %	Drawing	Drawing		
xi.	Ensure installation of the vacuum pan and vacuum pan lowering assembly	Visual	B	V	100 %	Drawing	Drawing		
xii.	Ensure installation of the vacuum pan lube assembly	Visual	B	V	100 %	Drawing	Drawing		
xiii.	Ensure installation of the slide deck lube assembly	Visual	B	V	100 %	Drawing	Drawing		
xiv.	Ensure installation of the water manifold assembly	Visual	B	V	100 %	Drawing	Drawing		
xv.	Ensure installation of the drive assembly	Visual	B	V	100 %	Drawing	Drawing		
xvi.	Ensure installation of the wear belts	Visual	B	V	100 %	Drawing	Drawing		
xvii.	Ensure installation of the drainage belts	Visual	B	V	100 %	Drawing	Drawing		
xviii.	Ensure installation of the cloth aligning assembly	Visual	B	V	100 %	Drawing	Drawing		
xix.	Ensure installation of the thrust roller assemblies	Visual	B	V	100 %	Drawing	Drawing		
xx.	Ensure installation of the cloth support assemblies	Visual	B	V	100 %	Drawing	Drawing		
xxi.	Ensure installation of the filter cloth	Visual	B	V	100 %	Drawing	Drawing		
xxii.	Ensure installation of the cloth forming roll assembly	Visual	B	V	100 %	Drawing	Drawing		

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बी एच ई एल BHEL	**STANDARD FIELD QUALITY PLAN FOR VACUUM BELT FILTER (FGD) (STATEMENT OF CHECKS)**	FQP NO.: AA/CQ/SFQP/SCA/FG/08 REV. NO.: 00
SYSTEM : FGD	**SUB - SYSTEM: VACUUM BELT FILTER**	AREA : ERECTION SHEET 5 / 6

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
xxiii.	Ensure installation of the sluice pipe assembly	Visual	B	V	100 %	Drawing	Drawing		
xxiv.	Ensure installation of the rear seal	Visual	B	V	100 %	Drawing	Drawing		
xxv.	Ensure installation of the feed box	Visual	B	V	100 %	Drawing	Drawing		
xxvi.	Ensure installation of the rear deflector	Visual	B	V	100 %	Drawing	Drawing		
xxvii.	Ensure installation of the feed piping	Visual	B	V	100 %	Drawing	Drawing		
xxviii.	Ensure installation of the cake wash pipe	Visual	B	V	100 %	Drawing	Drawing		
xxix.	Ensure installation of the cake the thickness indicator	Visual	B	V	100 %	Drawing	Drawing		
xxx.	Ensure installation of the slow speed tachometer	Visual	B	V	100 %	Drawing	Drawing		
xxxi.	Ensure installation of the limit switvh and trip wire assemblies	Visual	B	V	100 %	Drawing	Drawing		
xxxii.	Ensure installation of the filtrate manifold assembly	Visual	B	V	100 %	Drawing	Drawing		
xxxiii.	Ensure installation of the splash shields	Visual	B	V	100 %	Drawing	Drawing		
xxxiv.	Ensure installation of the discharge chute	Visual	B	V	100 %	Drawing	Drawing		
4	Preliminary alignment & leveling of Belt Filter	Coupling Alignment and leveling of frame	B	M	100%	Drawing	Drawing	IR	
5	Grouting of base	Compressive strength of cube	A	M	100%	Drawing	Drawing	Grouting Protocol	
6	Final alignment of vacuum belt filter after connection of discharge & suction pipe	Alignment of coupling	A	M	100%	Drawing	Drawing	IR	

FOR TENDER PURPOSE ONLY

बी एच ई एल BHEL	**STANDARD FIELD QUALITY PLAN FOR VACUUM BELT FILTER (FGD) (STATEMENT OF CHECKS)**	FQP NO.: AA/CQ/SFQP/SCA/FG/08 REV. NO.: 00
SYSTEM : FGD	**SUB - SYSTEM: VACUUM BELT FILTER**	AREA : ERECTION SHEET 6 / 6

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
7	Alignment of Vacuum pump with motor	Alignment of coupling Dial gauge /Micrometer	A	M	100%	Drawing	Drawing	IR	
8	Ensure installation of components a. Feed end assembly b. Vacuum pan assembly c. Drip Pan d. Water Manifold e. Instruments f. Hydro cyclone	Visual & orientation	B	V	100%	Drawing	Drawing	Protocol	
9	Cake wash pump & Cloth wash pump . Ensure Performance test of 3 nos each of the above 2 pumps to be carried out at site	Visual	A	V	100%	Drawing	Extra punching on the pump name plate for extended warranty for 3 years against failure		
9	Cold Run test Of VBF	Belt Alignment	B	V	100%	Installation Manual	Installation Manual	IR	
10	Alignment of cake / cloth wash water pump	Visual & orientation	B	V	100%	-do-	-do-	IR	
11	As a common Data Folder for complete FGD System	QP Compliance	C	R	100 %	Inspection reports	Dossier		
12	Supervision of Erection & Commissioning		B	V/M	100%	OEM representative			

FOR TENDER PURPOSE ONLY

BHEL	STANDARD FIELD QUALITY PLAN FOR **VACUUM BELT FILTER (FGD)**	FQP NO.: AA/CQ/SFQP/SCA/FG/08
		REV. NO.: 00
		Sheet 1 / 1 Sheet

DOCUMENTS REFERRED IN STANDARD FIELD QUALITY PLAN

SL.NO.	Reference Document	Issuing Authority
1	Guidelines for Erection	BHEL, Ranipet

FOR TENDER PURPOSE ONLY

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.: **AA/CQ/SFQP/SCA/FG/08**
PROJECT					REV. NO.:
UNIT NO.		FGD	VACUUM BELT FILTER	ERECTION	LOG SHEET NO. : L-00
RATING					SHEET 1 / 1 SHEET

FOR TENDER PURPOSE ONLY

	INSTRUMENT REG.		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT		

PROTOCOL

FOR TENDER PURPOSE ONLY

			NAME	SIGNATURE & DATE	FQP NO.: **AA/CQ/SFQP/SCA/FG/08**
PROJECT		INSPECTED BY			REV. NO.: 00
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

FIELD QUALITY PLAN

FOR

WET BALL MILL SYSTEM

(Erection)

2X660MW MAITREE STPP

BHARAT HEAVY ELECTRICALS LIMITED

FOR TENDER PURPOSE ONLY

DOC NO.:
REV. NO.: 00

	STANDARD FIELD QUALITY PLAN FOR **WET BALL MILL SYSTEM** **(ERECTION)**	FQP NO.: **AA/CQ/SFQP/SCA/FG/12**
		REV. NO.: 00
		Sheet 1 / 1 Sheet

CONTENTS

Sl.No.	Description	No. of Sheets
1.0	Record of revisions	01
2.0	Authorization for different categories of checks	01
3.0	Statement of checks	06
4.0	Log sheets (L-01 to L-05)	09
5.0	Documents referred in Field Quality Plan	01
6.0	Protocol	01
7.0	Feedback on Field Quality Plan	01

FOR TENDER PURPOSE ONLY

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RECORD OF REVISIONS

REVISION NO.	DATE OF REVISION	DETAILS OF REVISION
00 (1st Issue)	21.02.19	Made first time as SFQP by the task force.

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **WET BALL MILL SYSTEM** (ERECTION)	FQP NO.: **AA/CQ/SFQP/SCA/FG/12**
		REV. NO.: 00
		Sheet 1 / 1

AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECKS

Classification of Check		Checking Authority	Accepting Authority
Symbol	Description		
A	Critical	BHEL & Customer	Customer
B	Major	BHEL	HOS
C	Minor	BHEL	BHEL

Legend : Customer : Customer or any other agency authorized by customer.

BHEL : Concerned engineers of BHEL – Task Performer.

HOS : HEAD OF SECTION for BHEL

NOTE:

1. Quantum of check shall be 100% for all characteristics unless otherwise mentioned in reference documents.
2. Customer shall witness A category checks. He is also authorized to carry out Surveillance in any of the B & C category of checks at his discretion.
3. In case of non-conformity, accepting authority shall ensure dispositioning before accepting and the dispositioning shall be reflected in log sheets / protocols. Dispositioning of non-conformities to be authorized by Head/TSX with intimation to Head/Quality.
4. Instruments with valid calibration to be used for measurements.
4. Changes in authorizations may be done by PS-Regions as per contract.

FOR TENDER PURPOSE ONLY

बी एच ई एल BHEL	STANDARD FIELD QUALITY PLAN FOR **WET BALL MILL SYSTEM (ERECTION)**	FQP NO.: **AA/CQ/SFQP/SCA/FG/12** REV. NO.: 00 Sheet 1 / 5

STATEMENT OF CHECKS

Capacity / Type	:	**ALL**
System	:	**FGD**
Sub-System	:	**WET BALL MILL SYSTEM**
Area	:	**ERECTION**

* For checks where log sheets are not called for, suitable records shall be maintained in the form of log book / protocols.

* As an evidence of having carried out the work satisfactorily, a general purpose log sheet L-00 shall be maintained for all the checks.

* Abbreviations used in the column "Type of Check" are :

  R : Record Verification

  M : Measurement

  V : Visual

FOR TENDER PURPOSE ONLY

बी एच ई एल BHEL	**STANDARD FIELD QUALITY PLAN FOR WET BALL MILL SYSTEM (STATEMENT OF CHECKS)**	FQP NO.: AA/CQ/SFQP/SCA/FG/12
		REV. NO.: 00
SYSTEM : FGD	**SUB - SYSTEM: WET BALL MILL SYSTEM** AREA : ERECTION	SHEET 2 / 5

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
1	Receiving inspection of WBM packages/ components	Visual inspection	B	V	100%	Packing List	Packing List	Inspection report	L-01
2	Foundation inspection of WBM package	Dimension	C	M	100%	Drawing	Drawing	Inspection report	Review of Civil foundation release note, Anchor Bolt installation tolerance±3mm & angular 1 degree from vertical
3	Support plate (Sole Plate)	Elevation & level	A	M	100%	Drawing, Installation manual	Drawing, Installation manual	Inspection report	L-02
4	Gap between sole plate & main bearing base plate	Clearance	A	M	100%	Drawing, Installation manual	Drawing, Installation manual	Protocol	Grouting space shall be minimum 19mm.
5	Main Bearings alignment & Mill shell	Dimension	A	M	100%	O & M manual	O & M manual	Inspection report	Co-axial to each other L-03
6	Grouting		A	V	100%				
7	Mill flange face run out	Axial run out of mill flange face	A	M	100%	O & M manual	O & M manual	Inspection report	L-04
8	Gear & Pinion Backlash	Tape	B	M	100%	O & M manual	O & M manual	Inspection report	L-05
9	Motor & Gear Box alignment	Dial Gauge	A	M	100%	O & M manual	O & M manual		

FOR TENDER PURPOSE ONLY

बी एच ई एल BHEL	**STANDARD FIELD QUALITY PLAN FOR WET BALL MILL SYSTEM (STATEMENT OF CHECKS)**	FQP NO.: AA/CQ/SFQP/SCA/FG/12
		REV. NO.: 00
SYSTEM : FGD	**SUB - SYSTEM: WET BALL MILL SYSTEM** AREA : ERECTION	SHEET 3 / 5

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
10	Installation of WBM components								
i)	Feed spout	Compliance to drawing/Visual &orientation	C	V	100%	Drawing, O &M manual	Drawing, O & M Installation manual	Verification	
ii)	Inching drive	Compliance to drawing/Visual &orientation	C	V	100%	Drawing, O &M manual	Drawing, O & M Installation manual	Verification	
iii)	Main bearing lubrication system	Compliance to drawing/Visual &orientation	C	V	100%	Drawing, O &M manual	Drawing, O & M Installation manual	Verification	
iv)	Pinion bearing lubrication system	Compliance to drawing/Visual &orientation	C	V	100%	Drawing, O &M manual	Drawing, O & M Installation manual	Verification	
v)	Gear spray system	Compliance to drawing/Visual &orientation	C	V	100%	Drawing, O &M manual	Drawing, O & M Installation manual	Verification	
vi)	Shell & head liners	Compliance to drawing/Visual &orientation	C	V	100%	Drawing, O &M manual	Drawing, O & M Installation manual	Verification	
viii)	Run Test of ball mill (without ball)	Noise, Vibration & Integrity	A	V	100%	Drawing, O &M manual	Drawing, O & M Installation manual	Verification	

FOR TENDER PURPOSE ONLY

बी एच ई एल BHEL	**STANDARD FIELD QUALITY PLAN FOR WET BALL MILL SYSTEM (STATEMENT OF CHECKS)**	FQP NO.: AA/CQ/SFQP/SCA/FG/12 REV. NO.: 00
SYSTEM : FGD	**SUB - SYSTEM: WET BALL MILL SYSTEM** AREA : ERECTION	SHEET 4 / 5

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
11)	**GRAVIMETRIC FEEDERS**								
i)	Checking & Marking of center line of feeders	Water level/Level Gauge/ Measuring Tape	B	V/M	100%	Drawings	Drawings	Protocol	
ii)	Alignment of Base frame	Plum Bob/ Measuring Tape/Water Level/Dial Gauge	B	V/M	100%	Drawings	Drawings	Protocol	
iii)	Installation & alignment of Pulleys	Plum Bob/ Measuring Tape/Water Level/Feeler Gauge	B	V/M	100%	Drawings	Drawings	Protocol	
iv)	Belt Laying & Joining	----	B	V	100%	Drawings	Drawings	Protocol	
v)	Mounting & Alignment of Feeder drive and coupling	Plum Bob/ Measuring Tape/Water Level/Dial Gauge	B	V/M	100%	Drawings	Drawings	Protocol	
vi)	Alignment of feeder assembly	Water level/Level Gauge/ Measuring Tape	B	V/M	100%	Drawings	Drawings	Protocol	
viii)	Check tightness of mounting bolts.	---	B	V	100%	Drawings	Drawings	Protocol	
i)	Ensure Grouting of feeder	---	B	V	100%	Drawings	Drawings	Protocol	
ii)	Check installation of Silo shut off valve and down spout.	---	C	V	100%	Drawings	Drawings	Protocol	
iii)	Check installation of feed pipe from feeder to Ball Mill	---	C	V	100%	Drawings	Drawings	Protocol	
iv)	Check installation of discharge valve	---	C	V	100%	Drawings	Drawings	Protocol	

FOR TENDER PURPOSE ONLY

बी एच ई एल BHEL	**STANDARD FIELD QUALITY PLAN FOR WET BALL MILL SYSTEM (STATEMENT OF CHECKS)**		FQP NO.: AA/CQ/SFQP/SCA/FG/12
			REV. NO.: 00
SYSTEM : FGD	**SUB - SYSTEM: WET BALL MILL SYSTEM**	AREA : ERECTION	SHEET 5 / 5

SL NO.	ACTIVITY & OPERATION	CHARACTERISTICS/ INSTRUMENTS	CLASS OF CHECK	TYPE OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	REMARKS
c)	Installation of feeder remote control cabinet.	---	C	V	100%	Drawings	Drawings	Protocol	
b)	Check completion of electrical cabling and earthing of feeder.	Multimeter	B	V/M	100%	Drawings	Drawings	Protocol	
12)	**HYDROCYCLONES**								
a)	Foundation inspection	Dimension	C	M	100%	Drawing	Drawing	Inspection report	
b)	Ensure tightness of bolt	---	B	V	100%	Drawings	Drawings	Protocol	
c)	Center shaft to be vertical to the ground level	Plum Bob	B	V/M	100%	Drawings	Drawings	Protocol	
d)	Ensure any gas cutting/welding is not done near hydro cyclone	---	B	V	100%	Drawings	Drawings	Protocol	
13)	**MILL CIRCUIT TANKS**	Refer separate FQP for FGD Tanks							
14)	**MILL CIRCUIT PUMPS**	Refer separate FQP for FGD Pumps							
15)	**MILL CIRCUIT TANK AGITATORS**	Refer separate FQP for FGD Agitators							

FOR TENDER PURPOSE ONLY

FIELD QUALITY PLAN
FOR
FGD ABSORBER 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-HT-QA-300079-PSE, REV. NO. : 0

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-BR-50
REV. No.: 0

FIELD QUALITY PLAN
FOR
FGD ABSORBER SYSTEM

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-HT-QA-300079-PSE, REV. NO. : 0

PREPARED BY	ENGR./ QLY, BHEL-PSER	APPROVED BY	HEAD / QLY, BHEL-PSER

FQP NO.	**QPE-MTE-660-BR-50**
ORIGINAL DATE OF ISSUE	10/04/2019
REVISION NO. & DATE	0, Dt. 10/04/2019
COPY NO.	01
ISSUED TO	BIFPCL / FICHTNER
DATE OF ISSUE	10/04/2019
PURPOSE :	FOR REVIEW & COMMENTS / APPROVAL
ISSUED BY (SIGNATURE & DESIGNATION)	ENGR. / QLY, BHEL- PSER

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

PSER	FIELD QUALITY PLAN FOR FGD ABSORBER SYSTEM	FQP NO: MAITREE-00-HT-QA-300079-PSE BHEL Doc. No. : QPE-MTE-660-BR-50
		REV. NO. : 0
		SHEET 1 / 1 SHEET

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PSER	FIELD QUALITY PLAN FOR FGD ABSORBER SYSTEM	FQP NO: MAITREE-00-HT-QA-300079-PSE BHEL Doc. No. : QPE-MTE-660-BR-50
		REV. NO. : 0
		SHEET 1 / 1 SHEET

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 10/04/2019	The document is prepared as per Technicall Specifications and is in line with BHEL standard FQP for FGD Absorber.

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	FQA of BIFPCL / OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	Head FQA of BIFPCL / OE
'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/ OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BIFPCL Erection Engineer/ OE
'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

PSER	FIELD QUALITY PLAN FOR FGD ABSORBER SYSTEM	FQP NO: MAITREE-00-HT-QA-300079-PSE BHEL Doc. No. : QPE-MTE-660-BR-50
		REV. NO. : 0
		SHEET 01 / 08 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	COOLING WATER SYSTEM
Sub-system :	FGD ABSORBER SYSTEM
Area :	RECEIPT, STORAGE & 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. For FQP of Pumps & Agitators, refer to document number MAITREE-00-HT-QA-300089-PSE
4. For FQP of Tanks, refer to document number MAITREE-00-HT-QA-300090-PSE
5. For FQP of Process Water & Slurry piping, refer to document number MAITREE-00-HT-QA-300091-PSE
6. For FQP of Electrical and C&I work for FGD System, refer to document number MAITREE-00-HT-QA-300092-PSE
7. Latest revision of Standards & Specification shall apply.
8. Materials shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
9. 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
10. Only approved welding consumables shall be used, as per Approved Welding Consumable list.
11. Procedure shall be established and followed, for Procurement, Storage, Issue and Control of Welding Consumables.
12. NDT shall be carried out by Qualified Personnel with compliance to Approved NDT procedures and unless noted otherwise in the FQP, the Acceptance Norms shall be as per ASME Sec- V.
13. The Agency carrying out RT shall be approved by Local Authorities.
14. Field Radiography shall be carried out in compliance with Local Statutory requirements and safety precautions by Approved Agency.
15. Radiography Source handling and control procedure shall be established as per Local Statutory requirements and complied.
16. Preheating and Post Weld Heat treatment shall be in compliance with Approved Procedures.
17. Gauges and measuring Instruments, with valid calibration only shall be used
18. Cleaning, preservation and Painting of products shall be carried out as per Approved Painting Schedule.
19. Format of record identified with “tick” (√) mark in column no. ‘D*’ shall be essentially included in QA documentation.

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA		FIELD QUALITY PLAN FOR **FGD ABSORBER SYSTEM** STATEMENT OF CHECKS						FQP NO.: **MAITREE-00-HT-QA-300079-PSE** BHEL Doc. No. : QPE-MTE-660-BR-50 REV. NO. : 0 SHEET 02 OF 08		
SYSTEM: FGD		SUB-SYSTEM: FGD ABSORBER SYSTEM						AREA: RECEIPT, STORAGE & 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**	*10*
A	**GENERAL REQUIREMENTS**									
A.01	Ensure availability of requisite equipment in good working condition well before commencement of concerned activity. All MMRs to be used in 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 MMR damaging incident	Owner's Technical Specifications & Drawing	The calibration certificate shall specify the fitness of the MMRs within the limit of tolerance for use.	SR & Calibration Report	√	- 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 / erection drawings and OEM's Manual for equipment, 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**									
B.01	Check availability of Bill of materials (BOM) / packing slip, dispatch documents.	V	-	C	100%	-	-	-		
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	BOM / Dispatch documents / Packing slip	Logbook		
B.03	Check components/ boxes carefully for physical condition - a) In case of external damage to boxes, remove the top cover so that contents can be seen thoroughly. If the contents are sealed / intact, cover the contents / packing with original plastic sheeting / additional tarpaulin cover. b) 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.04	V	-	C	100%	Dispatch documents/ Packing slip	Dispatch documents/ Packing slip	Logbook		
B.04	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	BHEL Work instructions for site Operations	BHEL Work instructions for site Operations	MDR		

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FGD ABSORBER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300079-PSE** BHEL Doc. No. : QPE-MTE-660-BR-50 REV. NO. : 0 SHEET 03 OF 08
SYSTEM: FGD	SUB-SYSTEM: FGD ABSORBER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*10*
B.05	Control of receipt and issue of all components	V	-	C	100%	BHEL Work instructions for site Operations	BHEL Work instructions for site Operations	Register		
C	**STORAGE & PRESERVATION AT SITE**									
C.01	Ensure storage of materials as per OEM's Guidelines with easy traceability.	V	-	B	100% after receipt	Storage & Preservation Instruction from OEM (Annex-II)	Storage & Preservation Instruction from OEM (Annex-II)	Checklist		
C.02	Ensure preservation of materials as per OEM's Guidelines	V		B	As per OEM's Guidelines	Storage & Preservation Instruction from OEM (Annex-II)	Storage & Preservation Instruction from OEM (Annex-II)	Checklist		
C.03	Ensure safe handling & transportation to erection site	V	-	C	100%	Annex-II	Annex-II	-		Trailer, fork lift or crane of adequate capacity to be deployed
D	**WELDING & NON DESTRUCTIVE EXAMINATIONS**									
D.01	Ensure availability of applicable qualified WPS	R	-	A	100%	Drawing / EWS	ASME BPVC SEC-IX	WPS	√	
D.02	Review of MTC of welding electrodes & other consumables	R	-	A	100%	Relevant AWS specifications as per applicable WPS	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 & ASME BPVC SEC-IX	ASME BPVC SEC-IX	WQR	√	
D.04	Adoption of correct procedure, approved electrodes and methods : review of job cards	R	-	A	Random in each shift	Drawing / EWS & WPS	Drawing / EWS & WPS	SR		
D.05	Checking drying / baking of electrodes (where ever applicable)	V & R	-	B	Random in each shift	WPS	Recommendation of electrode manufacturer	SR		
D.06	Pre heating of field weld joints, as applicable.	V & M	Non-contact type Thermometer / Thermo-chalk	A	As per WPS	WPS	AWWA D100	SR		

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FGD ABSORBER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300079-PSE** BHEL Doc. No. : QPE-MTE-660-BR-50 REV. NO. : 0 SHEET 04 OF 08
SYSTEM: FGD	SUB-SYSTEM: FGD ABSORBER SYSTEM	AREA: RECEIPT, STORAGE & ERECTION

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.07	Ensure proper sequence of welding, as applicable	V	-	C	100%	Drawings & WPS	Drawings & WPS	SR		
D.08	PWHT of field weld joints, as applicable.	V/M	Time-Temp. Recorder	A	As per WPS	WPS	WPS & AWWA D100	SR	√	
D.09	Review of qualification of NDT inspectors	R	-	A	Once before engagement of each inspector	ASNT SNT-TC-1A or equivalent	Level-II or above	NDT Inspector Register		
D.10	Visual Inspection of all weldments (field weld)	V & M	As required	B	100%	Drawing & ASME BPVC SEC-V	AWWA D100& ASME BPVC SEC. VIII, DIV. 1	SR		
D.11	DPT on root run of field butt welds after back-gouging	T	DPT Kit	B	100%	ASME BPVC SEC-V	ASME BPVC SEC. VIII, DIV. 1	SR	√	
D.12	DPT of final welding of the casing panel of absorber	T	DPT Kit	B	100%	ASME BPVC SEC-V	ASME BPVC SEC. VIII, DIV. 1	SR	√	
D.13	RT of butt welds field joints. **NOTE** - For following joints RT need not be done : 1. Welds in roof plates 2. Welds in flat tank bottoms resting directly on grade or foundation 3. Welds joining flat tank bottoms to the first ring of the tank shell 4. Welds connecting appurtenances to the tank	T	RT Kit	A	Random 5%	AWWA D100 & ASME BPVC SEC-V	AWWA D100 & ASME BPVC SEC. VIII, DIV. 1	RT Film & Report	√	
D.14	DPT nozzle welds & all finished welds	T	DPT Kit	B	Random 10%	ASME BPVC SEC-V	ASME BPVC SEC. VIII, DIV. 1	SR	√	
D.15	Preservation of field welded area, as applicable	V	As required	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen		SR		
E	**CHECKS FOR FOUNDATION**									
E.01	Check for foundation : disposition & dimensions	M	Measuring tape, Optical surveying instrument & Water level	B	100%	Drawing	Drawing	SR		
E.02	Inspection of Anchor bolts and embedded items : Check locations and levels	M	Measuring tape & Water level	B	100%	Drawing	Drawing	SR		

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FGD ABSORBER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300079-PSE** BHEL Doc. No. : QPE-MTE-660-BR-50 REV. NO. : 0 SHEET 05 OF 08
SYSTEM: FGD	SUB-SYSTEM: FGD ABSORBER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*10*
F	**CHECKS FOR ABSORBER TOWER ERECTION**									
F.01	Packer Liner Setting with respect to Embedded Angle - Check alignment & level	V & M	Optical Surveying Instrument, Measuring tape & water level	B	100%	Drawing	Drawing & Erection Guidelines (Annex-I)	SR		
F.02	Bottom Plate Installation - Check alignment & level	V & M	Optical Surveying Instrument, Measuring tape & water level	B	100%	Drawing	Drawing & Erection Guidelines	SR		Welding checks & NDT shall be as per Sl. No. 'D'
F.03	Ensure installation of scaffolding	V	-	B	100%	Drawing & Erection Guidelines	Project HSE Plan	SR		
F.04	1st Stage Panel Casing Installation - Check alignment & verticality	V & M	Measuring tape & Plumb bob	B	100%	Drawing	Drawing & Erection Guidelines	SR		Welding checks & NDT shall be as per Sl. No. 'D'
F.05	Steel Structure Erection - Check alignment & verticality	V & M	Measuring tape, Plumb bob & water level	B	100%	Drawing	Drawing & Erection Guidelines	SR		Welding checks & NDT shall be as per Sl. No. 'D'
F.06	Upper Casing Panel Installation - Check alignment & verticality	V & M	Measuring tape, Plumb bob & water level	B	100%	Drawing	Drawing & Erection Guidelines	SR		Welding checks & NDT shall be as per Sl. No. 'D'
F.07	Inlet Duct Panel Installation - Check alignment	V & M	Measuring tape, Plumb bob & water level	B	100%	Drawing	Drawing & Erection Guidelines	SR		Welding checks & NDT shall be as per Sl. No. 'D'
F.08	Spray Pipe Support Installation - Check alignment & Verticality	V & M	Measuring tape, Plumb bob & water level	B	100%	Drawing	Drawing & Erection Guidelines	SR		Welding checks & NDT shall be as per Sl. No. 'D'
F.09	Mist Eliminator & Mist Eliminator washing Pipe Support Installation - Check alignment & Verticality	V & M	Measuring tape, Plumb bob & water level	B	100%	Drawing	Drawing & Erection Guidelines	Joint Protocol		Welding checks & NDT shall be as per Sl. No. 'D'
F.10	Ceiling Panel Installation - Check alignment & Verticality	V & M	Measuring tape, Plumb bob & water level	B	100%	Drawing	Drawing & Erection Guidelines	Joint Protocol		Welding checks & NDT shall be as per Sl. No. 'D'

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FGD ABSORBER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300079-PSE** BHEL Doc. No. : QPE-MTE-660-BR-50 REV. NO. : 0 SHEET 06 OF 08
SYSTEM: FGD	SUB-SYSTEM: FGD ABSORBER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*10*
F.11	Check Fit up of Nozzles & manholes and other appurtenance of required size at designed location as per drawing.	V & M	Measuring tape, Plumb bob & water level	B	100%	Drawing	Drawing & Erection Guidelines	Joint Protocol		
G	**TESTING OF ABSORBER TOWER**									
G.01	Vacuum box testing of ceiling panel, Shell & bottom plate welds	T	Vacuum box & Vacuum pump	A	100%	Procedure (Annex-III)	If no leakage is found during the test, the result is OK.	Log book	√	The necessary pressure is 0.06MPa(g).
H	**CHECKS FOR PAINTING (EXTERNAL SURFACE)**									
H.01	Check outside surface preparation, as applicable	V	-	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen	ISO 8501-1	SR		
H.02	Check Priming Coat of outside surface - thickness & finish	V & M	DFT Gauge	C	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen		SR		Primer & Paint to be procured from BIFPCL approved source & shall conform to ISO 12944
H.03	Final Painting of outside surface - thickness, finish, Colour shade, labelling & Marking	V & M	DFT Gauge	B	100%	Drawing, Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & approved colour scheme : MAITREE-00-BFA-FF-100001-GEN		Joint Protocol	√	
I	**CHECKS FOR RUBBER LINING**									
I.01	Check surface preparation, as applicable	V	-	B	100%	Approved Surface Preparation & Application Procedure for Absorber Lining : MAITREE-01-HTD-MDC-200306-RPT		Logbook		
I.02	Application of adhesive coating after surface preparation, as applicable	V	-	B	Random in each shift	Drawing & MAITREE-01-HTD-MDC-200306-RPT		Logbook		
I.03	Application of Rubber lining by Cold Bond Method	V		B	Random in each shift	Drawing & MAITREE-01-HTD-MDC-200306-RPT		Logbook		
I.04	High Voltage & High frequency spark test, as applicable	V & M	Spark test set up	A	Random	MAITREE-01-HTD-MDC-200306-RPT		Joint Protocol		
I.05	Hardness Test - For Rubber Lining	V & M	Durometer	B	Random	MAITREE-01-HTD-MDC-200306-RPT		Joint Protocol		
I.06	Adhesion test on production test piece at site, as aplicable	V & M		A	Random	MAITREE-01-HTD-MDC-200306-RPT		Joint Protocol		

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FGD ABSORBER SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-HT-QA-300079-PSE** BHEL Doc. No. : QPE-MTE-660-BR-50 REV. NO. : 0 SHEET 07 OF 08
SYSTEM: FGD	SUB-SYSTEM: FGD ABSORBER SYSTEM	AREA: RECEIPT, STORAGE & 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**	*10*
J	**CHECKS FOR ABSORBER SPRAY PIPES**									
J.01	Check all concerned absorber dimensions, i.e tolerance of Absorber Casing, support beam location, Absorber Nozzle location, Flange face location, bolt hole location, Size & Spacing etc, before Spray Pipe Installation	V	Measuring tape & water level	B	100%	Drawing & Erection Guidelines (Annex-II)				
J.02	Installation of temporary support / scaffold on Absorber Nozzles for inserting Spray Pipe into Absorber – Check alignment	V & M	Measuring tape & water level	B	100%	Drawing & Erection Guidelines (Annex-II)	Project HSE Plan			1. Padded support shall be used not to damage rubber lining 2. No welding is permitted.
J.03	Spray Pipe Installation using chain block- Check for horizontal level & insert shim plates to adjust the horizontal level within tolerance.	V & M	Measuring tape & water level	B	100%	Drawing & Erection Guidelines (Annex-II)				
J.04	Tightening of Bolts & Nuts – Check as per bolt tightening method during Erection.	V & M	Visual check	B	100%	Drawing & Erection Guidelines (Annex-II)				
I.11	Loosening of Saddle settings bolt & nut to allow thermal expansion of Spray pipes – Check as per procedure.	V & M	Visual check	B	100%	Drawing & Erection Guidelines (Annex-II)				
K	**CHECKS FOR ABSORBER SPRAY NOZZLES**									
K.01	Scaffolding modification for Installation of Spray Pipes – Check alignment during Erection.	V & M	Visual check	B	Random	Drawing & Erection Guidelines (Annex-II)	Project HSE Plan			1. Padded support shall be used not to damage rubber lining 2. No welding is permitted.
K.02	Spray pipe installation over Spray pipe flange & tightening of bolts & nuts – Check alignment & horizontality during Erection.		Visual check	B	100%	Drawing & Erection Guidelines (Annex-II)				
K.03	Before full torque tightening of Spray Nozzle Bolts & Nuts - Check for Spray Nozzle horizontality within tolerance.	V/M	Visual check	B	100%	Drawing & Erection Guidelines (Annex-II)				
L	**CHECKS FOR ABSORBER JET AIR SPARGER (JAS)**									
L.01	JAS Nozzle Orientation – Check for Air Intake Nozzle to be in upright Orientation.	V/M	Measuring Tape & water level	B	100%	Drawing & Erection Guidelines (Annex-II)		Log book		
L.02	JAS Bolt & Washer – Check dimension for double nut installation during Erection.	V & M	Measuring Tape & water level	B	100%	Drawing & Erection Guidelines (Annex-II)		Log book		

	BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FGD ABSORBER SYSTEM** STATEMENT OF CHECKS						FQP NO.: **MAITREE-00-HT-QA-300079-PSE** BHEL Doc. No. : QPE-MTE-660-BR-50		
								REV. NO. : 0		
								SHEET 08 OF 08		
SYSTEM: FGD		SUB-SYSTEM: FGD ABSORBER SYSTEM						AREA: RECEIPT, STORAGE & 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**	*10*
M	**CHCEKS FOR MIST ELIMINATORS**									
M.01	Check all concerned absorber dimensions i.e tolerance of absorber casing, support beam location, bolt hole location size & spacing etc., before installation of Mist Eliminator	V & M	Measuring Tape & water level	B	Random	Drawing & Erection Guidelines (Annex-II)				
M.02	Insert lower washing spray pipe into absorber – No sliding of pipe over support permitted – Check during erection.	V	-	B	100%	Drawing & Erection Guidelines (Annex-II)				
M.03	Insert dedicated shim plates between pipe & pipe support, and fixing U-bands or U- bolts and external flanges.	V	-	B	100%	Drawing & Erection Guidelines (Annex-II)				
M.04	Install the lower panel of Mist Eliminators – Check for alignment during Erection.	V & M	Measuring Tape & water level	B	Random	Drawing & Erection Guidelines (Annex-II)				
M.05	Install the lower down washing spray pipe & upper up washing spray pipe – Check for alignment during Erection.	V & M	Measuring Tape & water level	B	Random	Drawing & Erection Guidelines (Annex-II)				
M.06	Install the upper panels of Mist Eliminators – Check for alignment during Erection.	V & M	Measuring Tape & water level	B	Random	Drawing & Erection Guidelines (Annex-II)				
M.07	Install the upper down washing spray pipe – Check for alignment during Erection.	V & M	Measuring Tape & water level	B	Random	Drawing & Erection Guidelines (Annex-II)				

WARNING
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Mitsubishi Heavy Industries,Ltd..

ANNEX-I

BIFPCL DOC. NO. : MAITREE-00-HT-QA-300079-PSE, REV. NO. : 0

FOR REFERENCE

General Erection Guide

For

Absorber

29 SHEETS WITH COVER

REVISIONS NO.	DATE	DESCRIPTION	SECTION	APP'D	MHI PJ	APP'D

ORDER NO.	CUSTOMER
PROJECT TEAM	
APPROVED	
	PROJECT
SECTION	CONSTRUCTION
	Drawing No. / REV.
Approved	S320-00100
Reviewed	
Checked	CONTROL No. / 0
Prepared	
DRAWN DATE	

MITSUBISHI HITACHI POWER SYSTEMS, LTD.

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2.3 Test Instrument and Apparatus 2

3. ERECTION GUIDE 3

3.1 Work Flow Chart 3

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3.3 Fitting of Appurtenances 6

3.4 Lining Work 6

FOR REFERENCE

ANNEX-I

BIFPCL DOC. NO. : MAITREE-00-HT-QA-300079-PSE, REV. NO. : 0

[ATTACHED SHEET]

- INSTALLATION GUIDE FOR ABSORBER
- LINING GUIDE FOR ABSORBER
- TEST AND INSPECTION PROCEDURE AND STANDARD
- ASSEMBLY DRAWING FOR ABSORBER CASING PANELS

1. GENERAL

1.1 Scope

This erection guide covers general requirements for Absorber erection work and internal lining work for Maitree STPP.

This document describes only a general requirement for installation and lining work, and shall be used as reference. Detail procedure should be issued by subcontractor in accordance with site condition and local regulation.

2. REQUIREMENTS FOR INSTALLATION

2.1 Drawings and specific note

For the structure, panel casing and the internal elements such as spray pipe and mist eliminator, of which drawings and specific notes are provided, instruction information in such drawing shall have more precedence than this procedure.

2.2 Precaution for installation

2.2.1 The following items shall be considered for the selection of a lifting method and the installation of lifting equipment.

(1) Size, weight and shape of the steel structure, casing panel, equipment and machinery to be installed, and the slinging points.
(2) Space of the location of installation.
(3) Space and ground condition at the place of the lifting equipment.
(4) Buried objects such as underground piping and cables, and open trenches existing at the place where the lifting equipment is erected.
(5) Condition of roads as to whether or not they can be used.
(6) Space for dismantling or taking-out of the lifting equipment.
(7) Performance and maintenance condition of the lifting equipment.

2.2.2 Where material's roped for lifting, protection pads shall be applied on the corners, finished surfaces, etc. of the material for preventing damage resulting from wire rope.

2.2.3 Construction equipment, machines, tools and measuring instruments to be used in the works shall be thoroughly inspected, prior to use.

2.2.4 When lifting up or lowering down the equipment by the sling, due care shall be taken to its location and center of gravity in order to avoid unbalance of the material.

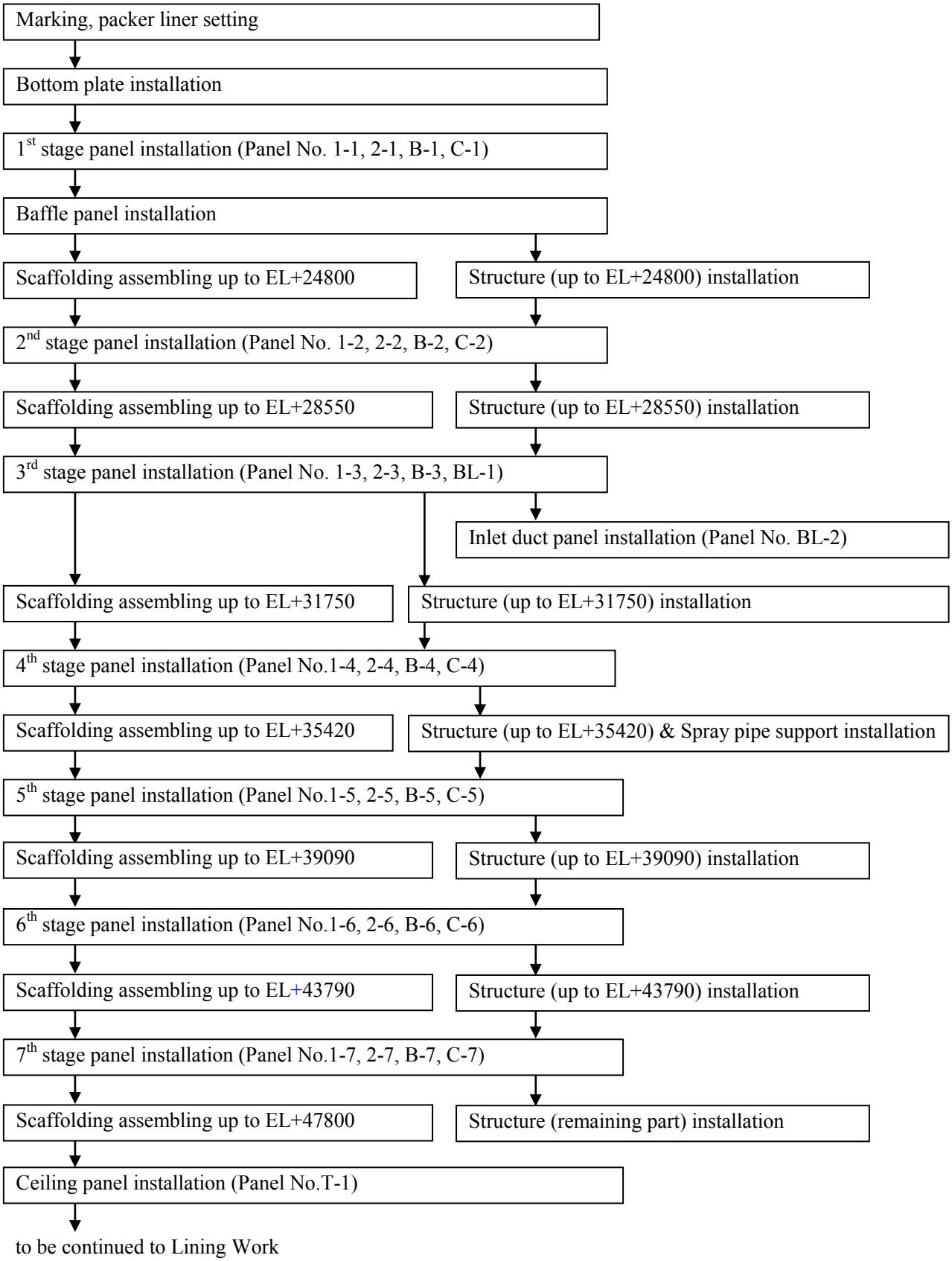
2.3 Test Instrument and Apparatus

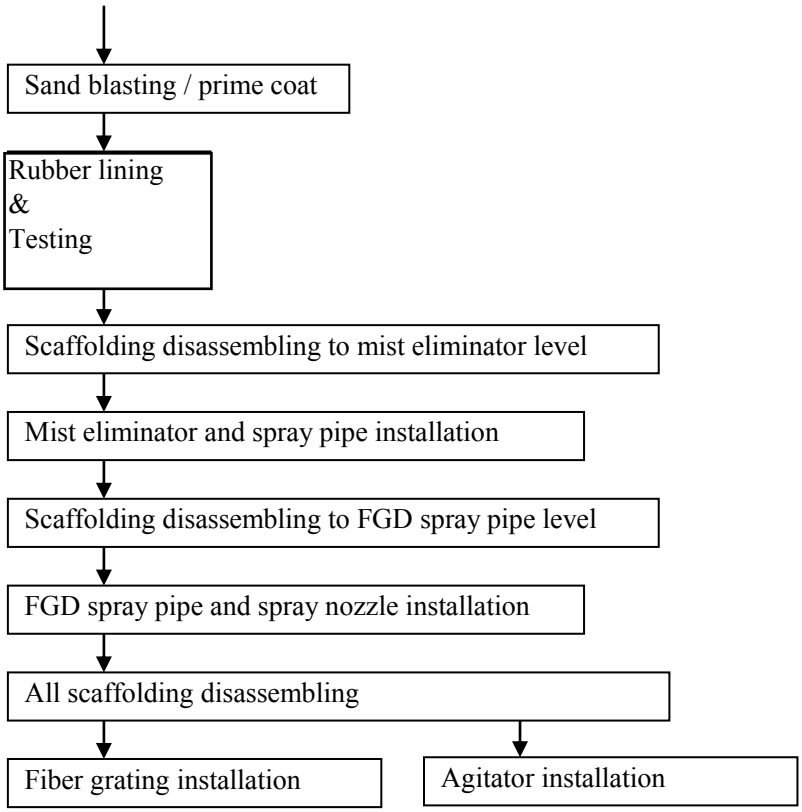
(1) All instruments and apparatus required for the inspection/test shall be controlled, calibrated and maintained to demonstrate the conformance of product to the specific requirements, as required item of ISO9001.
All calibration records which show the accuracy and clarity of the captioned items shall be ready for reviewing at the time of witness inspection.

(2) A label indicating expire date shall be struck on the calibrated instrument and apparatus.

3. ERECTION GUIDE

3.1 Work Flow Chart




from Absorber Erection Work
Sand blasting / prime coat
Rubber lining
&
Testing
Scaffolding disassembling to mist eliminator level
Mist eliminator and spray pipe installation
Scaffolding disassembling to FGD spray pipe level
FGD spray pipe and spray nozzle installation
All scaffolding disassembling
Fiber grating installation
Agitator installation

3.2 Casing Panel Installation

(1) Confirmation prior to erection

Splices of bottom plates at which casing panel are located shall be cleaned.

(2) Arrangement of casing panel

(a) Location of casing shall be marked on the foundation. Then, according to the casing panel assembly drawings, the location of vertical splices between plates shall be marked.

(b) Temporary assembly of lower stage casing panel shall be as follows :

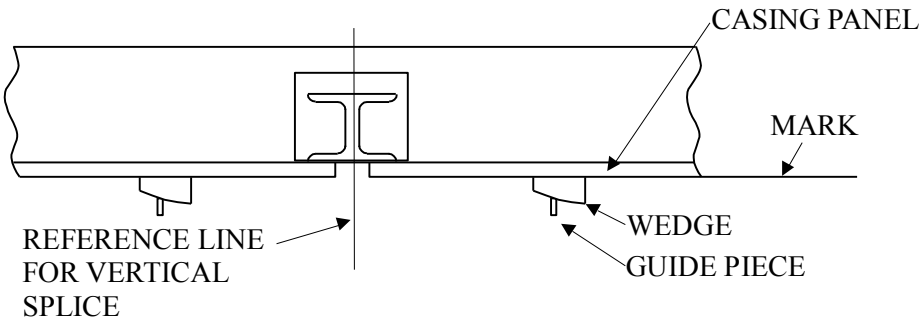
* Tack-weld the guide pieces to the bottom plate at intervals of 3 feet inside and outside the circular marking.
* When the temporary assembly of lower stage casing panel is completed, inspect the dimensions as per inspection criteria.

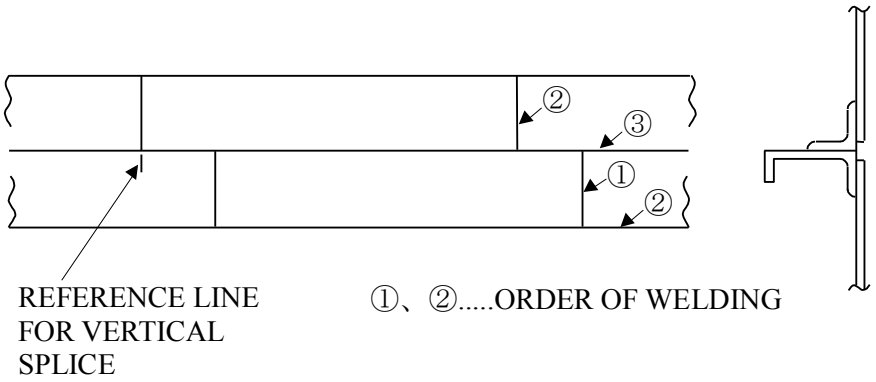
(c) Temporary assembly of upper stage casing panel shall be as follows :

* Match marks which have been provided on the inside surface of the lower stage casing panel shall be matched to vertical splice line and assembled.
* Jigs necessary for assembly are as follows :

Horizontal splice (stiffener) 3 feet intervals

Horizontal splice (stiffener) 3 feet intervals

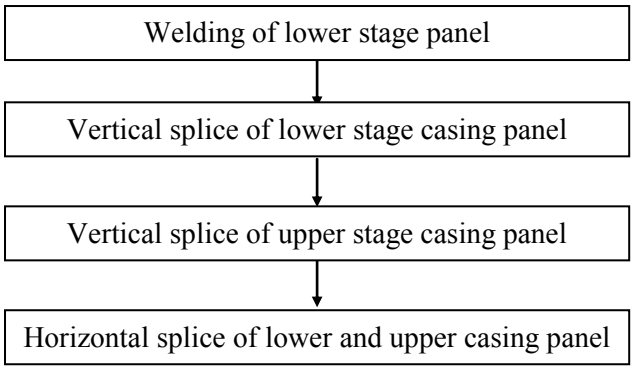




(3) Welding of the casing panel

(a) Order of the weld is as follows.

Vertical splice of lower stage casing panel



(b) The weld between lower stage casing panel and bottom plate shall be performed in a suitable time after the completion of vertical splice for lower stage casing panel.

(c) Vertical splice shall be welded from side by back step method of 1/3 of wall plate width after the completion of assembly of upper wall plate. After the welding from outside, grinding from inside shall be performed with grinder.

Welding of horizontal splices shall alternate across the 1st wall. 2nd wall weld's shall be laid simultaneously.

(d) Spacers used for root gap of welds shall be removed.

3.3 Fitting of Appurtenances

(1) Appurtenances such as manholes and nozzles shall be installed after marking on correct locations in accordance with the layout dwgs. The time to install then shall be decided in consideration of site construction progress.

(2) The location of large diameter nozzles which will be connected to rubber lined pipes shall be determined in accordance with the final piping locations which shall be set at the site.

3.4 Lining Work

(1) Confirmation prior to blasting and lining

Following document shall be referred for detail planning of lining work.

-

Humidity shall be checked and recorded before every application of blasting or lining. The surfaces shall not be blasted nor lined when relative humidity is

greater than 85%, or when there is a possibility that the blasted surface will be subject to wetting.

Flames, smoking, exposed heating elements, or any sources of ignition shall be prohibited in areas where paint application is being performed.

Other warning signs, such as “No Smoking”, “Caution”, “No Open Flames”, etc., shall be posted in all areas where paint is currently being applied. The signs shall also be remain for a sufficient times after the paint application has been completed.

(2) Storage of lining materials

A warehouse for the storage of paint shall be prepared in accordance with the applicable codes and regulations. The following items shall be considered:

- Good ventilation
- Explosion proof electrical appliances
- Roof and siding are constructed to avoid direct sun light
- Placing of warning signs such as “No Smoking”, “No Open Flames” and “Storage of Inflammable Materials”
- The maximum storage time for paint materials as per paint manufacturer.

(3) Surface preparation

- The grade of surface preparation for lining shall be SSPC SP-10 (Sa 2-1/2): near-white metal blast cleaning.

(4) Lining material

Mixing and thinning of paint shall be done in the following manner:

- Prior to opening the can, the product name, packing style, and the term of storage validity for the paints shall be checked.
- Any paint skin which has formed in the container shall be removed.
- Mixing shall preferably be done fully by mechanical stirrers.
- Lining materials which tends to easily separate shall be frequently mixed by a mechanical agitator or stirrer during its use.
- The thinning and mixing amount shall be in accordance with lining manufacturer’s instructions.

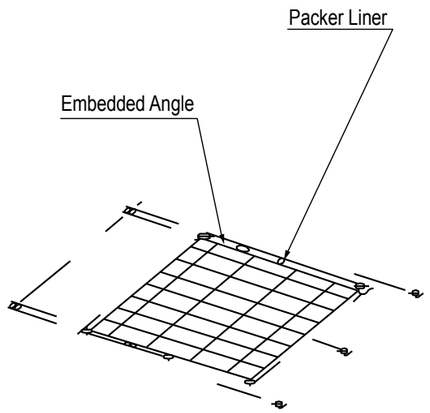
- Mixing and thinning shall be done in a well ventilated place where there are no open flames.

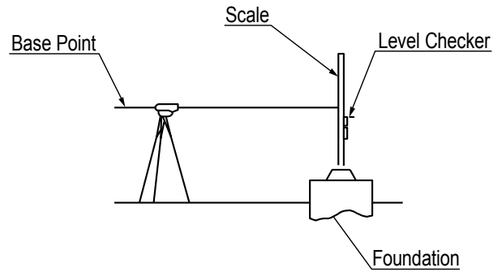
(5) Lining application

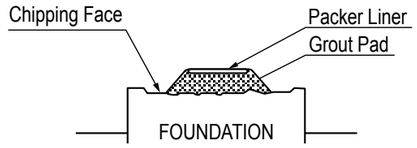
The application methods shall be as follows:

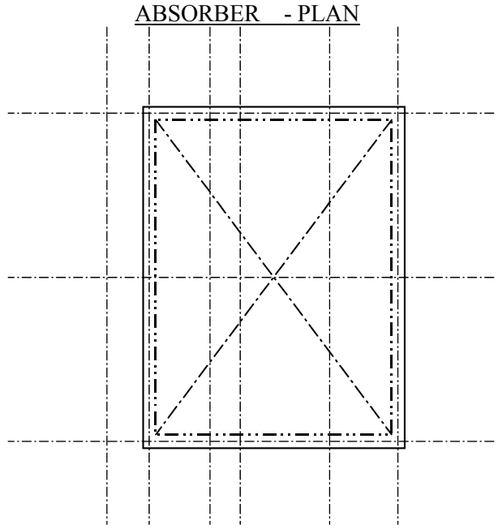
- Lining application shall be done by one of, or a combination of, the following methods:
  - (a) Brush
  - (b) Roller
  - (c) Spray (air spray or airless spray)
  - (d) Practical other methods

INSTALLATION GUIDE FOR ABSORBER

<table>
<tr><th>STEP NO.</th><th>WORK CATEGORY</th><th>SKETCH</th><th>WORKING POINT AND CHECKING ITEM</th></tr>
<tr><td>1</td><td>PACKER LINER SETTING</td><td>[EMBEDDED ANGLE INSTALLED]
 

LAYOUT OF PACKER LINER & EMBEDDED ANGLE</td><td>- LEVELING FORM BASE POINT - ANCHOR BOLT CHECK
- PACKER LINER SET UP
 

ABSORBER - PLAN
 
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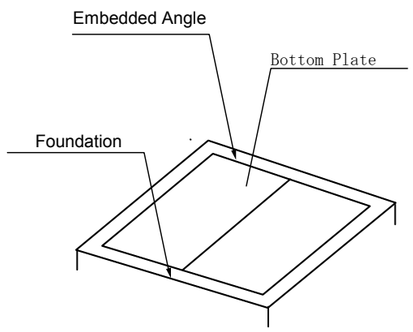
<tr><td>2</td><td>BOTTOM PLATE INSTALLATION</td><td> 
</td><td>Bottom plate installation & welding

Semi-automatic welding
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INSTALLATION GUIDE FOR ABSORBER

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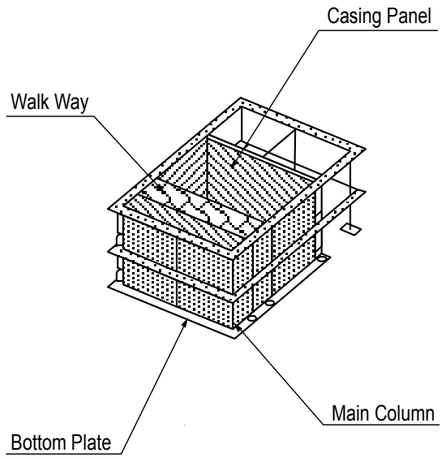
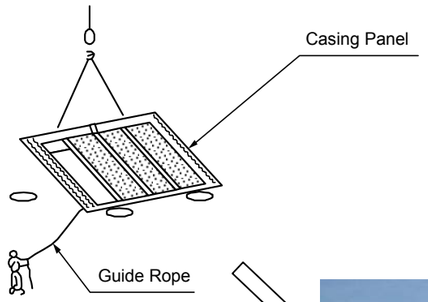
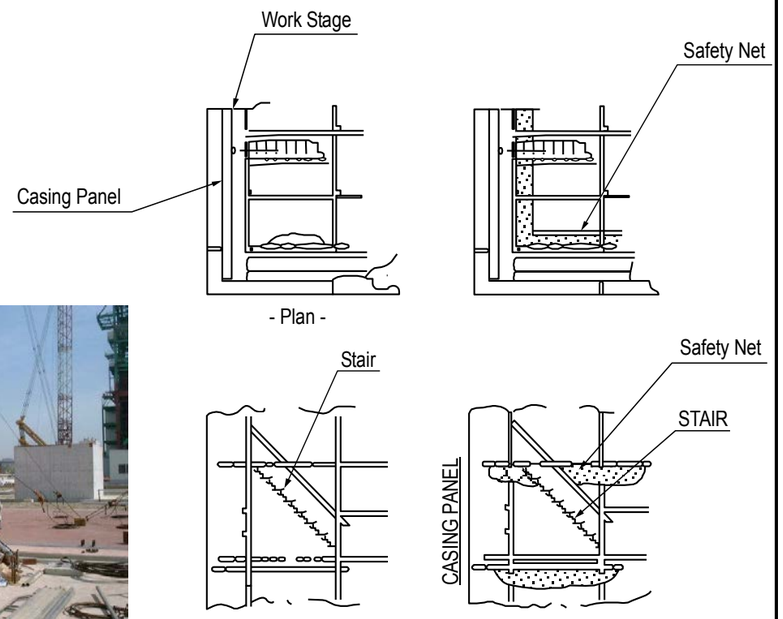
<tr><td>3</td><td>1st STAGE PANEL CASING INSTALLATION</td><td> 
</td><td>- SCAFFOLDING SETTING (INSIDE) - SAFETY NET SETTING
 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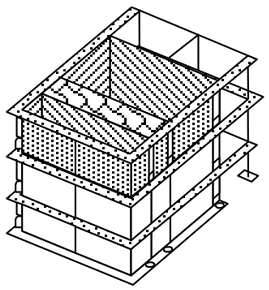
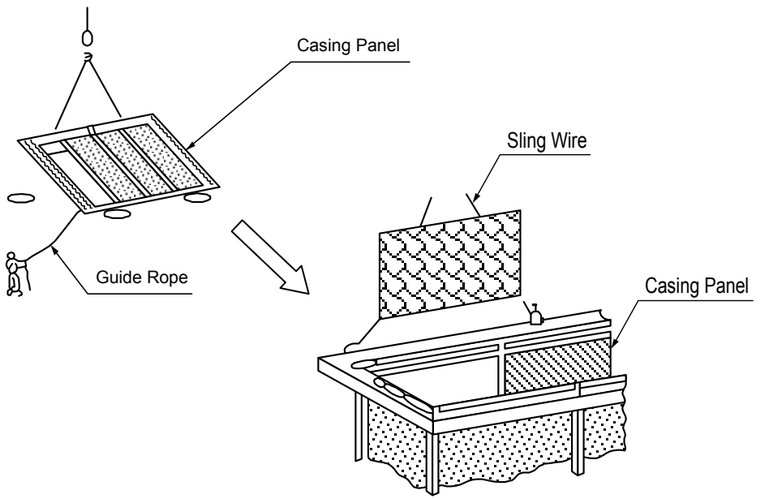
<tr><td>4</td><td>UPPER CASING INSTALLATION</td><td>  </td><td> 

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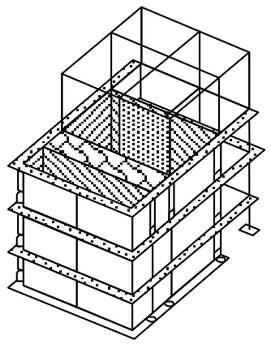
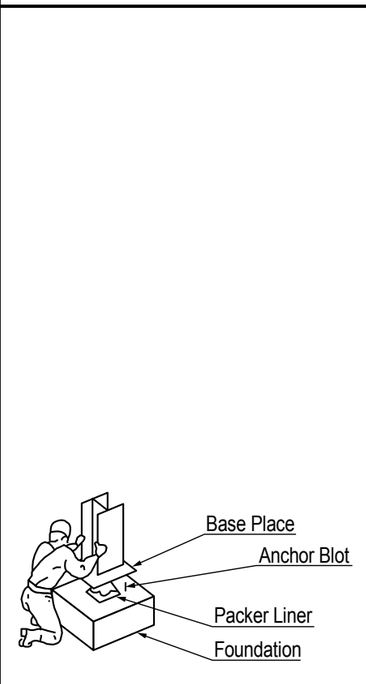
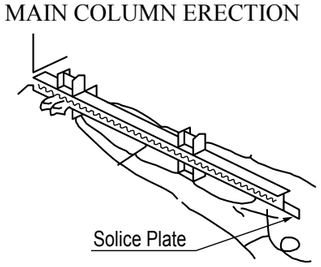
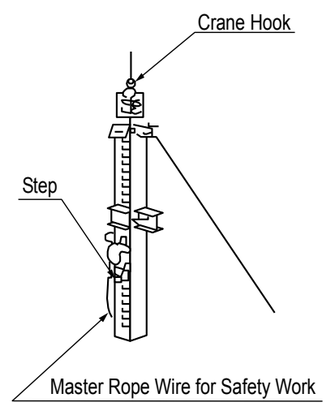
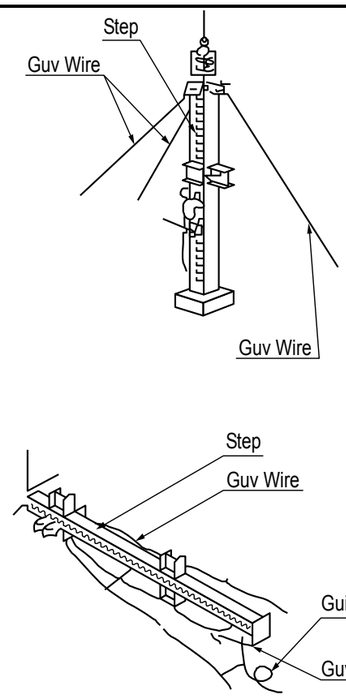
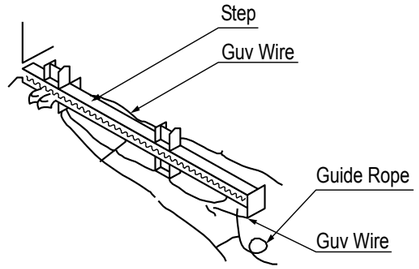
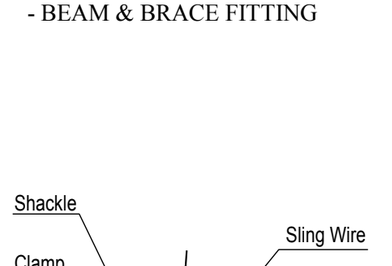
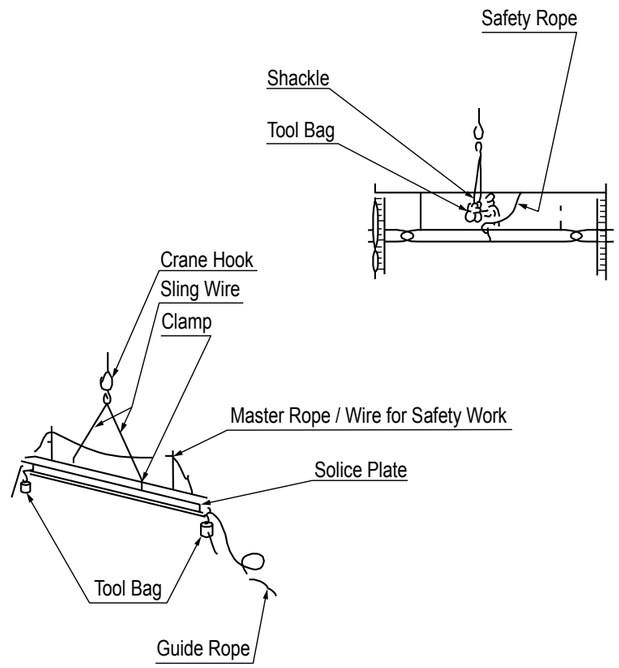
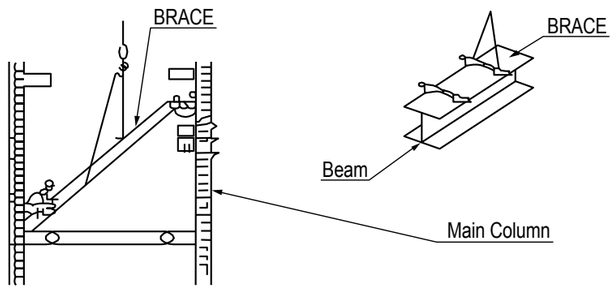
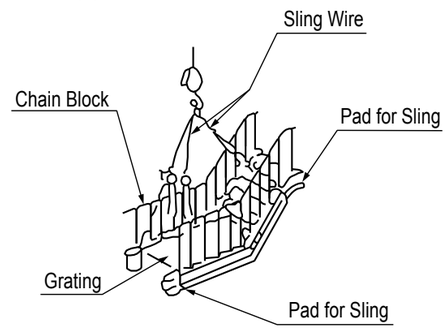
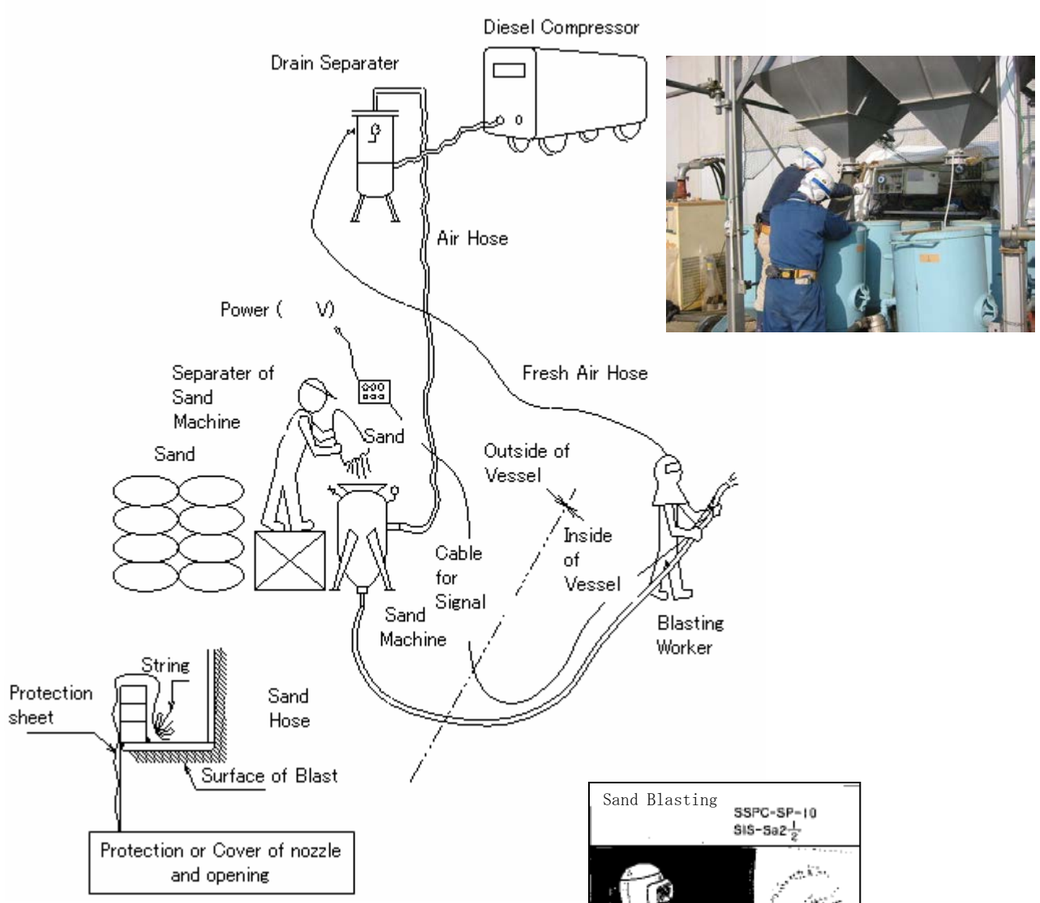
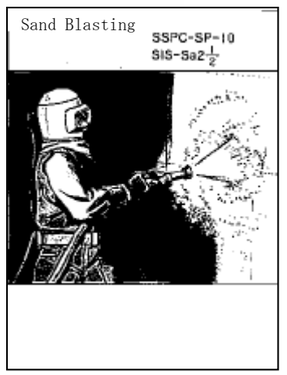
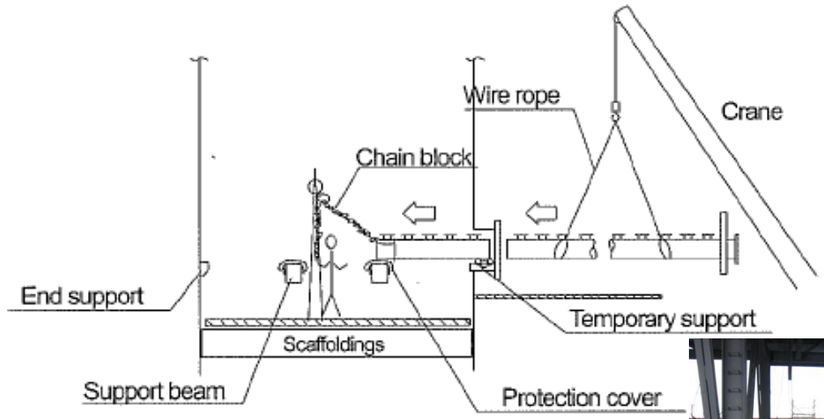
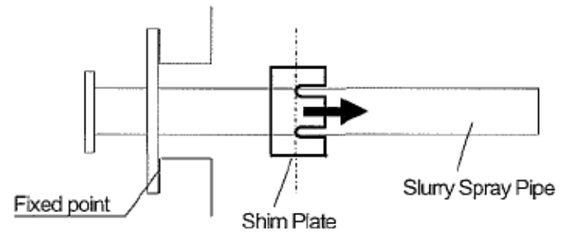
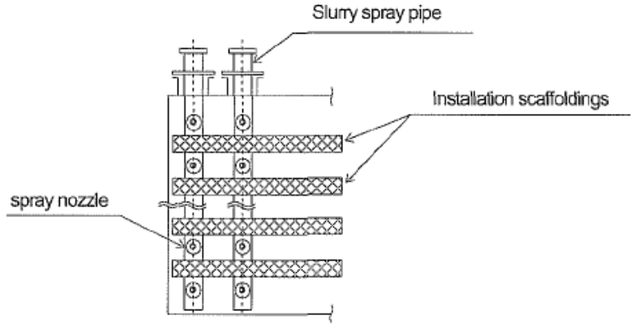
INSTALLATION GUIDE FOR ABSORBER

STEP NO.	WORK CATEGORY	SKETCH	WORKING POINT AND CHECKING ITEM
General	STEEL STRUCTURE ERECTION		- MAIN COLUMN ERECTION    - BEAM & BRACE FITTING    - WALKWAY/HANDRAIL & STAIR FITTING   

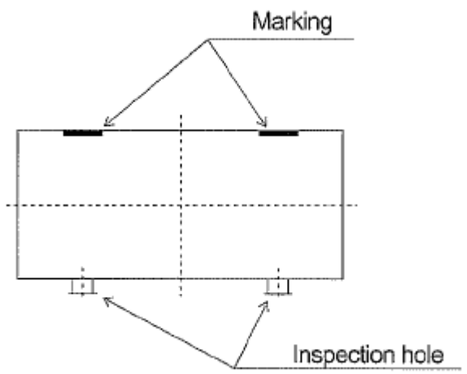
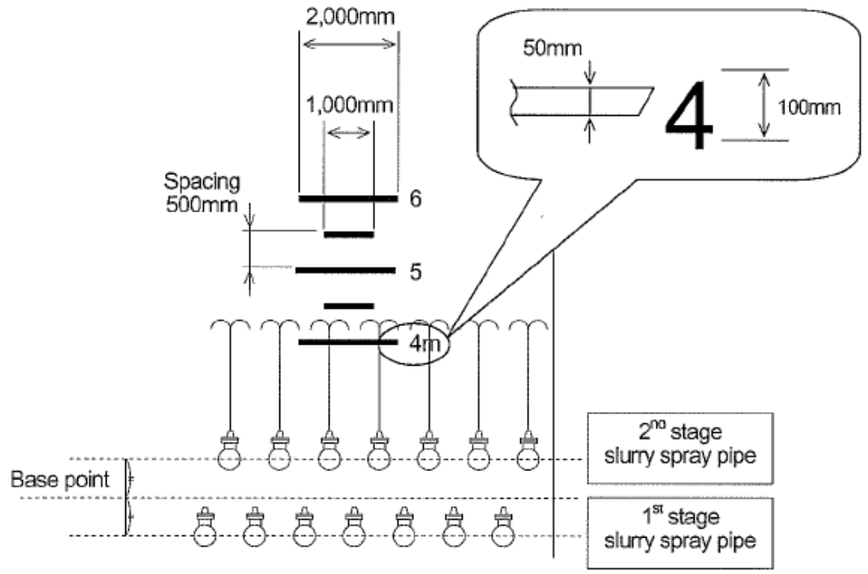
LINING GUIDE FOR ABSORBER

STEP NO.	WORK CATEGORY	WORK ACTIVITY	WORKING POINT AND SCETCH
1	SAND BLASTING	1. Setting of lining machine and connection - Connection of each hose - Running test of machines 2. Protection - Preparation of veneer sheet for each opening - Installation of dust catcher and duct 3. Confirmation prior to blasting - Confirmation of latest drawing - Confirmation of working area - Measurement of humidity and temperature (to be recorded) 4. Sand Blasting - Loading sand materials into sand tank - Running test of each signal bell land lamp - Start of Sand blasting by signal - Closing of each valve after work - Protection sheet for Sand materials and each machine for preventing rain 5. Air blow - Air blow from the top after sand blasting 6. Primer painting - Wait for settlement of sand dust under well ventilated condition. - Inspect of blasted surface. Surface criteria: SSPC-SP10 (Sis Sa 2.5) - Apply the primer by brush or roller or spray, after pass of blast inspection 7. Elimination of Sand - Elimination of sand from the vessel by vacuum.	 

INSTALLATION GUIDE FOR ABSORBER INTERNAL PARTS (SLURRY SPRAY PIPE & NOZZLE)

STEP NO.	WORK CATEGORY	WORK ACTIVITY	WORKING POINT AND SCETCH
1	SPRAY PIPE INSTALLATION	1. Check all concerned absorber dimensions, ie. tolerance of absorber casing, support beam location, absorber nozzle location, flange face location, bolt hole location, size and spacing etc., before Spray Pipe installation. 2. Install the temporary support on absorber nozzles for inserting Spray Pipe into absorber. The temporary support shall be installed at almost the same height of bottom of Spray Pipe. 3. Lift Spray Pipe up to the same height as absorber nozzle. 4. Insert the tip of Spray Pipe into the absorber, and unload the tip of Spray Pipe onto the temporary support. 5. Insert Spray Pipe into the absorber by using of chain block. 6. Insert bolt to Spray Pipe flange and Spray Pipe saddle, and tighten as temporary. Then check the horizontal level and insert shim plate to adjust the horizontal level. The level tolerance should be referred to specific drawing. 7. Tighten all the bolts and nuts. In case of dissimilar material between Spray Pipe flange (especially FRP made) and absorber flange, bolt tightening procedure should be strictly complied with the specific drawings in order to prevent the crack on the flanges. 8. Loosen the saddle setting bolts and nuts by half rotation to allow the Spray Pipe thermal expansion, and then lock the nuts by double nuts fixing.	 
2	SPRAY NOZZLE INSTALLATION	1. Modify the scaffolding for installation of Spray Nozzle. 2. Set the Spray Nozzle on the Spray Pipe flange, and tighten the bolts and nuts up to about 75% of full torque by using of torque wrench. 3. Check the horizontal level of Spray Nozzle face within the tolerance which is specified in the drawings, and tighten up to full torque. This level is most important for FGD performance. The special care shall be taken to SiC made Spray Nozzle, since these are weak against mechanical shock and impact.	

INSTALLATION GUIDE FOR ABSORBER INTERNAL PARTS (MIST ELIMINATOR & MARKING)

STEP NO.	WORK CATEGORY	WORK ACTIVITY	WORKING POINT AND SCETCH
1	MIST ELIMINATOR INSTALLATION	1. Check all concerned absorber dimensions, ie. tolerance of absorber casing, support beam location, bolt hole location, size and spacing etc., before installation of Mist Eliminator. 2. Insert the lower washing spray pipe into the absorber. In order to protect the FRP made pipe, do not slide the pipe on the support. 3. Insert the dedicated shim plates between pipe and pipe support, and fixing U-bands or U-bolts and external flanges. 4. Install the lower panel of Mist Eliminator and tightly coupled each other by means of comb brace and tie insulock. 5. Install the lower down washing spray pipe and upper up washing spray pipe as same manner as the above. 6. Install the upper panel of Mist Eliminator, and install upper washing spray pipe as same manner as the above. After installation of Mist Eliminator, to protect the panels by means of load spreaders e.g. wooden planks to allow walking on them during further stage of installation.	
-	MARKING	 	

Test and Inspection Procedure and Standard

Table "Test and Inspection Procedure and Standard".

Item	Inspection and Test Items	Procedure	Acceptable Limitation and Standard
1.	Fabrication work.		
1.1	Material Inspection.		
(1)	Chemical composition and Mechanical property.	Chemical composition and mechanical property to be checked with mill test report.	To be in accordance with the applicable ASTM material specification and/or CLIENT applicable specification.
(2)	Appearance, Shape and Dimension.	Appearance to be inspected visually, and shape and dimension to be inspected by suitable measuring Instrument.	To be in accordance with ASTM A6 tolerance and/or CLIENT applicable specification.
1.2	Full size Drawing Inspection.	Full size Drawing to be inspected with suitable measuring Instrument.	1) Basic steel tape : Less than ±0.3 mm ± (0.1 mm × L) Where : (a) under 20°C 5 kg tension (b) L = Length of basic steel tape (m) 2) Error of Frame Height and Span : Less than 1.0 mm 3) Partial detail drawing and Gauge plate : Less than 0.5 mm
1.3	Dimensional Inspection.	All shop and site product to be inspected with suitable measuring instruments in conformity with the related drawings and specification.	To be in accordance with the attached specification, AISC and AWS and/or CLIENT applicable specification.
2.	Welding Inspection.		
2.1	Qualification of Welder.	Qualified certificates of welders to be submitted to CLIENT for his approval.	To be in accordance with AWS D1.1 standard or others.
2.2	Groove Inspection.	(1) Surface of groove to be visually checked (2) Alignment of groove to be dimensionally checked with suitable measuring instruments.	(1) To be free from oil, dust, scale, water and other foreign matter, and be kept dry. (2) To be in accordance with the attached specification.

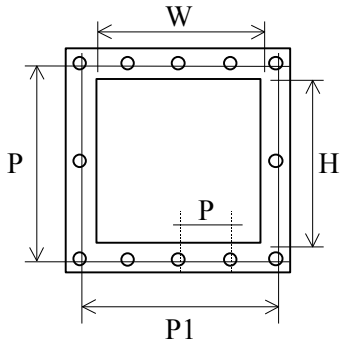
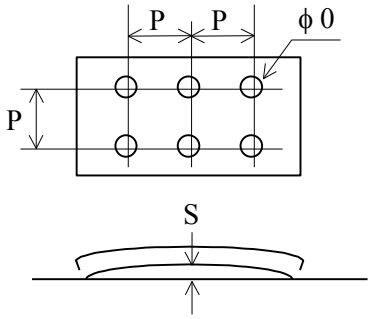
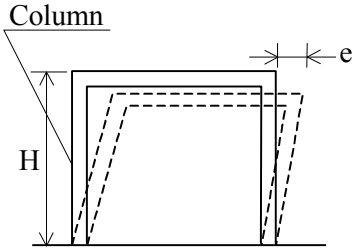
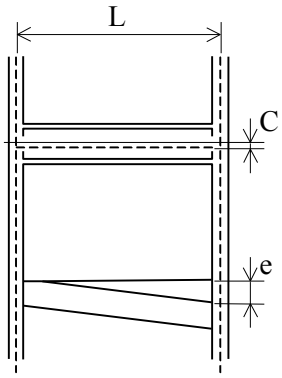
Item	Inspection and Test Items	Procedure	Acceptable Limitation and Standard
2.3	Visual Inspection.	The welded surface condition to be visual checked.	To be free from harmful defects such as blow-holes, pits, under-cuts, overlap, craters, racks and others.
2.4	Dye Penetrate Test (DPT) Flake Lining area only.	DPT to be applied at over 10% of welded line after grinding, which performed resin lining.	No surface defects to be acceptable.

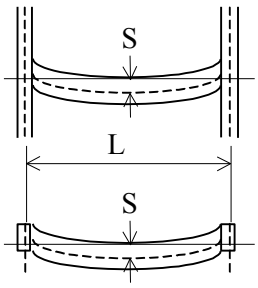
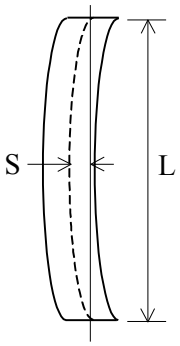
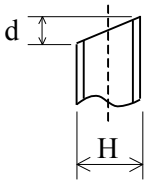
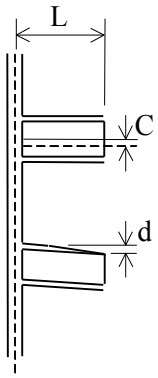
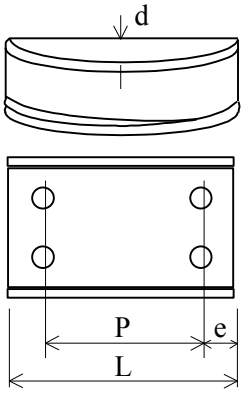
Item	Inspection and Test Items	Procedure	Acceptable Limitation and Standard
	Inspection Procedure and Standard of Erection.		
3.	Confirmation prior to start erection		
(1)	Anchor bolts and embedded items.	Locations and levels to be inspected with suitable measuring instruments.	To be in accordance with relative Drawings.
(2)	Steel structure, wall and Panel.	Plumbs and levels to be inspected with suitable measuring instruments.	
4.	Setting of Packer liner.	Chipping conditions and levels to be inspected visual and with suitable measuring instruments, respectively.	within -3mm to ±0
5.	Scaffolding inspection.	Scaffolding and safety devices to be inspected entirely.	To be in accordance with Law and applicable safety regulations for protection of personnel.
6.	Plumbing and Leveling inspection.		See Attachment
7.	Bolting inspection.	If any, Tightening of high strength bolts to be inspected by means of the turn-off-nut method or with an automatic cut off torque impact wrench.	
8.	Grouting inspection.	Grout condition to be inspected visually.	To be in accordance with relative Drawings.
9.	Lining inspection.	Appearance, thickness, pin-hole test	No pin-hole. Allowable thickness shall be in accordance with the drawing.
10.	Overall visual inspection.	After completion of erection work, all construction to be inspected visually.	

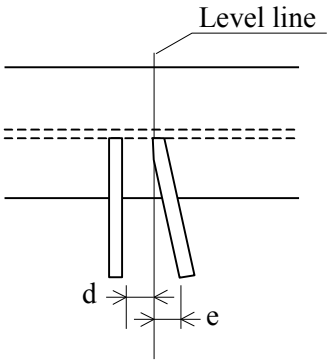
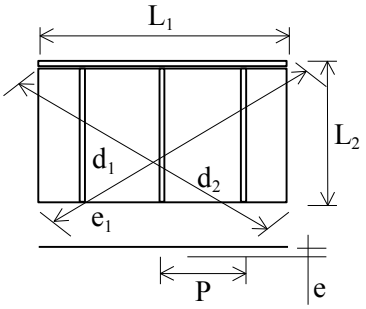
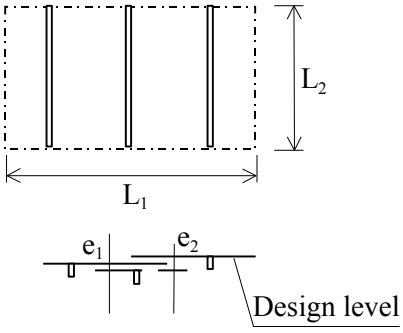
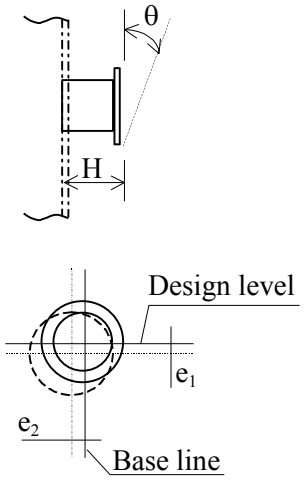
Attachment

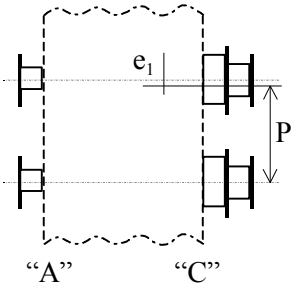
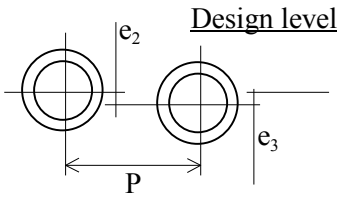
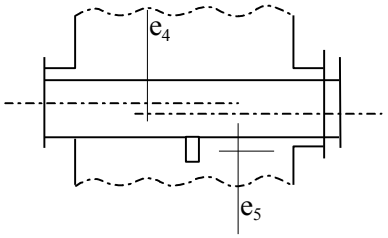
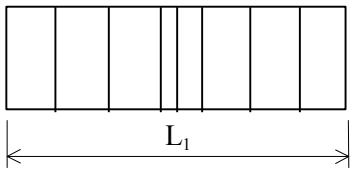
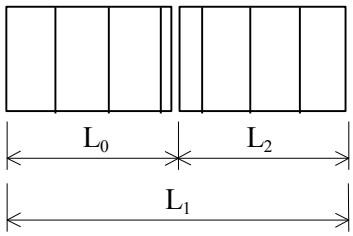
Attachment-1

"Tolerance of Steel structure and casing panel"

Item	Figure	Allowable tolerance
1. Flange of Duct		W ± 5 mm H ± 5 mm P ± 2 mm P1 ± 3 mm
2. Bolt hole pitch of Base plate and Level		P ± 2 mm Dϕ ≦ 16 mm・・・Dϕ +1/-0 mm Dϕ > 16 mm・・・Dϕ +2/-0 mm S ≦ 2 mm
3. Incline Column, Support Pillar and Others		e ≦ H/1,000 (Max. 20 mm)
4. Position and level of Support beam		C ≦ 3 mm e ≦ L/1,000 (Max. 5 mm)

Item	Figure	Allowable tolerance
5. Bend of Beam		S ≦ L/1,000
6. Bend of Main Column (For Prefab.)		L ± 5 mm S ≦ L/1,000 (Max. 5 mm)
7. Cut of Steel Structure (For Prefab.)		d ≦ 3/1,000 x H
8. Fitting and incline for Beam etc. (For Prefab.)		C ≦ 3 mm d ≦ L/500 (Max. 3 mm)
9. Bend and Length of Beam (For Prefab.)		L ± 5 mm P ± 3 mm e ± 3 mm d ≦ 1.5/1,000 x L (Max. 5 mm)

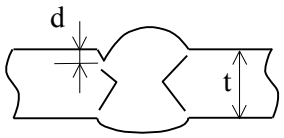
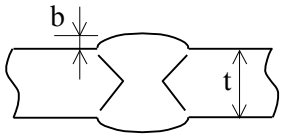
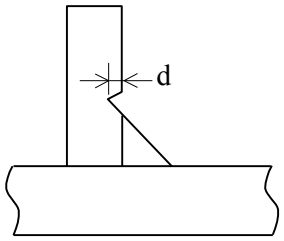
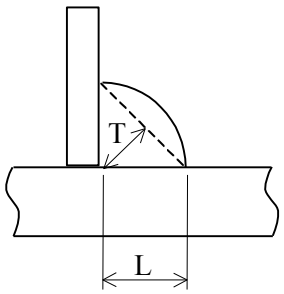
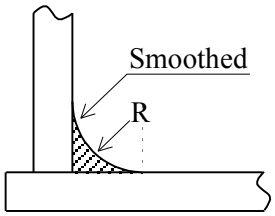
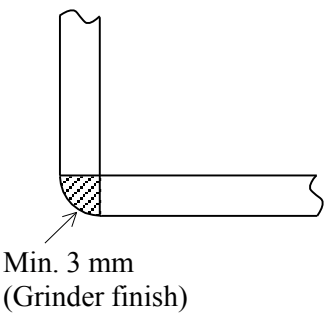
Item	Figure	Allowable tolerance
10. Fitting of Gusset plate		d ≦ 3 mm e ≦ 3 mm
11. Casing		L_1 ± 3 mm L_2 ± 3 mm P ± 5 mm e ± 3 mm $d_1 - d_2 = \pm 5$ mm
12. Support beam for Grid		L_1 ± 3 mm L_2 ± 3 mm e_1 ± 3 mm e_2 ± 6 mm
13. Nozzle (1) General		H ± 3 mm θ ± 0.5° e_1 ± 5 mm e_2 ± 5 mm

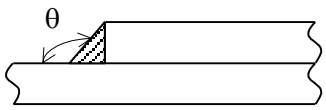
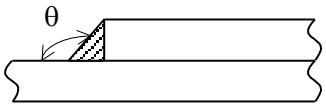
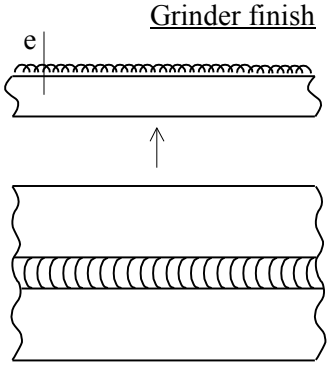
Item	Figure	Allowable tolerance
(2) Nozzle and Support beam for Spray pipe		Mutual vertical Between "A" & "C" e_1 ± 3 mm P ± 5 mm
		Mutual horizontal e_2 ± 3 mm Horizontal against the design level e_3 ± 3 mm
		Mutual horizontal Between "A" & "C" e_4 ± 1.5 mm Mutual horizontal Between "B" & "C" e_4 ± 3 mm
14. Casing Assembly		L_1 ± 6 mm
		L_0 ± 3 mm L_2 ± 3 mm

Item	Description		
3) Assembling stage	(1) Dimension Check at assembly Time When wall plates are erected, plumbness, horizontal tolerance and roundness shall be checked in accordance with the following specification.		
	Time to be Inspected	Location to be Measured	Range (Allowable)
Horizontal Tolerance	After the Completion of 1st stage	2 Places per wall plate	± 6 mm
Plumbness	First Stage 2nd stage	2 Places per wall plate	± 3 mm
Roundness	After the Completion of 1st stage	2 Places per wall plate	± 25 mm
	(2) Matching Inspection Allowable offset between adjacent casing wall at splices shall be as follows.		
	Vertical Splice		± 3 mm or less
	Horizontal Splice		± 5 mm or less

Attachment-2

"Inspection standards of welding"

Item	Figure	Allowable tolerance
Butt weld (Under cut)		d ≦ 0.5 mm Length of Under cut L : Max. 50 mm per 300 mm over
Butt weld (Convexity)		t ≦ 15 mm b ≦ 3 mm t > 15 mm b ≦ 5 mm * Shape of convexity to be smoothly
Fillet weld (Under cut)		d ≦ 0.5 mm Length of Under cut L : Max. 50 mm per 300 mm over
Fillet weld (Leg of weld & convexity)		L_0 & T_0 : Design figure L ≧ L_0 T ≧ T_0 * Shape of convexity to be smoothly
Flake lining parts (1) Inner corner		No under cut, blow hole, pin hole R ≧ 3 mm Leg of weld ≧ 6 mm
(2) Outer corner		R ≧ 3 mm

Item	Figure	Allowable tolerance
(3) Over lapping	Grinder finish  	θ ≧ 135°
	Grinder finish  	
	Grinder finish  	e ≦ 1 mm

STORAGE & ERECTION MANUAL

FOR

ABSORBER INTERNALS

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

RAMPAL, BANGLADESH

TABLE OF CONTENTS

A. SPRAY PIPES …….. 1

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D. EMERGENCY QUENCHING SPRAY PIPE …… 44

Note:

This Manual is being issued for general guidance only. Erection shall be done as per the project specific drawings and FQP.

SPRAY PIPES

1. GENERAL

This document covers the handling manual for FRP made spray pipes, which are to be furnished in Flue Gas Desulphurization (FGD) Plant

NOTE : This document describes only a general requirement for the installation work and shall be used for reference. Installation procedure may be changed according to the site condition.

2. RELATED DOCUMENTS AND DRAWINGS

Following drawings shall be applied to this document.

No.	Item	DF No.	MHPS No.
1.	Seawater FGD-FGD ABSORBER SEAWATER SPRAY PIPE AREA PLAN DWG.		V221-10202
2	Seawater FGD-FGD ABSORBER SEAWATER SPRAY PIPE SUPPORT PLAN DWG.		V221-10305
3	Seawater FGD-ABSORBER SEAWATER SPRAY PIPE & NOZZLE PLAN DWG..		V402-10301
4	Seawater FGD-ABSORBER DCFS SPRAY NOZZLE ASSEMBLY DWG		V221-10304

2/

3. HANDLING MANUAL FOR FRP MADE SPRAY PIPES

3-1. Storage at site

(1) Basically MHPS recommend to storage the FRP pipes in container to avoid any damage.
(2) Protect the equipment from direct sunshine for long time. Use vinyl sheet cover etc.
(3) Put the equipment at the place without fire because FRP equipment is combustible.

3-2. First Opening Inspection

When first opening container at site, check all FRP pipes that there are no damage on the pipes.
Check the quantity of shim plates and LT washing pipes as per Supply List and/or Packing List.
If any damage or shortage were found, take digital picture as it is and report the situation to MHPS immediately.

3-3. Withdrawing the pipes

(1) To withdraw FRP pipes from container, the Lifting tool as shown on Fig.3-1 shall be prepared at site.Steel pipe shall be fixed on the Fork-Lift.
(2) The Lifting tool shall be protected with soft materials (soft cloth etc.,) to protect FRP pipes.

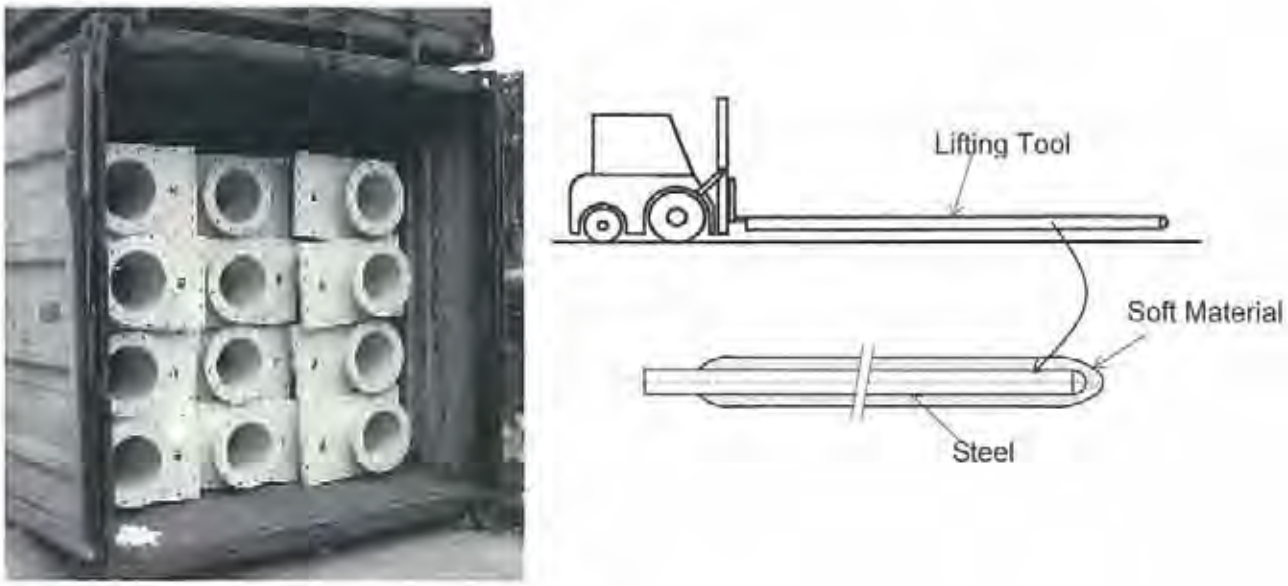
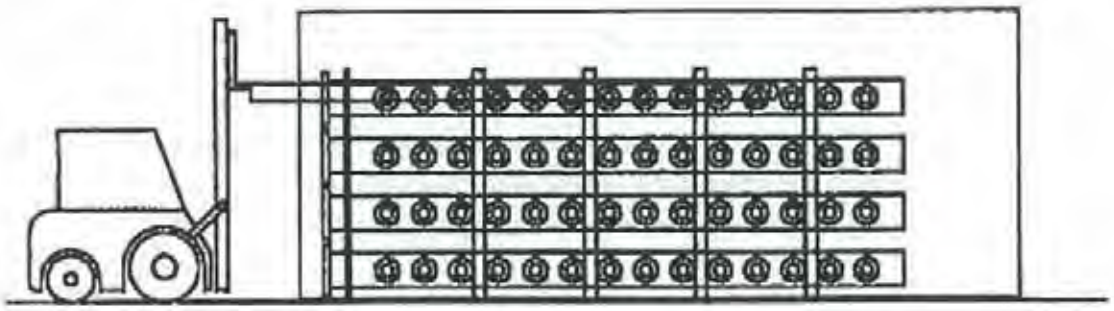


Fig. 3-1 Container and sketch of Lifting Tool

(3) As FRP pipes fixed at the container by wooden support, remove these supports one by one. (See Fig.3-2)

(4) Then insert the Lifting tool into FRP pipe which is located at the top of them. (See Fig.3-3)



(5) Lift up FRP pipe carefully, keeping the lifting tool & FRP pipes horizontally.Then it shall be carefully pulled out from container.After that, the lifting tool shall be carefully pulled out from FRP pipe and return to (4).

!!! Special notes !!!

Before pulling out FRP pipes, be sure that the performance of forklift is suitable for lifting, considering the weight and length of FRP pipes (approx. 270 kg/piece).

3-4. Lifting up to Absorber stage

(1) Do not lift the FRP pipe by nozzle neck. (See Fig. 3-4)

(2) Use fiber belt such as nylon sling to prevent any damage for nozzle neck.

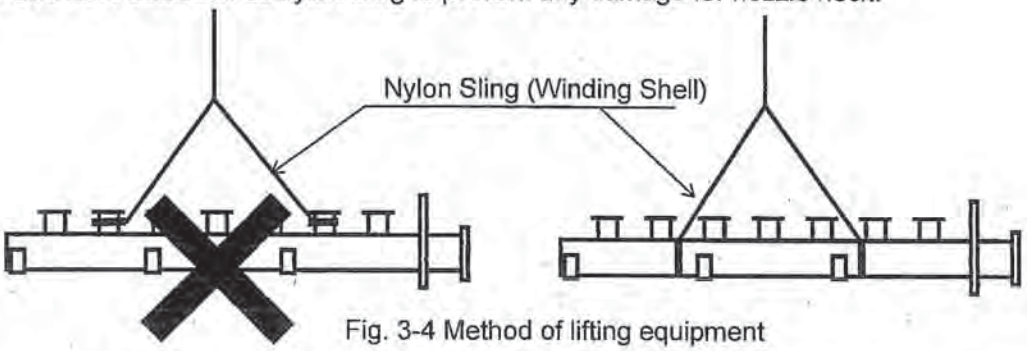


Fig. 3-4 Method of lifting equipment

(3) When lifting and transferring, make sure to use guide rope not to hit on the others. (See Fig. 3-5)

(4) If FRP equipment receives an impact, damages such as crack etc., would be occurred.

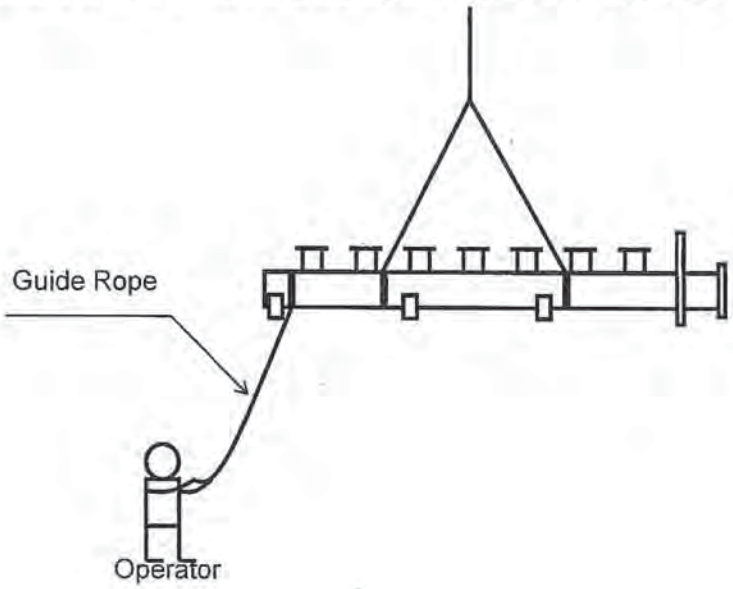


Fig. 3-5 Method of transferring equipment

(5) When transferring with using forklift, be careful not to fall down the equipment by using floor plate and stiffening plate such as pallet.

(6) When lifting and lowering, do not enter absolutely under the FRP equipment.
In case of falling down, serious problem would be occurred.

3-5. Installation

(1) Check all concerned absorber dimensions, i.e. tolerance of absorber casing, supporet beam location, absorber nozzle location, flange face inclination, bolt hole location, size and spcing etc., before FRP Seawater Spray Pipe installation.

(2) Install the temporary support on absorber nozzles for inserting FRP Seawater Spray Pipe into absorber.
The temporary support shall be installed at almost the same height of FRP Seawater Spray Pipe. (See Fig. 3-6)

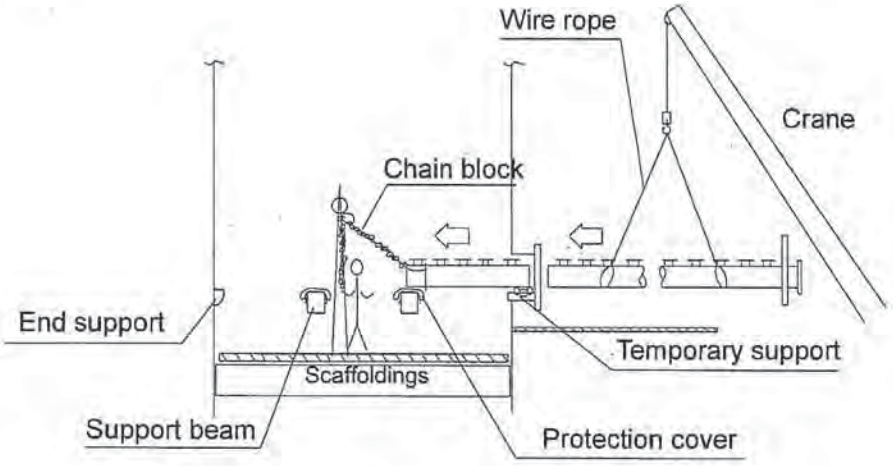


Fig. 3-6 Installation procedure

(3) Lift up FRP Seawater Spray Pipe to the absorber nozzle height using wire rope to hook up FRP Seawater Spray Pipe.

(4) Put the tip of FRP Seawater Spray Pipe on the temporary support mentioned in item (3) above.

6/

(5) Insert FRP Seawater Spray Pipe into absorber with chain block. If the chain block is unlikely for use, pull FRP Seawater Spray Pipe by hand. (See Fig. 3-7)
At that time, check that there is eunough space for thermal expansion of Seawater spray pipe between its end and the absorber wall.

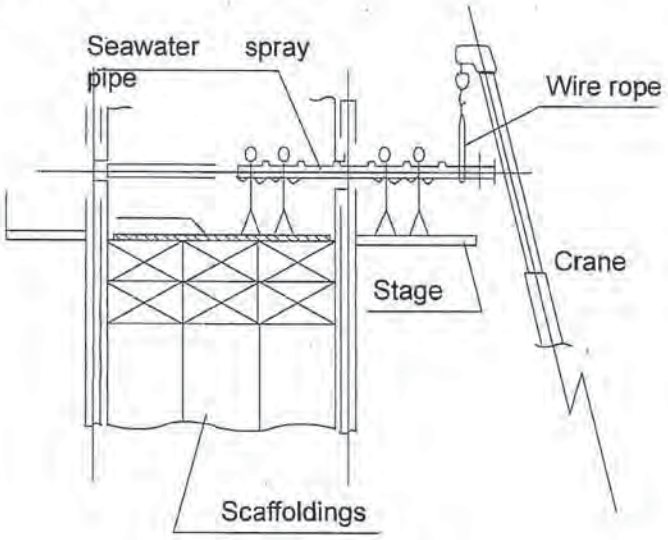


Fig. 3-7 Inserting FRP Seawater Spray Pipe

(6) After the insertion, jack up Seawater spray pipe and remove the temporary support.

(7) After tightening the bolts and nuts of the square flange temporarily, adjust FRP Seawater Spray Pipe horizontal level by inserting shim plates. Direction of inserting shim plates shall be in accordance with Fig. 3-8 so that the shim plates will not fall down easily even if the saddle moves by thermal expansion of Seawater spray pipe. Allowable inclination at the holder flange face is **3/100 (target : 1/100)**.

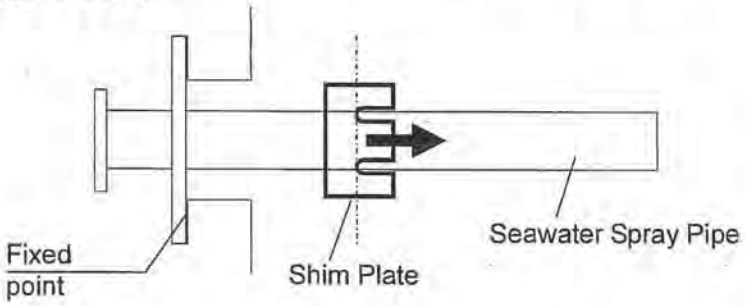


Fig. 3-8 Direction of shim plate

(8) Tighten the saddle setting bolts and nuts.

(9) Tighten the bolts and nuts of the square flange of FRP Seawater Spray Pipe firmly in accordance with following procedure. **[VERY IMPORTANT]**

SPECIAL NOTES)

a) Check again that flange face including lining shall be **Flat Face**, 5mm-thickness rubber gasket and 3mm-thickness steel washer are correctly installed as per Fig.3-9.
b) Silicon sealer shall be applied in both sides of the gasket surface.
c) Use Torque Wrench (~30Nm) to tighten the bolt.
d) M16 bolt for square flange shall be tightened diagonally to obtain even tightening. Uneven tightening will cause the crack and/or breakage of FRP made spray pipe.
e) M16 bolt for square flange shall be tightened with 10Nm at first. After 30 minutes, it shall be re-tightened with 16Nm.
f) Check the external of FRP spray pipe that there are no crack and/or breakage. If any trouble are founded, it shall be reported to MHPS immediately.

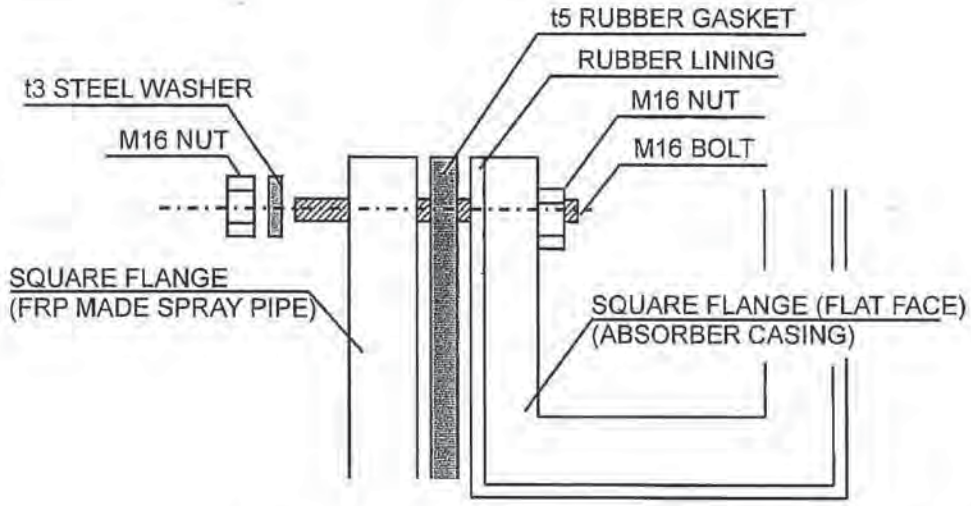


Fig. 3-9 Correct tightening method for FRP made Spray Pipe

(10) Loosen the saddle setting bolts and nuts by half rotation for thermal expansion of FRP Seawater Spray Pipe, and then lock the nuts by using the double-nuts to prevent from loosening.

(11) Set the scaffoldings across Seawater spray pipe to install DCFS spray nozzles. (See Fig. 3-10)

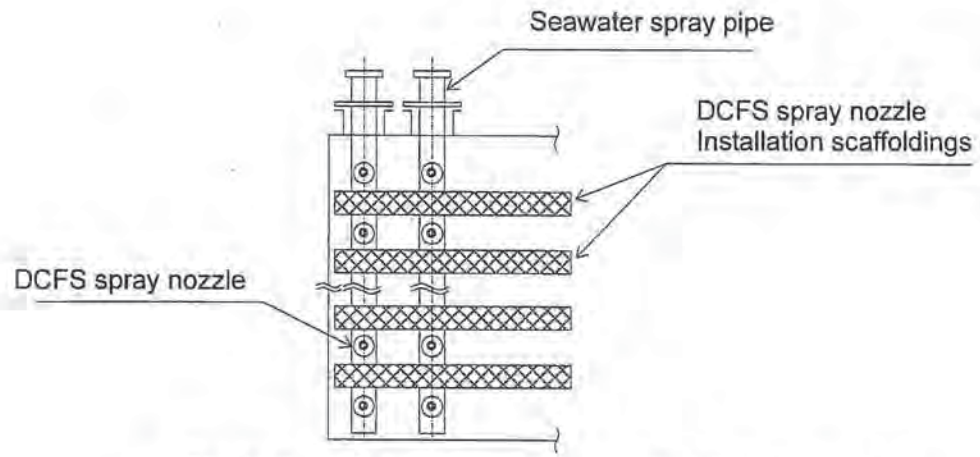


Fig. 3-10 Scaffoldings for installation of DCFS Spray Nozzles

(12) Install DCFS spray nozzle in accordance with "Seawater FGD-ABSORBER DCFS SPRAY NOZZLE ASSEMBLY DWG."
(MHPS Dwg. No: V221-10304).

(13) Remove the scaffoldings mentioned in item (12) above.

(14) Confirm that there are no foreign substances at the inside of Seawater spray pipe before connecting the external piping.

(15) Carry out spouting test before the start-up by checking visually through the upper inspection hole.

4. SPECIAL NOTES

4-1. Marking Procedure

As stated in Section 3-5 item (15), marking shall be made on the absorber inside wall for the spouting test. Marking procedure shall be as follows;

1) Marking procedure shall be referred to the below and Fig. 4-1 at the next page.
2) Each line shall be marked at the spacing of 500mm with conspicuous color on the absorber inside wall at the opposite side of the inspection hole.
3) Arabic numbers shall be marked at the spacing of 1,000mm.
4) Base point which corresponds to the height "0" shall be as follows;
   - Middle of centerlines of upper and lower stage FRP Seawater Spray Pipes
5) The principle of marking range shall be (0.9 ~ 1.1) x spouting height.
   For example, when the spouting height is 3m, the marking range becomes 2.7m (0.9 x 3m) to 3.3m (1.1 x 3m) according to the above formula, but in this case, actual marking range is 2m to 4m to facilitate the marking operation.

4-2. Other notice

(1) Flange surface of piping and support shall be **flat face. Do not use raised face.**

(2) Make sure to use all face gaskets for nozzle flange surface.

(3) When tightening the bolt on FRP flange, be careful to tighten all bolts uniformly with the greatest care.

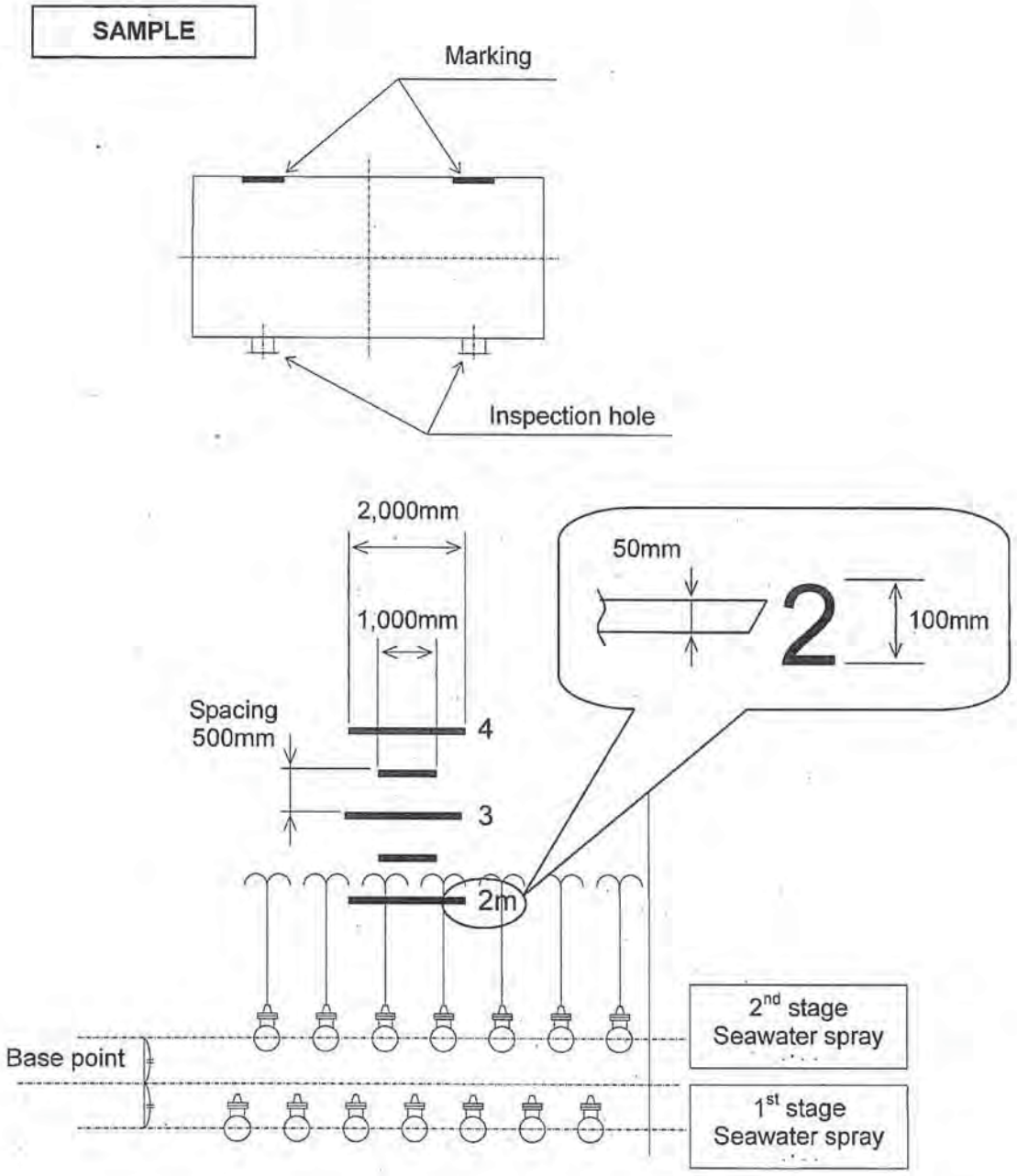
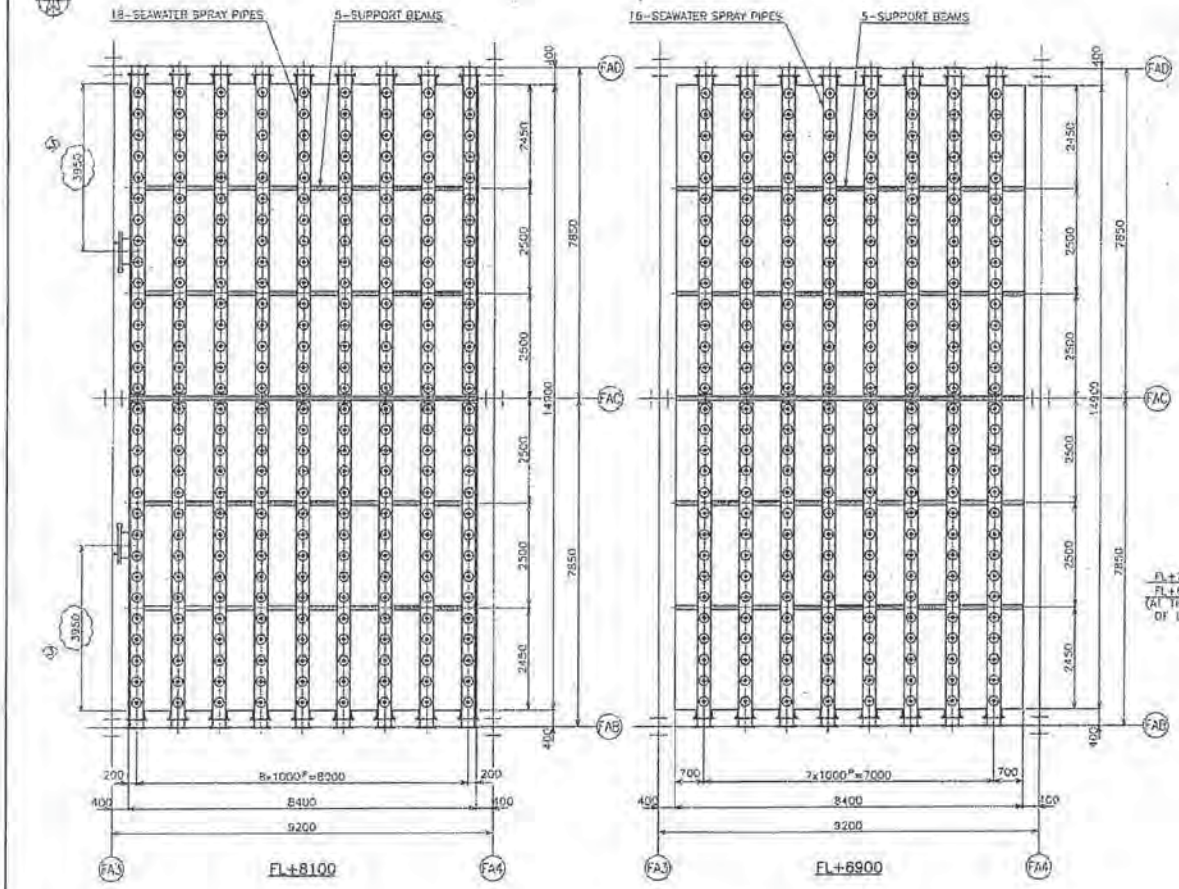
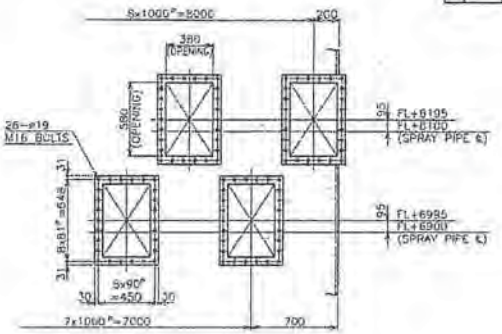
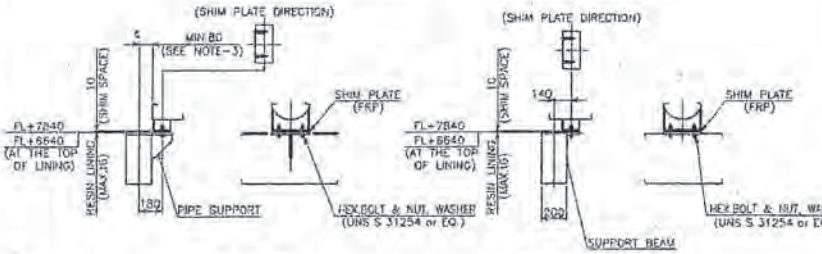


Fig. 4-1 Marking for spouting test



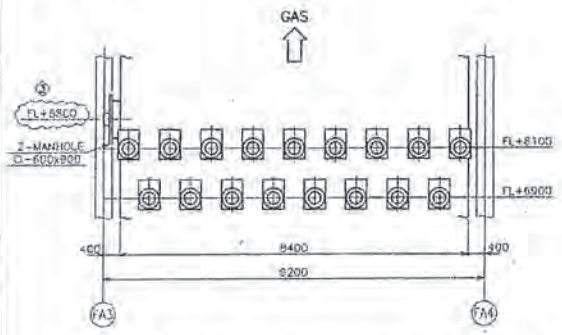


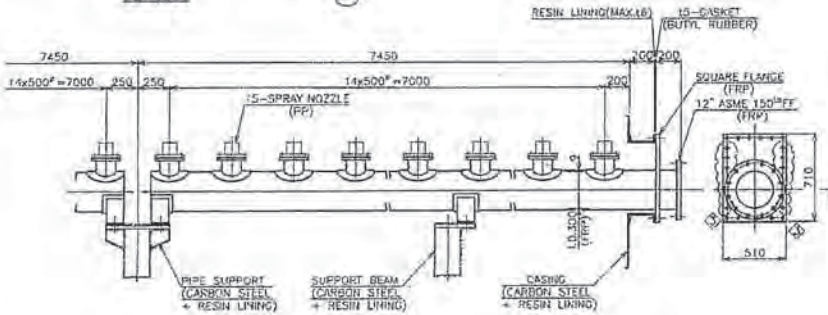
DETAIL OF PIPE OPENING



(FOR PIPE END) (FOR SUPPORT BEAM)

METHOD OF PIPE SUPPORT
(SEE NOTE-1,2&3)





SEAWATER SPRAY PIPE PLAN

NOTES
1. AFTER CONNECTING THE PIPING, LOOSEN THE SADDLE SETTING BOLTS/NUTS BY HALF ROTATION FOR THERMAL EXPANSION OF SEAWATER SPRAY PIPE. ALSO, TIGHTEN THE DOUBLE-NUTS TO PREVENT THE BOLTS FROM LOOSENING OFF.
2. DIRECTION OF INSERTING SHIM PLATES SHALL BE IN ACCORDANCE WITH "METHOD OF PIPE SUPPORT" SO THAT THE SHIM PLATES WILL NOT FALL DOWN EASILY EVEN IF THE SADDLE MOVES BY THERMAL EXPANSION OF SEAWATER SPRAY PIPE.
3. WHEN INSTALLING SEAWATER SPRAY PIPE, CONFIRM THAT THE SPACE BETWEEN ITS END AND ABSORBER CENTER LINE IS MORE THAN SPECIFIED, TAKING THERMAL EXPANSION OF SEAWATER SPRAY PIPE INTO CONSIDERATION.

FL±0=EL±0=GL+300=MSL+8000
GL±0=MSL+7700

REVISED
JUL. 15, 2015

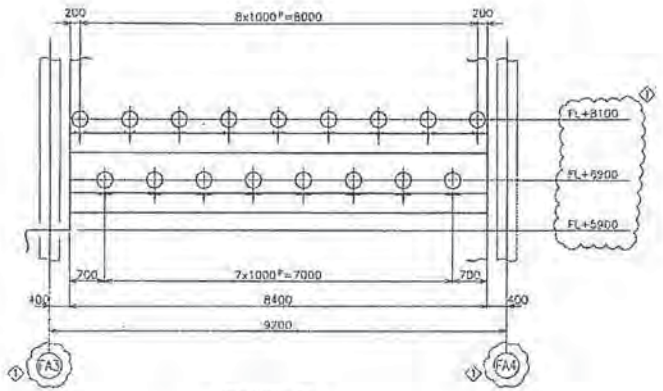
PLAN RECORDS			FUNCTION(TYPE)		PROJECT(TYPE)			
REV	DATE	DESCRIPTION						
1	2014.12.01	REVISED WHERE CLOUDED MARKED						
2	2014.12.19	REVISED WHERE CLOUDED MARKED						
3	2015.7.13	REVISED WHERE CLOUDED MARKED						

OWNER	PAGBILAO ENERGY CORPORATION
JOB	PAGBILAO 420MW UNITS COAL-FIRED POWER PROJECT
CONSULTANT	JACOBS
DWG	Seawater FGD-FGD ABSORBER SEAWATER SPRAY PIPE AREA PLAN DWG.
DESCRIPTION	
CONTRACTOR	MHPS / Daelim Consortium
SCALE	1/60
CONTRACTOR'S DRAWING NO.	V221-10202
REV. NO.	3
ORDER	3773046
ITEM	
DRAWN	2014. 8. 29 ISSUED

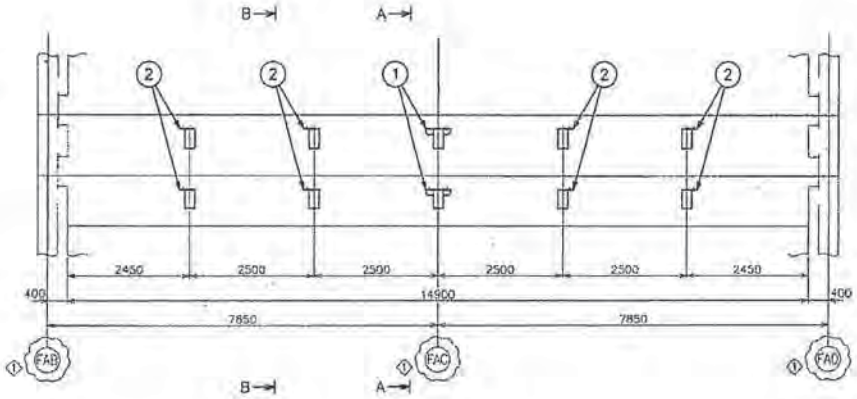
MITSUBISHI HITACHI POWER SYSTEMS, LTD.

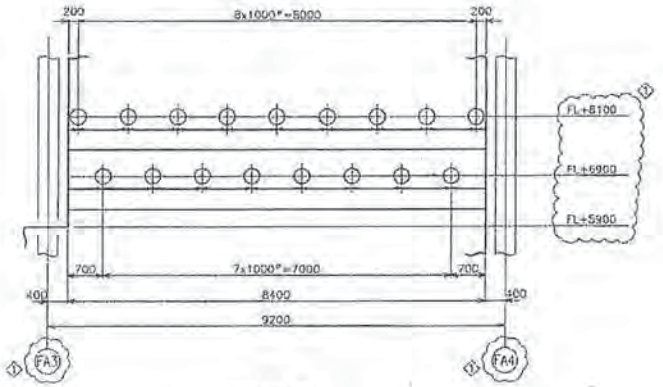
BIEPCL DOC. NO. - MAITREE-00-HT-QA-30007-PSE-REV.NO.01

ANNEX-H

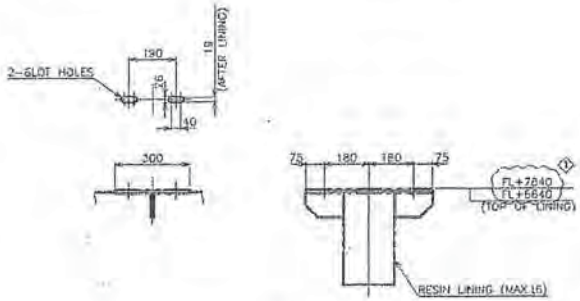


SECTION AA

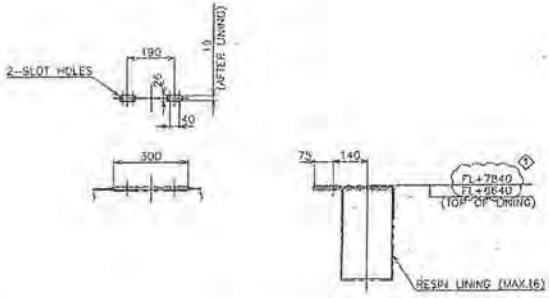




SECTION BB



DETAIL OF (1)



DETAIL OF (2)

NOTE

1. PIPE SUPPORT (SUPPORT LUG) & SUPPORT BEAM SHALL BE SUPPLIED BY CTCI.

REVISED

DEC. 10. 2014

FL±0=EL±0=GL+300=MSL+8000
GL±0=MSL+7700

OWNER:	PAGBILAO ENERGY CORPORATION
JOB:	PAGBILAO 420MW UNIT3 COAL-FIRED POWER PROJECT
CONSULTANT:	JACOBS
DWG.	Seawater FGD-FGD ABSORBER SEAWATER SPRAY PIPE SUPPORT PLAN DWG.
DESCRIPTION:	
CONTRACTOR:	MHPS / Daelim Consortium
DRAWN:	N.JUBO
DATE:	2014/9/29
SECTION:	ENGINEERING & PACKAGE UNIT ENGINEERING SECTION
SCALE:	1/50
ORDER:	3773046
ITEM:	
OWNER'S DRAWING NO.	—
CONTRACTOR'S DRAWING NO.	V221-10305
REVISION	1
	MITSUBISHI HITACHI POWER SYSTEMS, LTD.
	DRAWN 2014. 9.29 ISSUED

ANNEX-II
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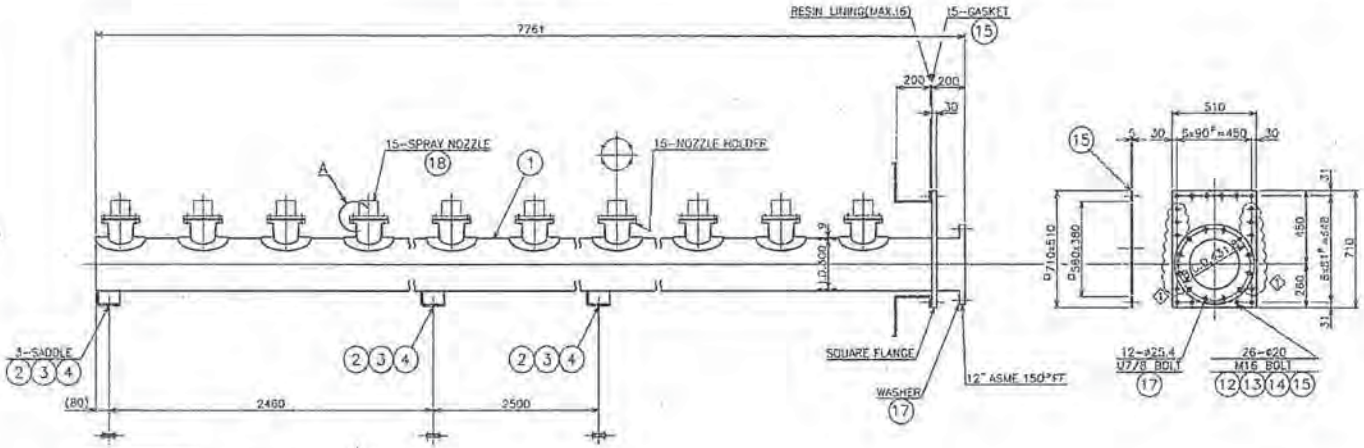
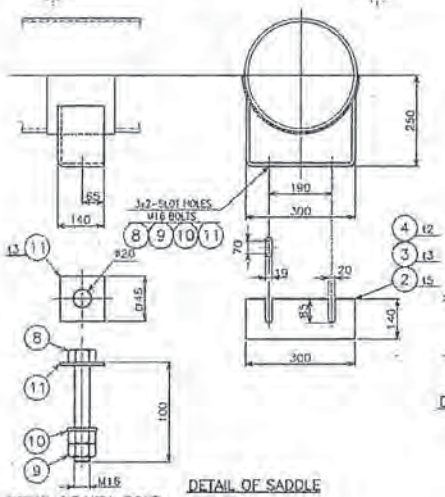


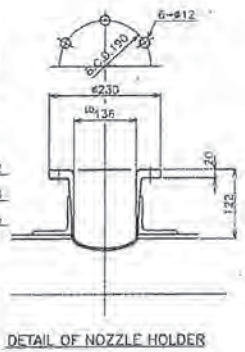
NOTES

1. DURING INSTALLATION AT SITE, IF ANY GAP OCCURS BETWEEN THE SADDLE AND THE SUPPORT, CORRECT IT WITH SPARE SHIM PLATES ③ & ④. A SHIM PLATE SHALL BE INSTALLED UNDER EACH SADDLE AT LEAST.
2. SPRAY NOZZLE (18) AND BUTYL GASKET (15) SHALL BE ASSEMBLED ON NOZZLE FLANGE AS SHOWN ON "DCFS SPRAY NOZZLE ASSEMBLY DWG. (V221-10304)". AFTER SETTING SEAWATER SPRAY PIPE INTO ABSORBER. IN CASE OF PULLING OUT SEAWATER SPRAY PIPE FROM ABSORBER FOR MAINTENANCE PURPOSE, SPRAY NOZZLE AND BUTYL GASKET SHALL BE DISMANTLED AT THE INSIDE OF ABSORBER IN ADVANCE.
3. AFTER CONNECTING THE PIPING, LOOSEN THE SADDLE SETTING BOLTS/NUTS BY HALF ROTATION FOR THERMAL EXPANSION OF SEAWATER SPRAY PIPE. ALSO, TIGHTEN THE DOUBLE-NUTS TO PREVENT THE BOLTS FROM LOOSENING OFF.
4. DIRECTION OF INSERTING SHIM PLATES SHALL BE IN ACCORDANCE WITH "METHOD OF PIPE SUPPORT" SO THAT THE SHIM PLATES WILL NOT FALL DOWN EASILY EVEN IF THE SADDLE MOVES BY THERMAL EXPANSION OF SEAWATER SPRAY PIPE.
5. WHEN INSTALLING SEAWATER SPRAY PIPE, CONFIRM THAT THE SPACE BETWEEN IT'S END AND ABSORBER CENTER LINE IS MORE THAN SPECIFIED, TAKING THERMAL EXPANSION OF SEAWATER SPRAY PIPE INTO CONSIDERATION.

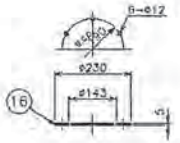


DETAIL OF HEX. BOLT

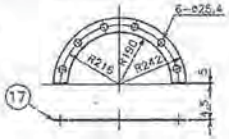
DETAIL OF SADDLE



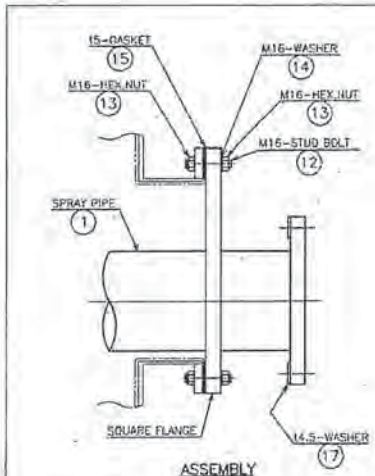
DETAIL OF NOZZLE HOLDER



DETAIL OF GASKET



DETAIL OF WASHER



ASSEMBLY

SPECIAL NOTES

A) CHECK THAT ABSORBER CASING FLANGE FACE INCLUDING LINING SHALL BE FLAT FACE, AND 5mm-THICKNESS RUBBER GASKET AND M16-STEEL WASHER IS CORRECTLY INSTALLED AS PER ABOVE DWG.

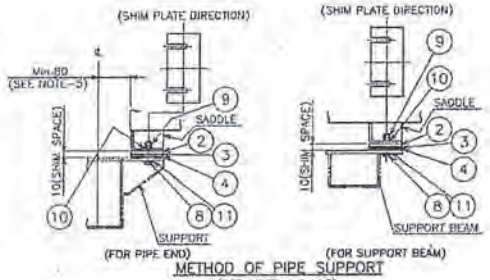
B) SILICON SEALER SHALL BE APPLIED IN BOTH SIDES OF THE GASKET SURFACE.

C) USE TORQUE WRENCH (~30Nm) TO TIGHTEN THE BOLT.

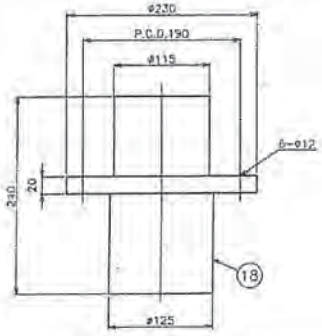
D) M16 BOLT FOR SQUARE FLANGE SHALL BE TIGHTENED DIAGONALLY TO OBTAIN EVEN TIGHTENING. UNEVEN TIGHTENING WILL CAUSE THE CRACK AND/OR BREAKAGE OF FRP MADE SPRAY PIPE.

E) M16 BOLT FOR SQUARE FLANGE SHALL BE TIGHTENED WITH 10Nm AT FIRST. AFTER 30 MINUTES, IT SHALL BE RE-TIGHTENED WITH 16~20Nm.

F) CHECK THE EXTERNAL OF FRP SPRAY PIPE THAT THERE ARE NO CRACK AND/OR BREAKAGE. IF ANY TROUBLE ARE FOUNDED, IT SHALL BE REPORTED TO MHPS IMMEDIATELY.



METHOD OF PIPE SUPPORT
(SEE NOTE-1,3,4&5)



DETAIL OF SPRAY NOZZLE

5	510	18	SPRAY NOZZLE	PP	15				
1	68	17	WASHER	CARBON STEEL + GALV.	2				t4.5
5	510	16	GASKET	BUTYL RUBBER	15				t5 (THICKNESS) (to 30~40)
1	34	15	GASKET	BUTYL RUBBER	1				t5
9	884	14	WASHER	CARBON STEEL + GALV.	26				M16
18	468	13	HEX. NUT	CARBON STEEL + GALV.	52				M16
9	884	12	STUD BOLT	CARBON STEEL + GALV.	26				M16x100 (FULL THREAD)
3	204	11	WASHER	JIS S 11254 or EQ.	6				□45xt3
3	204	10	WASHER		6				t3
5	469	9	HEX. NUT		12				M16
3	204	8	HEX. BOLT		6				M16x100 (FULL THREAD)
50	650	7	WASHER		150				M10xt2
50	650	6	HEX. NUT		150				M10
31	330	5	HEX. BOLT	JIS S 11254 or EQ.	90				M10x70 (FULL THREAD)
51	102	4	SHIM PLATE	FRP	3				t2
51	102	3	SHIM PLATE	FRP	3				t3
	102	2	SHIM PLATE	FRP	3				t5
	54	1	SPRAY PIPE	FRP	1				I.D.300xt9
QTY/SET	QTY/UNIT	MARK	DESCRIPTION	MATERIAL	TOTAL WEIGHT (Kg)	UNIT WEIGHT (Kg)	UNIT WEIGHT (Kg)	UNIT WEIGHT (Kg)	REMARKS

FOR INFORMATION

NOTICE

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REVISED

APR. -8. 2015

OWNER	PAGBILAO ENERGY CORPORATION
JOB	PAGBILAO 420MW UNIT3 COAL-FIRED POWER PROJECT
CONSULTANT	JACOBS
TITLE	Seawater FGD-ABSORBER SEAWATER SPRAY PIPE & NOZZLE PLAN DWG.
DESCRIPTION	
CONTRACTOR	MHPS / Daelim Consortium

PROJECT CHECKED	S.KIM	PROJECT CHECKED	K.YAMAMOTO	PROJECT APPROVED	I.NISHIYA	
DRAWN	N.JEON	DESIGN CHECKED	Y.SUN NISHIKAWA	DESIGN APPROVED	T.MIZUNAKA	DATE 2014/10/24

CONFORMED	SECTION: MECHANICAL MACHINERY & PACKAGE GAS ENGINEERING SECTION	SCALE: 1/15	OWNER'S DRAWING NO.: -
P/M	ORDER: 3773046	ITEM	CONTRACTOR'S DRAWING NO.: V402-10301

REVISION: 1

MITSUBISHI HITACHI POWER SYSTEMS, LTD.

DRAWN 2014.10.24 ISSUED

BIEPCL_DOC. NO. - MAITREE-00-HT-QA-300079-PSE_REV NO. 0

ANNEX-II

5.0 JET AIR SPARGERS (JAS)

1) Take out the JAS from the box only just before the assembly.
To prevent any scratch after removal from the box, put the JAS in a flat and prepare for the cushion such as Styrofoam under the JAS.

2) When carrying, handle it as per following picture by using Nylon sling to avoid any scratching.
Wire rope shall not be used.
Moreover be careful that any tension will not be added to the Flange and Bolt hole.

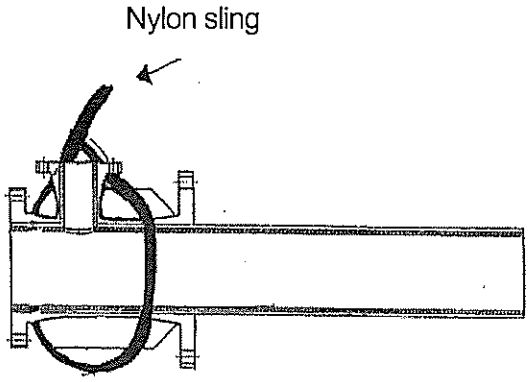

Fig. 3-4-1 Jet Air Sparger handling procedure

3) Don't place the JAS PIPE near any high temperature heat source like boiler, stove etc.
Also don't let it come in contact with oil, paint or other organic solvents etc., as these may cause deterioration of the nozzle material.

4) Ensure that welding sparks do not contact the JAS PIPE.
When a spark of welding, etc. may be flown on FRP equipment, protect them by using fire-resistant sheet, etc.

5) Keep clean the trash of flange face before install to the absorber.
Tighten the bolts equally and gradually so that there may not be inclination.

6) Expansion Joints are required for both Inlet of Air and Water connection to prevent any damage for FRP flange. [**IMPORTANT**]

SPRAY NOZZLES

1. GENERAL

This document covers the installation procedure for PP made DCFS spray nozzles , which are to be furnished in PAGBILAO 420MW UNIT 3 COAL-FIRED POWER PROJECT.

2. RELATED DOCUMENTS AND DRAWINGS

Following drawing shall be applied to this document.

1. ABSORBER
   DCFS SPRAY NOZZLE PLAN DWG. : Dwg. No. V221-10304

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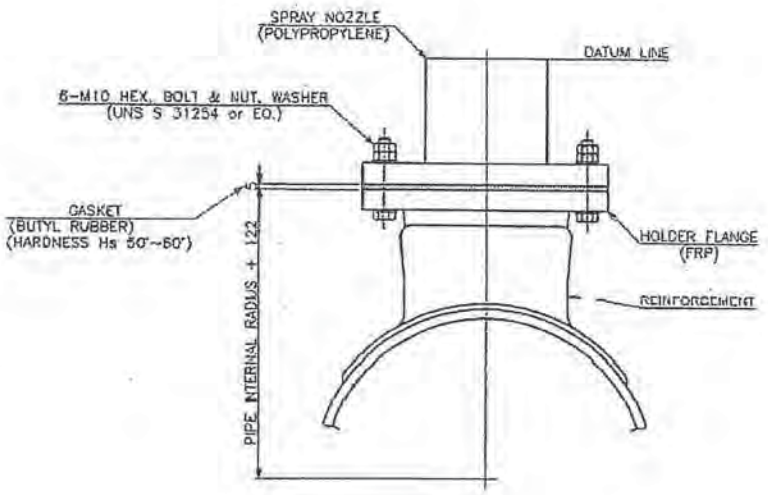
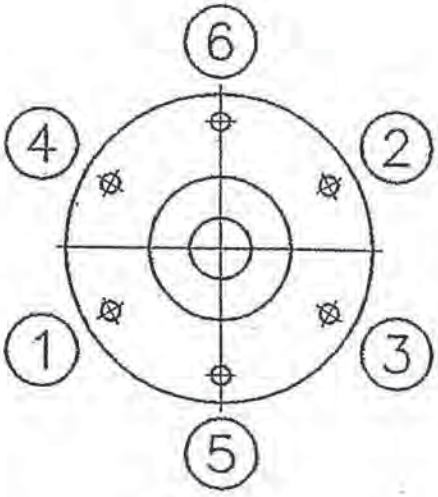
3. INSTALLATION PROCEDURE

1. CONFIRM THAT THERE ARE NO FOREIGN SUBSTANCES ON THE APPEARANCE OF ALL THE GOODS (SPRAY NOZZLES, GASKETS AND HOLDER FLANGES).
2. KEEP READY TORQUE WRENCH AND DIGITAL TYPE SPIRIT LEVEL.
3. SUFFICIENTLY CLEAN SURFACE OF GOODS MENTIONED ABOVE. (VERY IMPORTANT)
4. SET THESE GOODS AS SHOWN IN THE DRAWING, SET THE TORQUE WRENCH TO 10Nm AND TIGHTEN THE BOLTS DIAGONALLY AS SHOWN IN THE BELOW FIGURE TO OBTAIN EVEN TIGHTENING AT THAT TIME, TAKE CARE THAT THE BOLT SHOULD NOT TOUCH THE BOLT HOLE SO AS NOT TO CHIP OFF.
5. SET THE TORQUE WRENCH TO 16Nm AND UNIFORMLY TIGHTEN THE BOLTS WHILE CONFIRMING THAT HORIZONTALITY OF THE NOZZLE TOP IS WITHIN 3/100 (TARGET : 1/100).
6. IF 3/100 HORIZONTALITY OF THE NOZZLE CANNOT BE ACHIEVED WITH 16Nm TORQUE, SET THE WRENCH TO 18Nm AND TIGHTEN THE BOLTS GRADUALLY TAKING CARE THAT THE TORQUE DOES NOT EXCEED 18Nm.
   AT THIS TIME ENSURE THAT THE HORIZONTALITY IS DEFINITELY WITH THE STIPULATED VALUE.
   THE COMPRESSION OF GASKET SHALL NOT EXCEED 1mm.
   IN CASE THAT THE COMPRESSION EXCEEDS 1mm, IT SHOULD BE REPORTED TO THE DESIGNER IN CHARGE AND THE INSTALLATION PROCEDURE SHALL BE CHANGED.
7. AFTER THAT, FIX NOZZLE WITH DOUBLE-NUT TO PREVENT THE LOOSENING OF THE FIRST NUT.
8. FINALLY, CONFIRM THAT THERE ARE NO FOREIGN SUBSTANCES ON THE APPEARANCE.





NOTES

1. SPRAY NOZZLE SHALL BE ASSEMBLED ON HOLDER FLANGE AFTER INSTALLING SEAWATER SPRAY PIPE INTO ABSORBER COMPLETELY.
   IN CASE OF PULLING OUT SEAWATER SPRAY PIPE FROM ABSORBER FOR MAINTENANCE, SPRAY NOZZLE SHALL BE DISMANTLED AT THE INSIDE OF ABSORBER IN ADVANCE.
2. SPRAY NOZZLE SHALL BE ASSEMBLED SO THAT THE INCLINATION OF DATUM LINE OF NOZZLE SHALL BE WITHIN 3/100 (TARGET : 1/100) FOR ANY ORIENTATION, WHEN A SPIRIT LEVEL IS PLACED ON THE DATUM LINE OF THE NOZZLE. THE NOZZLE INCLINATION SHALL BE ADJUSTED BY FASTENING EACH BOLT. (REFER : INSTALLATION PROCEDURE)
3. BECAUSE PP IS FRAGILE, PAY ATTENTION NOT TO HIT ANYTHING (SPRAY NOZZLES, TORQUE WRENCH ETC.) AGAINST THE SPRAY NOZZLES.

Mist Eliminator

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Munters Euroform GmbH • Postfach 101109 • D-52011 Aachen

TÜVRheinland CERT ISO 9001

Order-No.:	**E2027219**
Project:	**Pagbilao Unit 3**
Client:	**Mitsubishi Hitachi Power Systems**
Client-Order-No.:	**4500303000/904**

Assembly and Installation Manual

Mist Eliminator

Type DV880

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		Function	Name	Initials	Function	Name	Initials	Function	Name	Initials	mm/dd/yy
0	First Issue	Engin.	Weidenb örner	JAW	Quality Manager	Sladek	PSL	Quality Manager	Sladek	PSL	01/20/05
1	general revision	Dipl. Ing.	Woike	fw	Quality Manager	Sladek	PSL	Quality Manager	Sladek	PSL	04/12/07
2	Changed by MHPS comments	Quality Assistant	Windels	FW	Quality Manager	Heitzer	AH	Quality Manager	Heitzer	AH	09/07/15

ANNEX-II
BIFPCL DOC. NO. : MAITREE-00-HT-QA-300079-PSE, REV. NO. : 0

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1 General Notes and Information

1.1 *Technical explanation of the mist eliminator*

The mist eliminator is located of the absorber above the scrubbing zone and consists of two stages: the coarse and the fine eliminator.
Both stages are set on a separate steel construction as shown on drawing Munters - No.: 00-1413304 / MHPS – No.: V321 – 10254. ①

The eliminator elements are arranged in parallel rows which will be aligned during construction. The form as well as the arrangement of these elements across the absorber diameter is shown on drawing Munters - No.:00-1413302 / MHPS – No.: V321 - 10252 ①

The span (clearance between beams) of the elements is 1900 mm.

The space between the eliminator lamella in the coarse eliminator is 40 mm.
The space between the eliminator lamella in the fine eliminator is 25 mm.

1.2 *Technical explanation of the cleaning system / spray nozzles*

For cleaning purposes the mist eliminator is equipped with 1 level of nozzle pipes. The diameter of the nozzle pipes is ø 90 mm. They are arranged at the:

- Fine eliminator downstream side

Each spray pipe is equipped with a number of full cone nozzles, screwed into the pipe walls. The nozzles are arranged at distances to ensure an even and complete distribution of the flushing water over the surface of the lamellas.

The arrangement of the spray pipes and nozzles are shown on drawing
Munters - No.:00-1413301 / MHPS – No. V321 - 10251. ①

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1.3 *Material specification*

The material of construction for the pipe system and the frame structure of the eliminators is polypropylene (PP).
The operating temperature of this material is given at 80 °C and can be raised for a short time (max. 10 min.) to 85 °C.
The mist eliminator profiles are made of PP. This material has a greater stiffness at the same operating temperature (80 °C, raised for a short time (max. 10 min.) to 85 °C).

The brittleness of thermoplastic synthetic resin at temperatures below + 5 °C (even more at temperatures below 0 °C) has always to be taken in consideration. At those temperatures the impact strength is drastically reduced and crushes, vibrations and sudden pressure changes must be avoided, especially during

- Transport
- Assembly and installation
- Pressure changes
- Cleaning cycles

Otherwise the risk of breakages is given.

The used material - polypropylene - can be welded easily by using the hot gas process or sealing with heat reflectors.
Sections of pipes can easily be removed and durably welded back on again.
The advantage of polypropylene against other materials is, that no corrosion problems which would make long and difficult reworking necessary, can arise at the seams.

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2 Transportation to the site

2.1 *Transport*

The eliminator elements as well as the spray system equipment will be delivered in wooden crates and boxes to site. The crates and boxes are allowed to be lifted and transported only at the marked points. Rough handling has to be avoided.

Transportation of the equipment at temperatures below 5°C is generally forbidden.
At temperatures between +5°C and +10°C transportation has to be carried out with a maximum of caution and care.

2.2 *Transportation damages*

Generally, transport damage is understood to be damage that materials being transported have suffered in transit. So there is a clear distinction between damage that has occurred before and after the time of transportation.

Transport damage is also divided into "visible" and "concealed" damage.
The distinction between the two types of damage is relevant to the freight carrier's liability.
The freight carrier will only be liable if it can be proved that the damage was caused in transit.

Therefore immediately open consignments and make sure that no concealed damage has occurred.

Visible damage

Damage to the transported item or its packaging has occurred and is visible from the outside.
The forwarding agent must be immediately notified of any visible damage.
The damage must also be recorded on the freight documents and confirmed by the freight carrier. It is also recommended that any damage be documented with the help of digital photos.

Concealed damage

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Concealed damage usually becomes apparent when the items are unpacked, the packaging itself is not damaged, but the contents turn out to be damaged.
Transported items with concealed damage should not be unpacked any further once damage has become apparent. The damage should also be documented here as far as possible with the help of digital photos.

Time limits for reporting damage

The recipient must make any complaints about any damage within the statutory time limits in order to ensure that the transport company becomes liable. The freight carrier must be immediately notified of any apparent transport damage when the goods are received.
Please record the delivery date, delivery time, any incorrect quantities, type of damage and vehicle registration number on the proof of delivery/delivery note and have the driver confirm this.
The freight carrier must be immediately notified or notified within seven days in writing (also by fax) of concealed damage. It is always helpful to send us a copy of the notification of damage.

IMPORTANT

Munters Euroform GmbH must be immediately notified of any transport damage. You will then receive timely instructions about further measures, e.g. regarding the commissioning of a loss assessor, return transport, replacement delivery, etc.

Please send us the following documents:

- Freight documents (e.g. driver's delivery schedule, CMR bill of lading, delivery note, packing list, ...)
- Description of the damage and a copy of your claim against the forwarding agent and its response

The transition of risk in accordance with the respectively valid Incoterms will apply to claim adjustments

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2.3 *Storage*

Care must be taken that the crates and boxes are stored safely to avoid tilting and bumping. Fire or welding close by, as well as stacking the crates and boxes, is also not allowed.

If the equipment is stored outside, it should be adequately protected from the weather (e.g. strong rain, dust).
Polypropylene is not resistant against UV - radiation; therefore the equipment has to be protected from the sun.

Generally, storage inside a closed building is strongly recommended by Munters Euroform GmbH.

2.4 *Packing lists*

To avoid unnecessary waiting times or delay during installation, all delivered boxes should be opened and checked, regarding completeness and undamaged condition, immediately after arriving on site.
It is useful to tick off the enclosed listings.
After this inventory all equipment must be returned to the box in the original order. This enables parts to be found more quickly during the assembly process.

A work copy of the packing lists (chapter 6.2) is attached to this manual.

2.5 *Disposal of packaging material*

The effective disposal / recycling of the packaging material is the responsibility of the client. Munters Euroform GmbH can not be held responsible for this in any way.

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3 Assembly and Installation

3.1 *Safety references*

For the assembly and installation of the mist eliminator, safety guidelines, including all local regulations, must be followed, even if they are not expressly specified here.

The installation shall be carried out only by well skilled and trained personnel.

The installation of the mist eliminator is carried out at height. For safety reasons it is necessary to take precautions against fall. It is recommended, for example, to cover the working area with wooden boards and to use fall protection equipment during installation.
Additionally the assembly of a working platform, approximately 2 meter below the top of the support beams, is required.

Other work beneath the mist eliminator is not allowed to be carried out during installation. Safety precautions like spanning a net or similar are not sufficient to protect workers below against falling objects like tools, bolts or even eliminator elements.

Tools and lifting devices which are used for the installation must have a test certificate and number (if required by local authorities or the site management).
Ropes or chains for lifting are only allowed to be used in an undamaged condition.
The weight of the lifted part must be checked and the lifting device must be able to handle that weight.

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3.2 *Lining protection*

In some cases, depending on the material of the mist eliminators support structure and lining type, it may be necessary to apply a lining protection on the support structure prior to the installation of the mist eliminator.
In such cases Munters will supply PP strips for the lining protection.
The lining protection has to be attached by the customer according the specification of the lining supplier.
The method and the required adhesives may be different and depend on the type of lining.

Munters is not responsible to supply detailed instructions for the lining protection installation!

3.3 *Preparation of the assembly*

Before fitting the mist eliminator elements into the absorber, the carrier construction for the elements has to be checked for correct positioning, clearance between the beams and secured fastening to the main structure. If any measurement is outside the accepted tolerance, Munters Euroform GmbH has to be notified immediately.
Placing the parts under mechanical stress to make them fit is not acceptable.
In all cases were this is seen as necessary, Munters should be immediately contacted.

The necessary assembly of the single elements has to be carried out outside of the absorber.

The assembly and installation of the mist eliminator should only be carried out by such personnel, who are skilled and trained in the handling and processing of polypropylene.
Possible adjustments to, or welding of the equipment should only be done by qualified workers with a valid welding certificate (according DVS-Guideline or similar). Suitable tools and machinery must be used.

The competent instruction by a Munters Euroform supervisor is strongly recommended!

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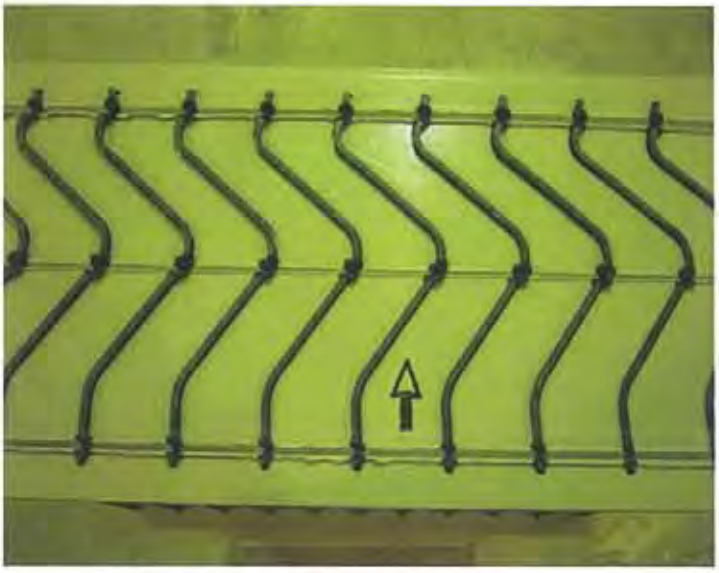
3.4 *Marking of parts*

The pictures below show an eliminator element and its marking:

Mist eliminator element



The marking is analogue for other parts.

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Spraying pipes

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3.5 *Installation of the mist eliminator elements*

The construction of the elements and the marking of the needed parts has been done in such way, that the assembly can be done easily.

For reasons of safety, before starting the installation of the mist eliminator, the working area has to be covered with boards.

The mist eliminator elements will be brought into the absorber via the maintenance and installation door.

According to the assembly drawing the installation of the corresponding modules should start opposite to the installation door by taking away the boards from the single sectors and to put on the modules on the support beams. The installation of each row starts with the end elements close to the absorber wall. Special attention must be paid to the direction of the profiles which has to be identical for all elements of one row.

The elements of each row have to be aligned carefully. The cover plates at the end of each row must to have an even expansion distance to the absorber wall. The complete absorber diameter must be covered with mist eliminator elements. Openings which would allow flue gas bypasses must be avoided.

The end lamellas of each element are not allowed to touch the liner of the supporting beams directly; otherwise the liner could be damaged. For lining protection these elements must be equipped with gliding plates of polypropylene.

The installation of the spraying system (as described in chapter 3.6) must be considered during the installation of the mist eliminator elements.

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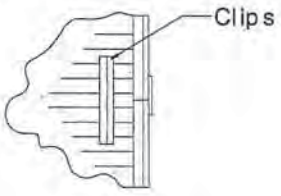
Attention!

The supporting safety scaffolding must follow the installation work in progress up to the installation door.

The complete mounted and aligned mist eliminator elements have to be fixed to each other with clamping strips. See sketch below.



Please note: before assembly of the clamping strips (spacers) heat them to 40° - 50°C (e.g. in a bath of water).

Finally all screwed joints have to be checked that they are securely tightened.

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3.6 *Installation of the spraying system*

It has to be assured, that the whole spraying system is absolutely clean before installation. Possible dirt within the pipes (like swarf etc.) can block single nozzles during operation and cause failure of the cleaning system.

The nozzle pipes will be installed in the provided supports. The nozzles must be aligned in such way, that the nozzle outlet area and so the spray cone is directed to the lamella of the eliminator element.
During assembly it must be paid attention to the marking of the flanges (nozzle adjustment)

In order to avoid damage to the polypropylene flushing pipes and flanges, caused by vibrations or shock pressure, the counter flanges, provided by customers, should be equipped with compensators.

The nozzle pipes downstream of the coarse eliminator and upstream of the fine eliminator elements have to be installed after completion of the fine eliminator stage and before installation of the coarse eliminator.

The supplied gaskets must be installed at each pipe connection.
The correct fit has to be checked.
If available screwed pipe joints of the type ME must be secured with an additional screw (see chapter 3.6.1). The supplied safety screw (DIN931 M10x20) has to be fitted into the pre-drilled hole.

Most of the flushing systems don't need any alignment after installation. The nozzles spray in the right direction if the flushing system is installed correctly.
Some flushing systems have adjustable parts/nozzles and the spray directions of the nozzles have to be adjusted as shown on the referring drawings.

After complete installation of the pipe system all nozzles will be solidly screwed in the designated tapping holes.
All screwed joints (pipes, nozzles, flanges) must be checked regarding a tight and secure joint. Any loose connection must be re-tightened.

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It must be confirmed in the acceptance certificate (see chapter 4), that this control has been carried out.

Screws for flushing system, flange connection (PP/steel) outside of the scrubber:

Screw size	Material	Torque (Nm)
M16	galvanised steel	32 - 37
M20	galvanised steel	32 - 37
M24	galvanised steel	32 - 37

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3.6.1 Screwed pipe joints (if available)

The following screwed pipe joints are used for the pipe connection of the spraying system:

Screw joint with coupling ring

ME – screw joint

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4 Acceptance of Assembly and Installation

After complete assembly and installation of the total mist eliminator system an acceptance certificate regarding the work carried out has to be issued.
In this certificate the correct and complete installation as well as the undamaged condition of the mist eliminator has to be confirmed.
A copy of this acceptance certificate, signed by the responsible supervisor, must be send to Munters Euroform GmbH.

Commissioning of the system without this certificate is not admissible and exempts Munters Euroform GmbH from all guarantees.

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5 Munters Euroform Service and On-Call Duty

First please contact your local agent.
During office hours (core time 09:00 – 16:00 CET) Munters Euroform can be reached on:

phone no.:	++ (49) 241-8900-5313
fax-no.:	++ (49) 241-8900-5269
e-mail:	markus.karbach@munters.de

After office hours, in cases of urgency, we can be contacted at the following address:

Munters Euroform GmbH
Dpt. Service, Assembly and Spare Parts

phone no.:	++ (49) 241-8900-5313
fax-no.:	++ (49) 241-8900-5269
mobile:	++ (49) 173-5816725
e-mail:	markus.karbach@munters.de

Munters Euroform will be glad to offer advice in the case of an emergency. Repairs and cleaning work are carried out by our trained and experienced staff

Munters

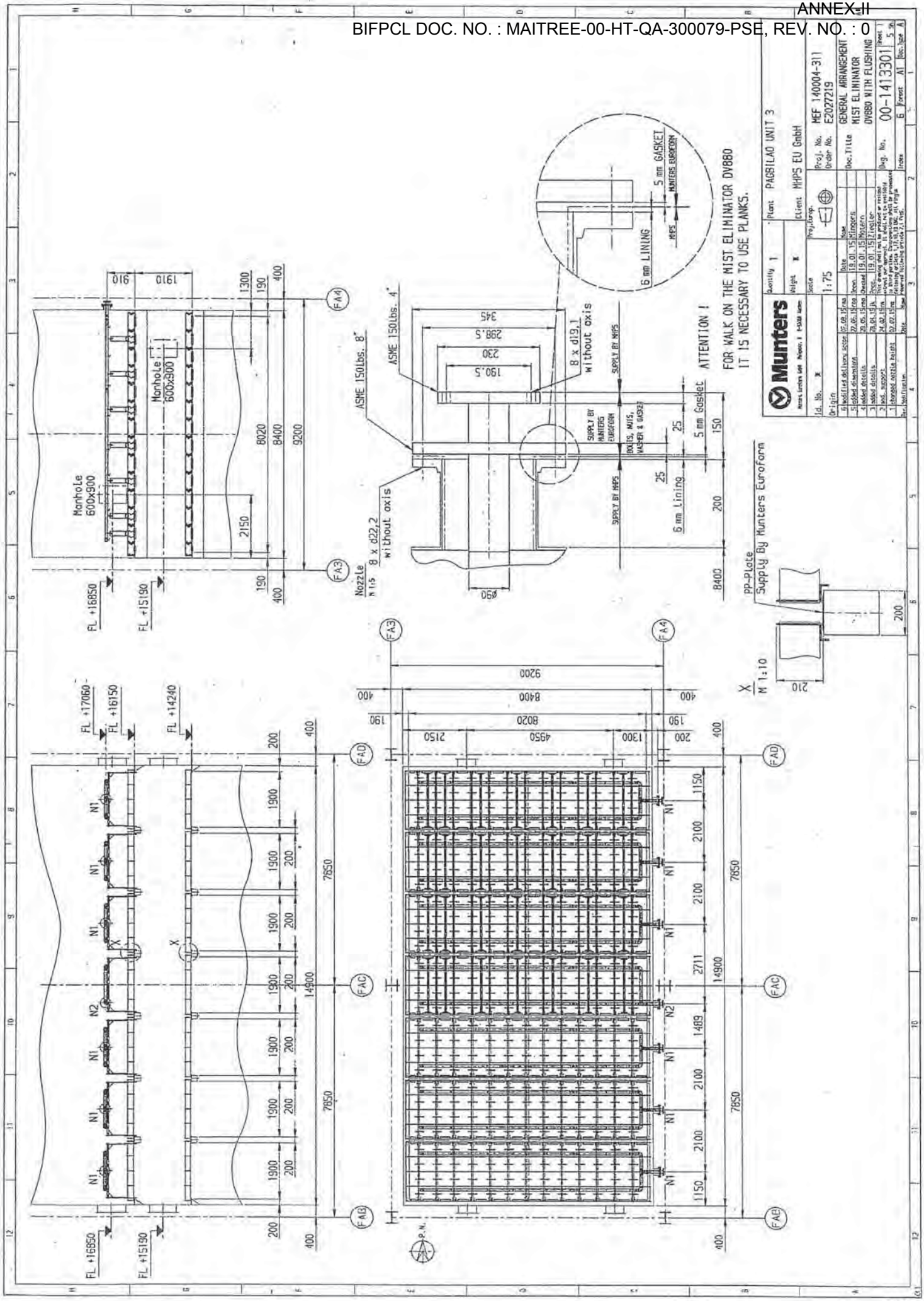
6 Applicable Documents

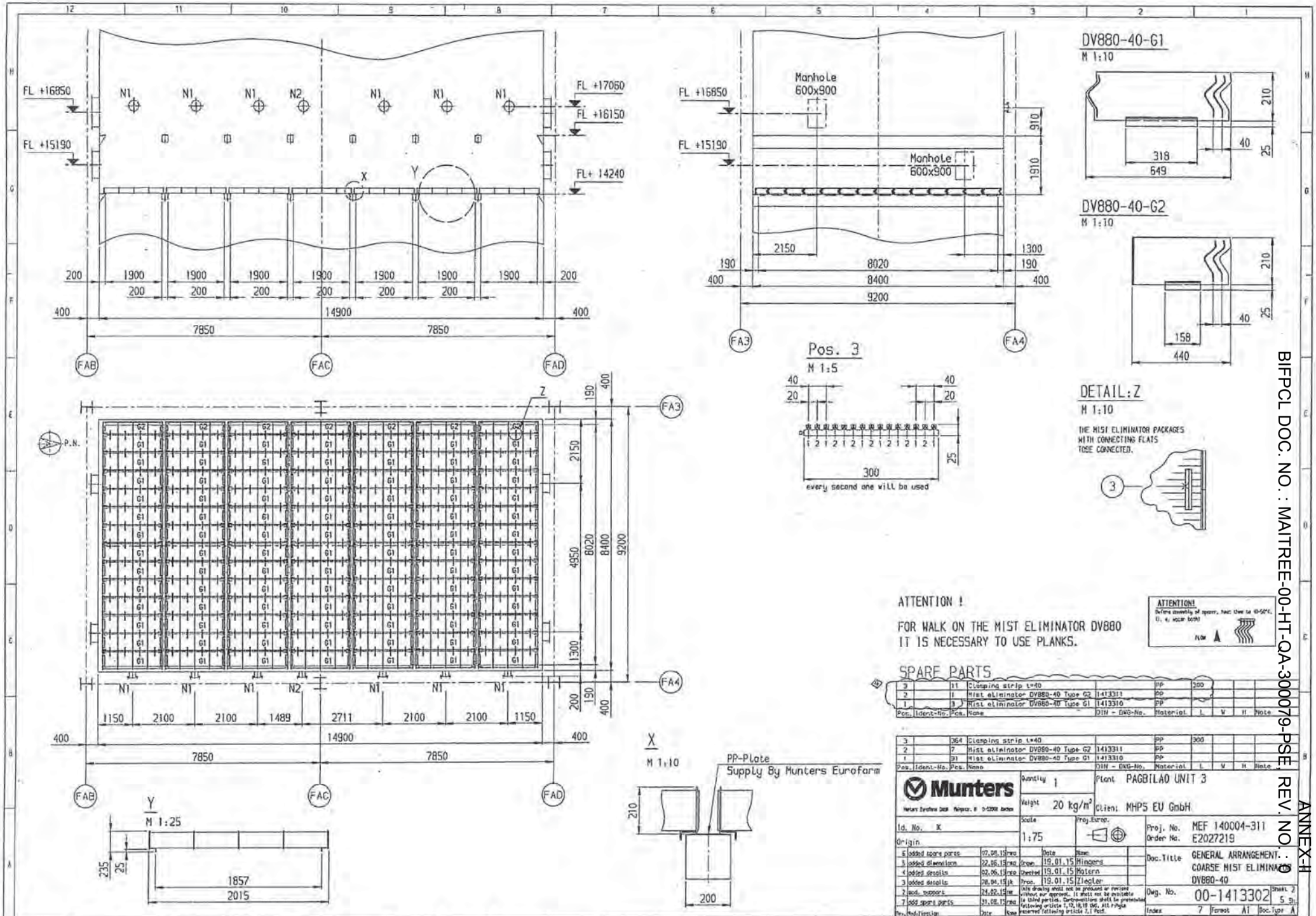
6.1 *Drawings list*

Element	Drawing – No. Munters	Drawing – No. MHPS
Drawing	00 – 1413301	V321 – 10251
Drawing	00 – 1413302	V321 – 10252
Drawing	00 – 1413303	V321 – 10253
Drawing	00 – 1413304	V321 – 10254

6.2 *Packing lists*

Please find attached the packing lists for your project.


Munters
Plant: PAGBILAO UNIT 3
Client: MMPS EU GmbH
Proj. No. MEF 140004-311
Order No. E2027219
Doc. Title GENERAL ARRANGEMENT MIST ELIMINATOR DV880 WITH FLUSHING
Dwg. No. 00-1413301
Sheet 1 Sh. 5
Index 6 Format A1 Doc. Type A
Scale 1:75
Quantity 1
Weight
Id. No.
Origin
ATTENTION !
FOR WALK ON THE MIST ELIMINATOR DV880
IT IS NECESSARY TO USE PLANKS.
Manhole 600x900
Manhole 600x900
FL +16850
FL +15190
FL +17060
FL +16150
FL +14240
ASME 150lbs. 8"
ASME 150lbs. 4"
8 x d19,1 without axis
8 x d22,2 without axis
Nozzle N1:5
SUPPLY BY MMPS
SUPPLY BY MUNTERS EUROFORM
BOLTS, NUTS, WASHER & GASKET
5 mm GASKET
6 mm LINING
5 mm Gasket
6 mm Lining
PP-Plate Supply By Munters Euroform
M 1:10
P.N.
FA1
FA2
FA3
FA4
FA5
FA6
FA7
FA8
FA9
FAA
FAB
FAC
FAD
FAE



ATTENTION !

FOR WALK ON THE MIST ELIMINATOR DV880
IT IS NECESSARY TO USE PLANKS.

ATTENTION!

SPARE PARTS

Pos.	Ident-No.	Pos.	Name	DIN - DWG-No.	Material	L	W	H	Note
3		11	Clamping strip L=40		PP	300			
2		1	Mist eliminator DV880-40 Type G2	1413311	PP				
1		3	Mist eliminator DV880-40 Type G1	1413310	PP				

Pos.	Ident-No.	Pos.	Name	DIN - DWG-No.	Material	L	W	H	Note
3		364	Clamping strip L=40		PP	300			
2		7	Mist eliminator DV880-40 Type G2	1413311	PP				
1		91	Mist eliminator DV880-40 Type G1	1413310	PP				

Munters

Quantity 1
Weight 20 kg/m²
Scale 1:75
Proj.Europ.

Plant PAGBILAO UNIT 3
Client MHPS EU GmbH

Id. No. X
Origin

			Date	Name
6	added spare parts	07.08.15 rea		
5	added dimension	22.06.15 rea	Drawn	19.01.15 Mingers
4	added details	02.06.15 rea	Checked	19.01.15 Matern
3	added details	28.04.15 jk	Proc.	19.01.15 Ziegler
2	mod. supports	24.02.15 jk		
1	add spare parts	31.08.14 rea		
Rev.	Modification	Date	Name	

Proj. No. MEF 140004-311
Order No. E2027219

Doc.Title GENERAL ARRANGEMENT. . . COARSE MIST ELIMINATOR DV880-40

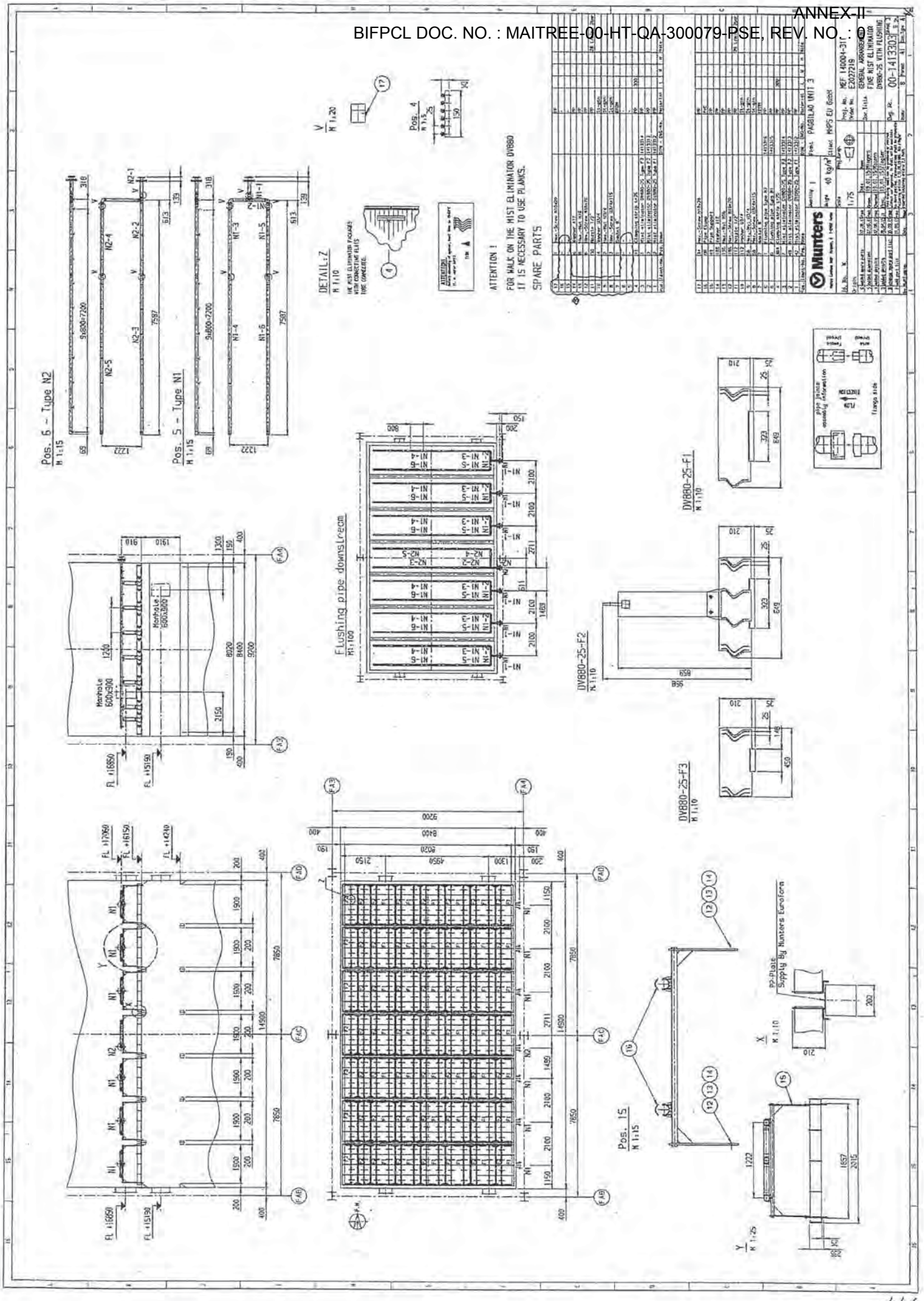
Dwg. No. 00-1413302 Sheet 2 5

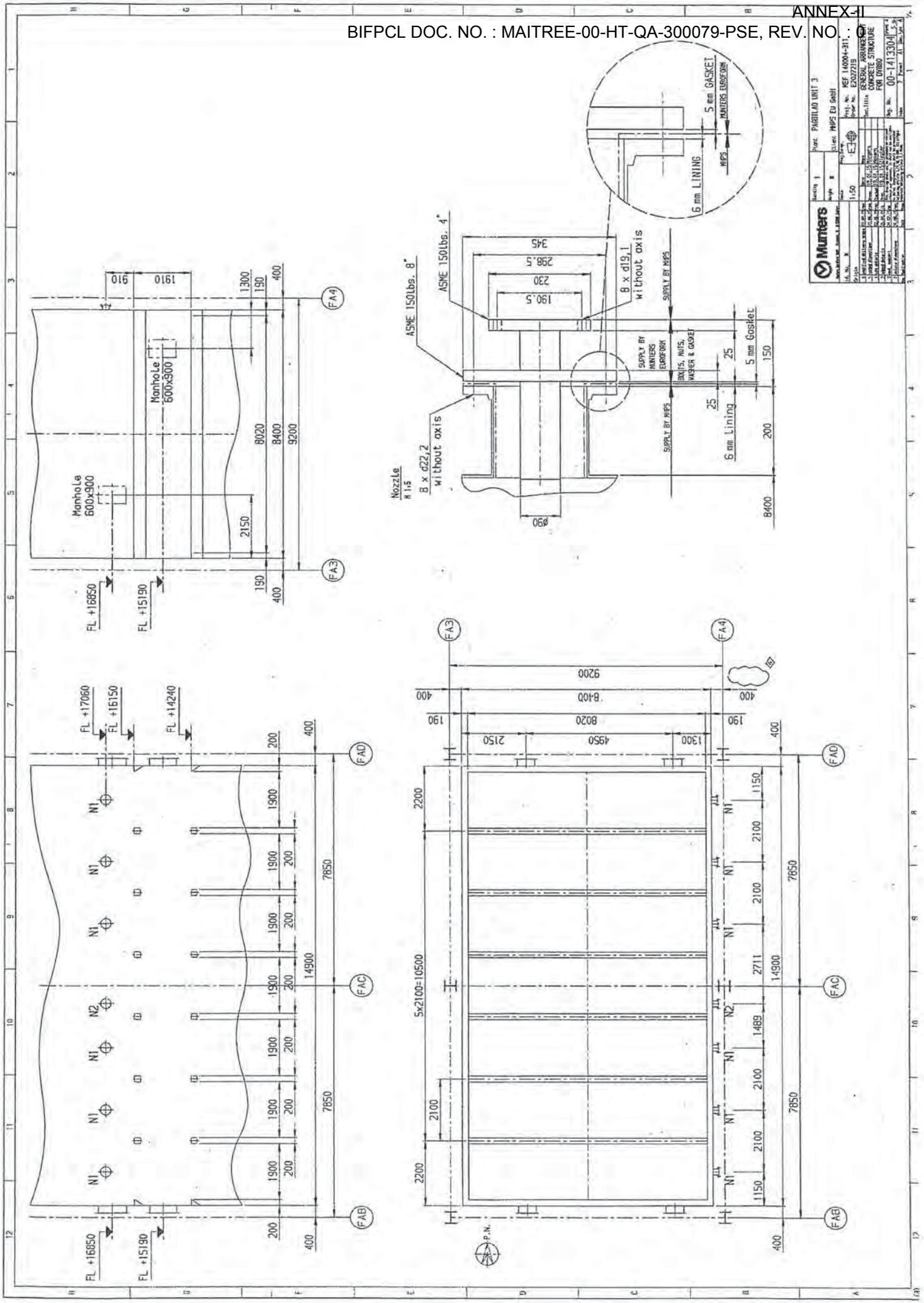
Index 7 Format A1 Doc.Type A

The drawing shall not be produced or revised without our approval. It shall not be available to third parties. Contraventions shall be prosecuted following article 7,12,16,19 UWG. All rights reserved following article 7,1 PatG.

BIFPCL DOC. NO. : MAITREE-00-HT-QA-300079-PSE, REV. NO. : 0

ANNEX-H


Pos. 6 - Type N2
Pos. 5 - Type N1
DETAIL: Z
ATTENTION !
FOR WALK ON THE MIST ELIMINATOR DV880
IT IS NECESSARY TO USE PLANKS.
SPARE PARTS
Flushing pipe downstream
DV880-25-F1
DV880-25-F2
DV880-25-F3
Pos. 15
Munters
GENERAL ARRANGEMENT
FINE MIST ELIMINATOR
DV880-25 WITH FLUSHING
00-1413303


Munters
Plant: PASRILAD UNIT 3
Client: MPS EU GmbH
Proj. No.: REF 140004-311
Order No.: E2027219
Scale: 1:50
Dwg. No.: 00-1413304
GENERAL ARRANGEMENT CONCRETE STRUCTURE FOR DY880
5 mm GASKET
MUNTERS EUROFORM
MPS
6 mm LINING
ASME 150lbs. 4"
ASME 150lbs. 8"
8 x d19,1 without axis
SUPPLY BY MPS
SUPPLY BY MUNTERS EUROFORM
BOLTS, NUTS, WASHER & GASKET
5 mm Gasket
6 mm Lining
Nozzle
8 x d22,2 without axis
Manhole 600x900
Manhole 600x300
FL +16850
FL +15190
FL +17060
FL +16150
FL +14240
FA3
FA4
FAB
FAC
FAD
N1
N2
5x2100=10500
P.N.

Munters

vorläufige Packliste /
Preliminary Packing List

Munters Auftrags-Nr/ order no. **E2027219**
Kunde/ Customer: **MHPS Europe GmbH**
Bestell-Nr/ P.O. number: 4500303000/904
Projekt/ Project.: Pagbilao Unit 3
Datum/ Date: 29.01.2015

Lieferadresse
Delivery Address

Pagbilao
Unit 3

Philippines

Munters Euroform GmbH
Phillpsstraße 8
D-52068 Aachen

E2027219

Kolli Colis Nr. No. n° N°	Packages Bultos Anzahl Quantity Quant. Cant.	Art Kind Type Modo (*)	Gewichte Poids Netto Net Neto (kg)	Weights Peso Brutto Gross Brut Bruto (kg)	Abmessungen Dimensions Volumen Volume Volume Volumen (m³)	Measurements Dimensiones Länge Length Longueur Longitut (cm)	Breite Width Largeur Anchura (cm)	Höhe Height Hauteur Altura (cm)	Inhalt Contenu Stück Pieces Pièces Piezas	Contents Contenido Deutsch German Allemand Alemán	Übersetzung Translation Traduction Traducción
1	1	1	1.295,00	1.825,00	12,298	260	215	220		DV880-25 PP	
2	1	1	1.295,00	1.825,00	12,298	260	215	220		DV880-25 PP	
3	1	1	1.295,00	1.825,00	12,298	260	215	220		DV880-25 PP	
4	1	1	875,00	1.405,00	12,298	260	215	220		DV880-40 PP	
5	1	1	875,00	1.405,00	12,298	260	215	220		DV880-40 PP	
6	1	1	875,00	1.405,00	12,298	260	215	220		DV880-40 PP	
7	1	1	155,00	475,00	7,200	500	120	120		Flushing Pipes	
8	1	1	285,00	605,00	7,200	500	120	120		Flushing Pipes	
8										Support beams	
8										Accessories and special Tools	
			6.950,00	10.770,00	88,19						

(*) 1 = Kiste / Case
2 = Karton / Carton
3 = Bibox
4 = Verschlag / Crate
5 = Palette / Pallet
6 = Palette m. Karton/ Pallet w. carton
7 = Bund / Bundle
8 = unverpackt / Unpacked
9 = Rolle / Roller
10 = Sack / Bag
11 = Fass / Cask
12 = Container

gemeldet durch/ Da

Seite / Page / Page / Página 1

[E] Store under protective roof / Unter Schutzdach lagern a

[ ] Store in closed rooms / In geschlossenen Räumen lagern b

[ ] Store in air conditioned compartmen / Lagerung in klimatisierten Räumen C

43/

ANNEX-II
BIFPCL DOC. NO. : MAITREE-00-HT-QA-300079-PSE, REV. NO. : 0

Emergency Quenching Spray Pipe

Page Not Used

CONTENTS

Page

1. GENERAL 2
2. RELATED DOCUMENTS AND DRAWINGS 2
3. PREPARATION FOR INSTALLATION 3
4. INSTALLATION PROCEDURE 3

1. GENERAL

This document covers the erection manual for FGD-EMERGENCY QUENCHING SPRAY PIPE, which are to be furnished in Flue Gas Desulfurization (FGD) Plant at PAGBILAO 420MW UNIT3 COAL-FIRED POWER PLANT.

NOTE : This document describes only a general requirement for the installation work and shall be used for reference. Installation procedure may be changed according to the site condition.

2. RELATED DOCUMENTS AND DRAWINGS

The following drawings shall be applied to this document.

No.	Item	MHPS No.
1.	Seawater FGD-EMERGENCY QUENCHING SPRAY PIPE AREA PLAN DWG.	V221-10201
2.	Seawater FGD-EMERGENCY QUENCHING SPRAY PIPE SUPPORT PLAN DWG.	V221-10301
3.	Seawater FGD-ABSORBER EMERGENCY QUENCHING SPRAY PIPE & U-BOLT DETAIL DWG.	V321-10201
4.	EMERGENCY QUENCHING SPRAY NOZZLE DETAIL DWG.	V321-10202

3. PREPARATION FOR INSTALLATION

(1)At first, check the quantity and dimension of all the parts shown in the reference drawings as per the list in Sec.2 and confirm that installation work can be carried out smoothly.
(2)The construction spare parts shall be separated and stored properly.
(3)The gaskets shall be stored in proper place.
(4)In handling these parts, take care not to damage any items by using proper tools.
(5)Confirm that the nozzle and support for emergency quenching spray pipe are at the correct position.

4. INSTALLATION PROCEDURE

Installation procedure shall be in accordance with the following:

4-1. Pre-fitting

Prefixed the emergency quenching spray pipe from outside of the inlet duct and nozzle orientation marking by using bolts and nuts. (See Fig.1-Fig.3 for reference)

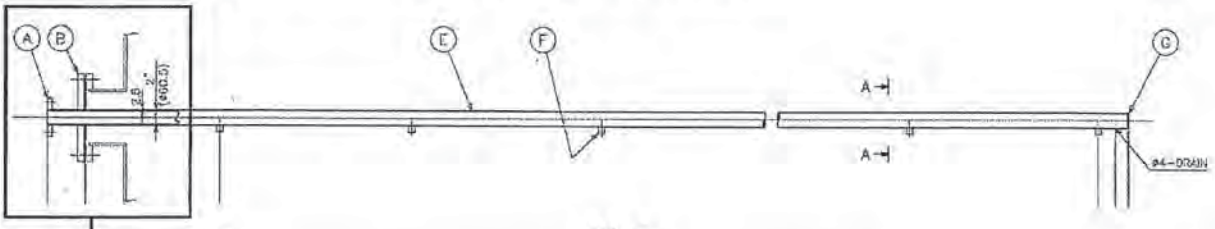


Fig.1

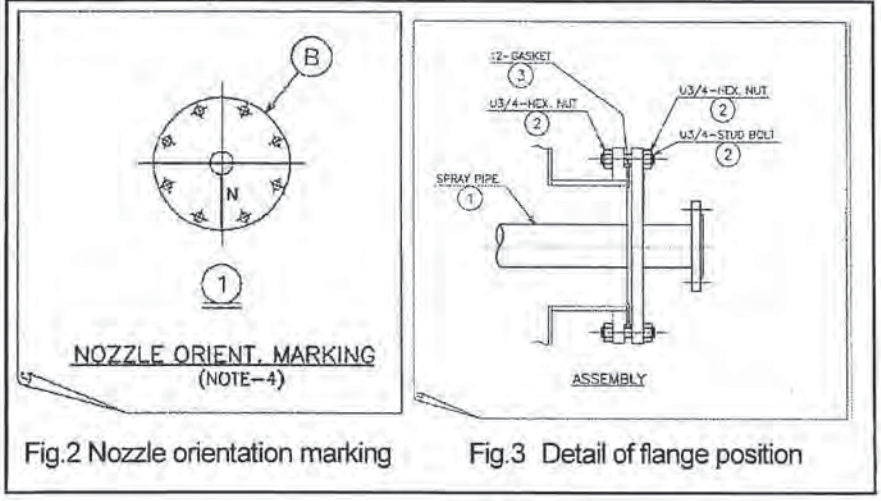


Fig.2 Nozzle orientation marking

Fig.3 Detail of flange position

MARK	DESCRIPTION
G	END PLATE
F	NOZZLE HOLDER
E	PIPE
D	LINING PLATE
C	PLATE
B	BLIND FLANGE
A	LOOSE FLANGE
1	SPRAY PIPE

4-2. Fitting U-bolt

(1)After pre-fitting, spray pipe shall be installed according to the procedure as mentioned above and confirm that it is installed properly. Then, fit the U-bolt and confirm that the inner surface of the U-bolt shall be completely fitted on the outer surface of spray pipe for saddle in a right angle.

(2)When installing the U-bolt, take care that the bolts shall be evenly tightened.

(3)After tightening the U-bolt, confirm that all nuts are firmly tightened and the washer is fitted or do not rotate. The spray pipe and U-bolt shall not move when shaking the spray pipe tip.

(4)After checking, install the lock nut properly to avoid loosening of the bolt.

(5)Then, double check the close surface contact of pipe outer surface and U-bolt inner surface. Ensure that there is no gap between spray pipe, support and U-bolt. If some gap occurred, do not tighten the bolt and nut by excess force. It shall be installed again in accordance with the installation procedure from the beginning.

(6)Lastly, confirm again that the spray pipe and U-bolt are installed properly and there is no problem in outer surface appearance for final check.

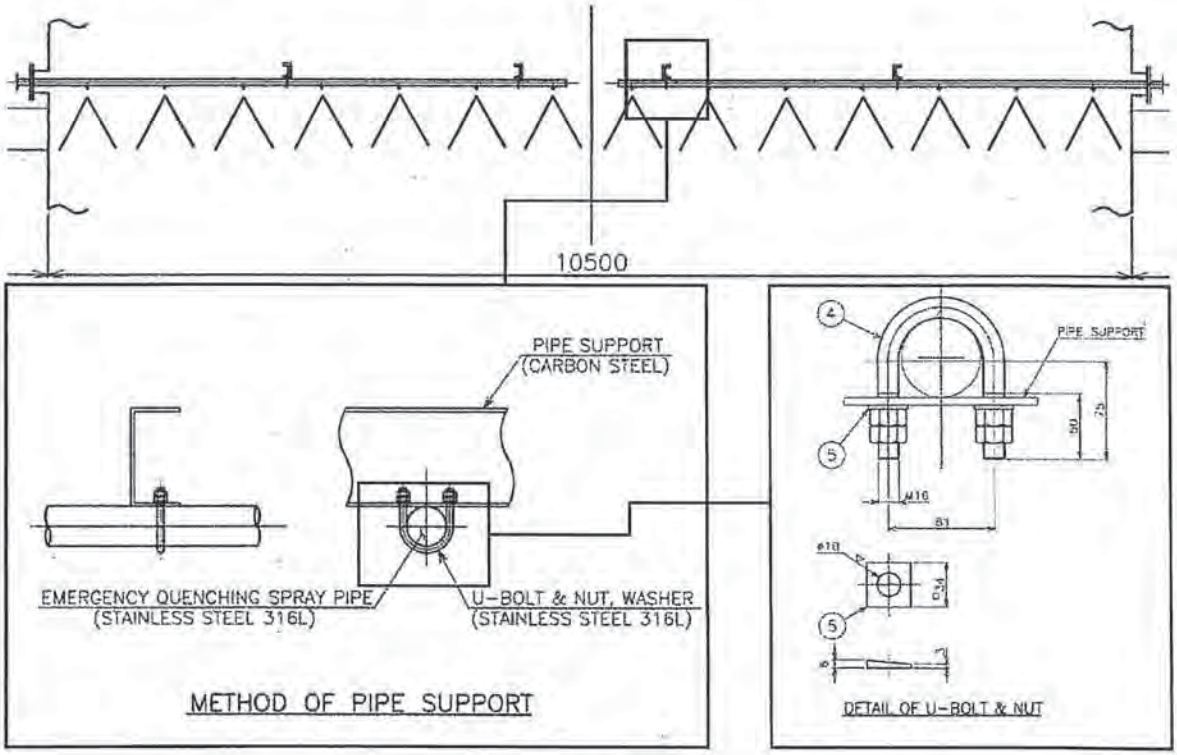


Fig.4. Detail of U-bolt

4-3. Spray Nozzle

After installation of spray pipe, attach carefully the spray nozzle and confirm the fitting.

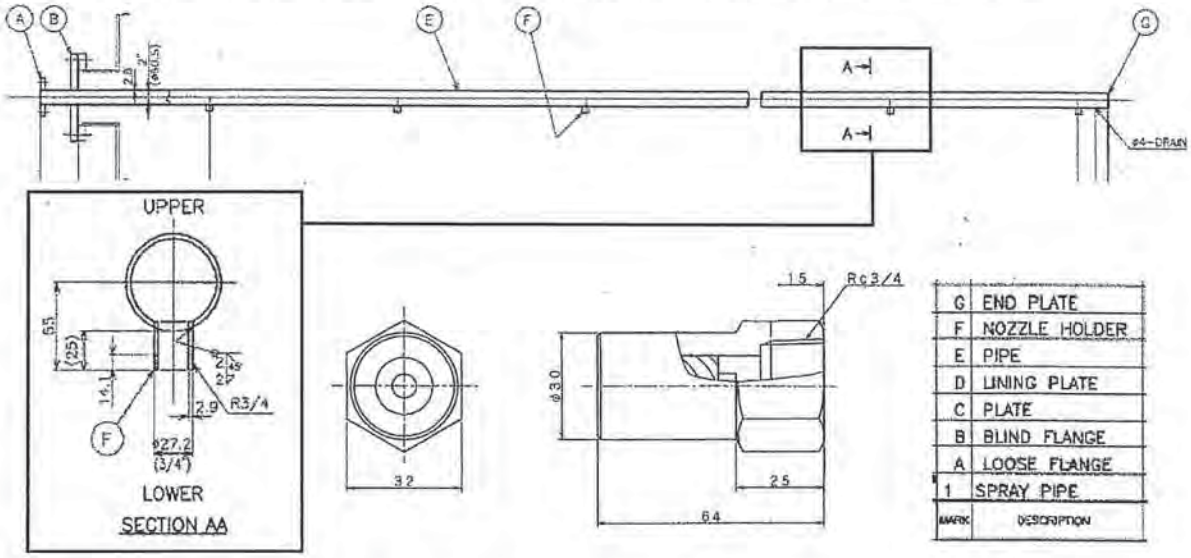


Fig.5. Detail of Spray nozzle (SUS316L)

NOTE:

- In case that some trouble occurred, installer shall report the situation to MHPS and take a proper action. And for the result caused by the installer's own judgement, MHPS shall not be held responsible for any damages and delays.

VACUUM BOX TEST PROCEDURE OF WELDS FOR FGD ABSORBER CEILING PANEL, SHELL & BOTTOM PLATE

1.0 SCOPE

The purpose of the vacuum box technique of bubble leak testing is to locate leaks in a pressure boundary that cannot be directly pressurized. This is accomplished by applying a bubble forming solution to a local area of the pressure boundary surface and creating a differential pressure across that local area of the boundary causing the formation of bubbles as leakage gas passes through the solution. This procedure is prepared as a general guideline for Vacuum Box Testing of welds for FGD absorber ceiling panel, shell & bottom plate for 2x660MW Maitree STPP, Bangladesh.

2.0 EQUIPMENT

2.1 The Vacuum box test is performed by using a box with visible window of toughened glass. The open bottom is sealed against the tank surface by a sponge rubber gasket or any appropriate sealant. The test scheme shall have suitable connections, necessary valve and calibrated Vacuum gauge. The gauge shall be calibrated as per ISO 3567 (or any other accepted international standard) and have a range of 0KPa to 100KPa or equivalent Pressure limits.

2.2 A vacuum can be drawn on the box by any convenient method, such as connection to a diesel motor intake manifold or to an air ejector or special vacuum pump. The gauge shall register a partial vacuum of at least 60KPa.

3.0 SURFACE PREPARATION

The surface to be examined and all adjacent areas shall be cleaned thoroughly and free from all dirt, grease, lint, scale, welding flux, weld spatters, paint, oil and other foreign matter that could obstruct surface openings or otherwise with the examination. Prior to vacuum testing all joints shall be checked visually and NDT shall be done as per the requirement of approved drawing / QP.

4.0 PROCEDURE

4.1 The temperature of the surface of the part to be examined shall not be below 5^0C nor above 50^0C.

4.2 The weld seam on the test shall be uniformly applied with a bubble forming solution by spraying or brushing, forming a continuous film relatively free of bubbles, before placement of the vacuum box. The solution shall not be applied more than one (1) minute prior to the test. The bubble forming solution shall produce a film that does not break away from the

area to be tested and the bubbles formed shall not break rapidly due to air drying or low surface tension. The number of bubbles contained in the solution should be minimised to reduce the problem of discriminating between existing bubbles and those caused by leakage. The bubble forming solution shall be compatible with the temperature conditions of the test.

4.3 Place the vacuum box over the solution coated portion of the test surface and evacuate it to the required partial vacuum (differential pressure).

4.4 The required partial vacuum shall be maintained for at least for 15 seconds examination time stop watch to be used after reaching the designated vacuum.

4.5 An Overlap of 25mm minimum for adjacent placement of the Vacuum box shall be given for each subsequent examination.

5.0 INTERPRETATION

5.1 Bubbles produced by air sucked through the welded joint can detect the presence of defect. Presence of continuous bubble growth on the surface of the material or weld seam indicates leakage through the weld joint in the areas under test.

5.2 Area being tested can be acceptable when no continuous bubble formation is observed.

5.3 Any leak observed is considered as unacceptable and the location of leak shall be duly marked and recorded for repairs. The subject weld is to be re-tested as per this procedure after repair.

6.0 LIGHTING

Lighting shall be sufficient to ensure the detection of leaks and the formation of bubbles as leakage gas passes through the solution. Artificial illumination such as a flashlight or other auxiliary lighting may be used.

7.0 SAFETY REQUIREMENT

Approved HSE Manual for Maitree STPP shall be followed for this activity.

8.0 REFERENCE STANDARDS

1. AWWA D100 : Welded Carbon Steel Tanks for Water Storage

2. API Std. 650 : Welded Tanks for Oil Storage

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-BR-50
PROJECT					REV. NO. : 0
UNIT NO.					LOG SHEET NO. : **L- 00**
RATING					PAGE **1** OF **1**

PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

			NAME	SIGNATURE & DATE	FQP NO.: QPE-MTE-660-BR-50
PROJECT		INSPECTED BY			REV. NO. : 0
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

FIELD QUALITY PLAN
FOR
TURBO GENERATOR AUXILIARIES

(STATIC EXCITER, SEAL OIL SYSTEM, GAS SYSTEM & PRIMARY WATER SYSTEM)

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

FOR TENDER PURPOSE ONLY

BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED

OWNER'S CONSULTANT

FICHTNER

Fichtner GmbH & Co. KG, Germany

BIFPCL DOC. NO. : MAITREE-00-MK-QA-300074-PSE, REV. NO. : 1

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-ST-44C
REV No.: 0

FIELD QUALITY PLAN
FOR
TURBO GENERATOR AUXILIARIES

(STATIC EXCITER, SEAL OIL SYSTEM, GAS SYSTEM & PRIMARY WATER SYSTEM)

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-MK-QA-300074-PSE, REV. NO. : 1

PREPARED BY	ENGR./QLY, BHEL-PSER	APPROVED BY	HEAD / QLY, BHEL-PSER
FQP NO.		**QPE-MTE-660-ST-44C**	
ORIGINAL DATE OF ISSUE		18/01/2019	
REVISION NO. & DATE		1, Dt. 25/02/2019	
COPY NO.		01	
ISSUED TO		BIFPCL / FICHTNER	
DATE OF ISSUE		25/02/2019	
PURPOSE :		FOR REVIEW & COMMENTS / APPROVAL	
ISSUED BY (SIGNATURE & DESIGNATION)		Digitally signed by Arup Ratan Paul DN: cn=Arup Ratan Paul, o=BHEL-PSER, KOLKATA, ou=ENGR./QLY, email=arpaul@bhel.in, c=IN Location: BHEL, PS:ER, Kolkata Date: 2019.02.25 11:39:18 +05'30' ENGR / QLY, BHEL, PSER	

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

PSER	FIELD QUALITY PLAN FOR TURBO GENERATOR AUXILIARIES	FQP NO: MAITREE-00-MK-QA-300074-PSE BHEL Doc. No. : QPE-MTE-660-ST-44C
		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	10
5.0	Log Sheets	07

FOR TENDER PURPOSE ONLY

PSER	FIELD QUALITY PLAN FOR TURBO GENERATOR AUXILIARIES	FQP NO: MAITREE-00-MK-QA-300074-PSE BHEL Doc. No. : QPE-MTE-660-ST-44C
		REV. NO. : 1
		SHEET 1 / 1 SHEETS

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	-	0, Dtd.: 18/01/2019	Document prepared as per the owner's technical specifications. This FQP is similar to NTPC approved FQP No. **9650-110-ER-QVM-G-002A / Rev-0** for Barh-II (2x660MW) for Static Excitation System and relevant portion of Part-II of NTPC-approved FQP No. **4410-001-110-QVE-Q-546 / Rev-1** for NTPC - North Karanpura STPP (3x660MW) for other generator auxiliaries.
02	Sheet 1 / 10 of Statement of Checks	1, Dtd.: 25/02/2019	The FQP is revised as per the comments dated 23/02/2019 from BIFPCL/OE. This FQP is similar to NTPC approved FQP No. **9650-110-ER-QVM-G-002A / Rev-0** for Barh-II (2x660MW) for Static Excitation System and relevant portion of Part-II of NTPC-approved FQP No. **4410-001-110-QVE-Q-546 / Rev-1** for NTPC - North Karanpura STPP (3x660MW) for other generator auxiliaries.

FOR TENDER PURPOSE ONLY

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 / OE FQA	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BIFPCL HEAD-FQA / OE 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 / OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	BIFPCL Erection Engineer / OE
'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 ONLY

PSER	FIELD QUALITY PLAN FOR TURBO GENERATOR AUXILIARIES	FQP NO: MAITREE-00-MK-QA-300074-PSE BHEL Doc. No. : QPE-MTE-660-ST-44C
		REV. NO. : 1
		SHEET 01 / 10 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	TURBO GENERATOR AUXILIARIES
Sub-system :	STATIC EXCITER, SEAL OIL SYSTEM, GAS SYSTEM & PRIMARY WATER SYSTEM
Area :	RECEIPT, STORAGE & 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. Unless noted otherwise in this FQP & drawing, 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. Unless noted otherwise in this FQP, 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 OEM 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.
16. (1) Installation of temporary platforms / ladders, required during erection of equipment / piping, shall be ensured as per the project specific HSE Manual.
17. (1) Use of TG/Auxiliary components for any temporary support or scaffolding works is strictly prohibited.

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **TURBO GENERATOR AUXILIARIES** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MK-QA-300074-PSE** BHEL Doc. No. : QPE-MTE-660-ST-44C REV.NO.: 1 SHEET 02 / 10 SHEETS
SYSTEM: TURBO GENERATOR AUXILIARIES	SUB-SYSTEM: STATIC EXCITER, SEAL OIL SYSTEM, GAS SYSTEM & PRIMARY WATER SYSTEM	AREA: RECEIPT, STORAGE & ERECTION

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*
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 latest drawings and Field/Erection Welding Schedule (EWS), 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		
A.03	Check for availability of permanent benchmarks at convenient places with elevations marked on them.	V	-	B	Once prior to start of work	-	Benchmark with elevation marking to be available	SR		
B	**MATERIAL RECEIPT**									
B.01	Check availability of Bill of materials (BOM) / packing slip, dispatch documents.	V	-	C	100%	-	Availability of documents	-		
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	Completeness & correctness of material	Logbook		
B.03	Check components/ boxes carefully for physical condition - a) In case of external damage to boxes, remove the top cover so that contents can be seen thoroughly. If the contents are sealed / intact, cover the contents / packing with original plastic sheeting / additional tarpaulin cover. b) 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.04	V	-	C	100%	Dispatch documents/ Packing slip	No damage	Logbook		
B.04	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	BHEL Work Instructions for site operations	BHEL Work Instructions for site operations	MDR		
B.05	Control of receipt and issue of all components	V	6290465373	C	100%	BHEL Work Instructions for site operations	BHEL Work Instructions for site operations	Register		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **TURBO GENERATOR AUXILIARIES** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MK-QA-300074-PSE** BHEL Doc. No. : QPE-MTE-660-ST-44C REV.NO.: 1 SHEET 03 / 10 SHEETS
SYSTEM: TURBO GENERATOR AUXILIARIES	SUB-SYSTEM: STATIC EXCITER, SEAL OIL SYSTEM, GAS SYSTEM & PRIMARY WATER SYSTEM	AREA: RECEIPT, STORAGE & 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*	*D**	*9*
C	**STORAGE & PRESERVATION**									
C.01	Storage & Preservation of components at site	V & P	As required	C	as per Section-IV of reference doc.	Storage & Preservation Instructions for components of Steam Turbine, Generator & Auxiliaries (MAITREE-00-M-DC-300067-PSE)		SR		
D	**WELDING & NON DESTRUCTIVE EXAMINATIONS**									
D.01	Ensure availability of applicable WPS as per Erection Welding Schedule (EWS) / Drawing	R	-	A	100%	Drawing & EWS	Qualified WPS should be available at site.	-		
D.02	Review of Batch TC of welding electrodes & other consumables from manufacturer.	R	-	A	100%	Relevant AWS specifications as per applicable WPS	Relevant AWS specifications as per applicable WPS	SR		The copy of TCs to be reviewed & signed by BHEL and record to be maintained in Site Register. BIFPCL/OE may 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 & ASME BPVC Sec.-IX	WPS & ASME BPVC Sec.-IX	WQR	√	
D.04	Adoption of correct procedure, approved electrodes and methods.	V	-	B	100%	Drawing/ EWS & WPS	Drawing/ EWS & WPS	SR		
D.05	Daily in-Process monitoring of joint fit-ups	V & M	Taper Gauge, Hi-Lo Gauge & Measuring tape	B	100%	Drawing / EWS	Drawing / EWS	SR		
D.06	Daily in-process monitoring of Drying / baking of SMAW electrodes	V & R	-	B	Random in each shift		Recommendations of electrode manufacturer	SR		
D.07	Pre heating of weld joints, as applicable.	V & M	Thermo-chalk or Non-contact type Thermometer	A	As per WPS	Drawing & WPS	WPS	Logsheet	√	
D.08	Ensure proper sequence of welding.	V	-	C	100%	Drawing	Drawing	SR		
D.09	Visual Inspection of all weldments	V & M	As required	B	100%	Drawing	ASME BPVC Sec-V	Logsheet		
D.10	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		
D.11	NDT of welds	T	As required	A	As per EWS / Drawing	Drawing / EWS	ASME BPVC Sec-V	NDT Report	√	

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **TURBO GENERATOR AUXILIARIES** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MK-QA-300074-PSE** BHEL Doc. No. : QPE-MTE-660-ST-44C REV.NO.: 1 SHEET 04 / 10 SHEETS
SYSTEM: TURBO GENERATOR AUXILIARIES	SUB-SYSTEM: STATIC EXCITER, SEAL OIL SYSTEM, GAS SYSTEM & PRIMARY WATER SYSTEM	AREA: RECEIPT, STORAGE & 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*	*D**	*9*
D.12	Rectification of welding defect (if case of any defect)	P & R	As required	A	As per EWS & Annex-I	Annex-I	ASME BPVC Sec-V	Logsheet	√	
D.13	Post Weld Heat Treatment of welds, as applicable	V & R	Time-temperature recorder	A	As per EWS	Drawing / EWS	WPS	HT Chart	√	
D.14	Ensure preservation of welded joint (application of primer), as applicable	V	As required	C	100%	Approved painting schedule	Approved painting schedule	Logsheet		
E	**STATIC EXCITER**									
E.01	DISPOSITION & CORRECTNESS OF FOUNDATION									
E.01A	Check for correctness/ soundness of civil foundations and it's cleanliness.(free from oil & grease etc) .	V		B	100%	Layout Drawing	Layout Drawing	Joint Protocol		
E.01B	Check elevation at different points on exciter foundation/ pipes with respect to the permanent benchmark	M	Level gauge	C	100%	Drawing	Drawing	Joint Protocol		
E.02	ASSEMBLY OF SLIP RING BASE PLATE AND BEARING PEDESTAL									
E.02A	Ensure sole plates of required thickness are placed and levelled as per catenary and grout them.	V		C	100%	Drawing	Erection manual, Drawing	Log book		
E.02B	Check levelling of foundation plates/ bearing pedestal (with all assemblies in place as received and positioned as per "load deflection curve").	V		B	100%	Drawing	Erection manual, Drawing	Protocol		
E.03	AXIAL CLEARANCES									
E.03A	Check distance between generator bearing (EE) C/L and end of foundations.	M	Measuring tape.	B	Once	Foundation drawing	Erection manual, Drawing	Protocol		
E.03B	Check distance between C/L of Generator bearing (EE) to exciter coupling face before and after coupling.	M	Measuring tape	C	Once	Drawing	Erection manual, Drawing	Protocol		
E.03C	Check dimensions between machine axis and foundation bolt centre line.	M	Measuring tape	C	100%	Drawing	Erection manual, Drawing	Logbook		
E.04	Pre-align exciter as per generator drawing and tighten foundation bolts.	M	Torque wrench	B	Once	Drawing	Erection manual, Drawing	Protocol		
E.05	Ensure the soundness of the grout after grouting is complete.	V		C	100%	Grouting Procedure	Erection manual, Drawing	Logbook		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **TURBO GENERATOR AUXILIARIES** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MK-QA-300074-PSE** BHEL Doc. No. : QPE-MTE-660-ST-44C REV.NO.: 1 SHEET 05 / 10 SHEETS
SYSTEM: TURBO GENERATOR AUXILIARIES	SUB-SYSTEM: STATIC EXCITER, SEAL OIL SYSTEM, GAS SYSTEM & PRIMARY WATER SYSTEM	AREA: RECEIPT, STORAGE & 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*	*D**	*9*
E.06	SLIP RING SHAFT ASSEMBLY									
E.06A	With Slip Ring shaft resting on support bearings and normal bearing, check face run out on coupling.	M	Dial gauge	C	100%	Erection manual.	Erection manual, Drawing	Logbook		
E.06B	Carry out alignment with generator rotor.	M	Feeler gauge, Dial gauge	B	100%	Erection manual, Drawing	Erection manual, Drawing	L-01		
E.06C	With exciter rotor coupled to TG rotor, check run out and carry out swing check.	M	Feeler gauge, Dial gauge	B	100%	Erection manual, Drawing	Erection manual, Drawing	L-02		
E.07	BEARING ASSEMBLY.									
E.07A	Check journal diameter and bearing ID.	M	Micrometer	B	100%	Drawing	Drawing	Protocol		
E.07B	Check and record side and top clearances.	M	Feeler gauge	B	100%	Drawing	Drawing	Protocol		
E.07C	Check matching between top and bottom half.	V	Feeler gauge	B	100%	Drawing,	0.03mm feeler gauge should not go.	Protocol		
E.07D	Ensure vibration pick ups are assembled and electrical connections are in order.	V		C	100%	Drawing	Erection manual, Drawing	Logbook		
E.07E	Measure IR value between bearing pedestal and base frame.	M	500V IR Tester	B	100%	Drawing	IR≥ 3MΩ	L-03		
E.07F	Ensure air purging, Check oil inlet, outlet and jacking oil holes against blockages.	V		C	100%	Drawing	No blockage	Log book		
E.08	Check and record the radial and axial clearances.	V		C	100%	Drawing	Erection manual, Drawing	Log book		
E.09	Install and align the blower housing and brush carrier assemblies along with insulating sheet between two halves.	M	Feeler gauge	C	100%	Erection setting clearance Drawing	Erection setting clearance Drawing	Protocol		
E.10	Install all the base frame accessory components as per drawing.	M	Feeler gauge	B	100%	Drawing	Erection manual, Drawing	Protocol		
E.11	INSTALLATION OF BRUSH HOLDER ASSEMBLY									
E.11A	Insert completed brush holder into brush carrier as per drawing.	V		C	100%	Drawing	Erection manual, Drawing	Logbook		
E.11B	Carry out lapping of carbon brushes with the help of emery strip taking care that cloth side is facing the slip ring. Ensure that carbon brush contact area matches with outer radius of slip ring.	V		C	100%	Drawing	Erection manual, Drawing	Logbook		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **TURBO GENERATOR AUXILIARIES** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MK-QA-300074-PSE** BHEL Doc. No. : QPE-MTE-660-ST-44C REV.NO.: 1 SHEET 06 / 10 SHEETS
SYSTEM: TURBO GENERATOR AUXILIARIES	SUB-SYSTEM: STATIC EXCITER, SEAL OIL SYSTEM, GAS SYSTEM & PRIMARY WATER SYSTEM	AREA: RECEIPT, STORAGE & 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*	*D**	*9*
E.11C	Carry out radial gap measurement between slip ring and brush holder as shown in drawing. This should be approx. 2mm. Suitably adapt the gap in case required.	M		C	100%	Drawing	Erection manual, Drawing	Logbook		
E.12	INSTALLATION OF HOUSING ASSEMBLY									
E.12A	Carry out installation of sealing wall assembly after reaming holes in base frame. Install the labyrinth ring also as per drawing.	V		C	100%	Drawing	Erection manual, Drawing	Logbook		
E.12B	Complete the assembly by installing the housing cover along with Silencer and filter assemblies as per drawing.	V		C	100%	Drawing	Erection manual, Drawing	Logbook		
E.13	STATIC EXCITATION SYSTEM PANELS									
E.13A	Check Floor cut out matching with panel cut out. Panel alignment. Locking arrangement. Clearance between phase and earth. Verticality of panel and excitation transformer.	V		C	100%	OGA Drawing	OGA Drawing	Logbook		
E.13B	IR of excitation transformer, bus bar system and cable	M	IR Tester	A	100%	Drawing & Erection Manual	Drawing & Erection Manual	Log book		
E.13C	Tightness of bus bar, plugging of spare holes, bus bar tightness, earthing of signal cable, tagging and lugging, tightness of cables	V		B	100%	Drawing & Erection Manual	Drawing & Erection Manual	Log book		
E.13D	All panel components subassemblies and modules in the cubicle as per panel drawing.	V		C	100%	Drawing & Erection Manual	Drawing & Erection Manual	Log book		
E.13E	Cable termination and equipment specifications.	V		C	100%	Drawing & Erection Manual	Drawing & Erection Manual	Log book		
E.13F	Connection for LV side of excitation transformer (Tightness with bi-metallic strip if reqd.) .	V		B	100%	Drawing & Erection Manual	Drawing & Erection Manual	Log book		
E.13G	Connection for HV side of excitation transformer (Tightness with bi-metallic strip if reqd.)	V		B	100%	Drawing & Erection Manual	Drawing & Erection Manual	Log book		
E.13H	Check earthing of equipment and panel at both side. Electronic earthing for system.	V		A	100%	Panel Layout Drawing	Panel Layout Drawing	Joint Protocol		
E.13I	Provision of anti-vibration pads.	V		C	100%	Panel Drawing & Erection Manual	Panel Drawing & Erection Manual	Logbook		
E.13J	Mounting of thyristor cooling fans and duct	V		C	100%	Panel Drawing & Erection Manual	Panel Drawing & Erection Manual	Logbook		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **TURBO GENERATOR AUXILIARIES** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MK-QA-300074-PSE** BHEL Doc. No. : QPE-MTE-660-ST-44C REV.NO.: 1 SHEET 07 / 10 SHEETS
SYSTEM: TURBO GENERATOR AUXILIARIES	SUB-SYSTEM: STATIC EXCITER, SEAL OIL SYSTEM, GAS SYSTEM & PRIMARY WATER SYSTEM	AREA: RECEIPT, STORAGE & ERECTION

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*
F	**SEAL OIL SYSTEM**									
F.01	Ensure that a slope of 40 mm/ meter is maintained while erecting the drain lines	M	Level Gauge	B	100%	Drawing	Drawing & Erection Manual	Log book		
F.01A	Welding, Visual Inspection & NDT of welding of drain lines	As per Checks in Sl. No. D								
F.01B	Acid cleaning in case the pipes are found rusted from inside.	V	-	B	Once	Drawing & Erection Manual	No presence of rusting marks	Protocol		
F.01C	Oil flushing as per the instructions of drain lines	V	-	B	100%	Oil flushing procedure	Oil flushing procedure	Protocol		
F.01D	Leak test at working pressure of drain lines at working pressure	T	-	B	Once	Procedure for Oil flushing & Hydraulic testing	Procedure for Oil flushing & Hydraulic testing	Protocol		
F.01E	Check float valve for absence of foreign particles	V	-	C	Once	Drawing & Erection Manual	Cleanliness	Logbook		
F.02	Check IR value of windings of DC motor and AC motor of Seal Oil Pump-Motor units	M	500V IR Tester	C	100%	Drawing & Erection Manual	IR value is (KV+1) Megaohms	Log book	√	
F.03	Ensure cleanliness of Seal Oil Storage Tank.	V	-	C	100%	Drawing & Erection Manual	Cleanliness	Log book		
F.04	Ensure grouting of seal oil pump-motor units and seal oil valve rack.	V	-	C	Once	Drawing & Erection Manual	Drawing	Log book	√	Cubes to be taken during grouting and compressive test to be done & witnessed by FQA .
G	**GAS SYSTEM**									
G.01	Verification of dimension piping according to diagram.	M & V	Tape, Water level	B	100%	Drawing	Drawing	SR		
G.02	Welding, Visual Inspection & NDT of welding of piping	As per Checks in Sl. No. D								
G.03	Ensure mechanical cleaning of piping by blowing with compressed air.	V		B	Once	Erection Manual		Protocol		
G.04	Leak test according to erection instructions.	T	As required	B	Once	Commissioning Procedure	Commissioning Procedure	Protocol		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **TURBO GENERATOR AUXILIARIES** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MK-QA-300074-PSE** BHEL Doc. No. : QPE-MTE-660-ST-44C REV.NO.: 1 SHEET 08 / 10 SHEETS
SYSTEM: TURBO GENERATOR AUXILIARIES	SUB-SYSTEM: STATIC EXCITER, SEAL OIL SYSTEM, GAS SYSTEM & PRIMARY WATER SYSTEM	AREA: RECEIPT, STORAGE & 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*	*D**	*9*
G.05	Ensure that Silica gel in the gas drier is dry and it is reactivated if moist (wherever applicable)	V		C	100%	Commissioning Procedure	Commissioning Procedure	Log book		
G.06	Check for cleanliness and physical condition of gas unit, CO2 bottle rack, N2 bottle rack, H2 bottle rack, H2 drier and CO2 vaporiser.	V		C	100%	-	Cleanliness	Log book		
G.07	Check for passing and calibration of safety valves.	V		B	Once	Drawing	Drawing	Protocol		
G.08	GENERATOR WASTE GAS SYSTEM									
G.08A	Check IR value of motor winding.	M	500V IR Tester	C	Once		IR≥(KV+1)	Log book	√	
G.08B	Ensure correct direction of NRV in vapour exhauster fan pipe	V		C	Once	Drawing	Drawing	Log book		
G.08C	Ensure free movement of valves by rotating the hand wheel.	V		C	Once	Drawing	Free Movement	Log book		
G.09	Ensure grouting of the unit.	V		C	Once	Drawing	Drawing	Log book		Cubes to be taken during grouting and compressive test to be done & witnessed by FQA .
H	**PRIMARY WATER SYSTEM**									
H.01	CONNECTING PIPING									
H.01A	Check PW piping for its nonmagnetic properties.	V	-	C	Sample	Drawing & Erection Manual	should be Non Magnetic	Log book		
H.01B	Welding, Visual Inspection & NDT of welding of piping	As per Checks in Sl. No. D								
H.01C	Mechanical cleaning of pipes with SS wire brush.	V	-	C	Once	Drawing & Erection Manual	Cleanliness	Log book		
H.01D	Verification of dimension and visual inspection.	V	-	C	Once	Drawing & Erection Manual	Drawing	Log book		
H.01E	Ensure that compensator assembly is free from any load.	V	-	C	100%	Drawing & Erection Manual	Drawing & Erection Manual	Log book		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **TURBO GENERATOR AUXILIARIES** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MK-QA-300074-PSE** BHEL Doc. No. : QPE-MTE-660-ST-44C REV.NO.: 1 SHEET 09 / 10 SHEETS
SYSTEM: TURBO GENERATOR AUXILIARIES	SUB-SYSTEM: STATIC EXCITER, SEAL OIL SYSTEM, GAS SYSTEM & PRIMARY WATER SYSTEM	AREA: RECEIPT, STORAGE & ERECTION

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*	*D**	*9*
H.02	ASSEMBLY OF PRIMARY WATER SYSTEM									
H.02A	Hot water flushing of complete system with condensate at 80°C. Ensure isolation of following before flushing: a) Stator winding b) Bushings c) Water treatment system d) Conductivity indicator at the main filter.	V	-	C	Once	Drawing & Erection Manual	No dirt detected in filters	Log book		
H.02B	Pipes to be dried with dry compressed air.	V	-	C	100%	Drawing & Erection Manual	Drawing & Erection Manual	Log book		
H.02C	Pipes not required for immediate use should be closed at the end.	V	-	C	Once	Drawing & Erection Manual	Closed	Log book		
H.02D	Check the piping within the PW pump-filter unit and PW cooler unit as per drawing.	V	-	C	100%	Drawing & Erection Manual	Drawing	Log book		
H.02E	Check for cleanliness and physical condition of PW pump filter & PW cooler unit as per drawing.	V	-	C	100%	Drawing & Erection Manual	Cleanliness	Log book		
H.03	Check IR value of the PW pump motor winding.	M	500V IR Tester	C	Once	Drawing & Erection Manual	Minimum value is (KV+1) megaohms	Log book	√	
H.04	Check for the physical condition and cleanliness of the PW filter elements.	V	-	C	Once	Drawing & Erection Manual	Cleanliness	Log book		
H.05	Check the condition of “O” ring/ gaskets for cracking. Replace, if not found to be in proper condition	V	-	C	Once	Drawing & Erection Manual	No visible cracks	Log book		
I	**INSULATION & PAINTING (UN-INSULATED PARTS)**									
I.01	Completion of Insulation & cladding, as applicable	V	-	B	100%	Drawing & Insulation Schedule	Drawing & Insulation Schedule	Logbook	√	
I.02	Touch-up of paint in damaged portions of uninsulated parts of the equipment, if required (Batch TC from manufacturer to be reviewed & invoice to be co-related for each lot of supply, by FQA)	V & R	-	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen	JOINT PROTOCOL	√	- Primer / paints to be procured from BIFPCL/OE approved source
I.03	Final Painting inspection for pipe / pipe-support - check DFT, finish, Colour shade	M & V	Digital DFT Gauge	B	100%			JOINT PROTOCOL	√	

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **TURBO GENERATOR AUXILIARIES** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-MK-QA-300074-PSE** BHEL Doc. No. : QPE-MTE-660-ST-44C REV.NO.: 1 SHEET 10 / 10 SHEETS
SYSTEM: TURBO GENERATOR AUXILIARIES	SUB-SYSTEM: STATIC EXCITER, SEAL OIL SYSTEM, GAS SYSTEM & PRIMARY WATER SYSTEM	AREA: RECEIPT, STORAGE & 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*	*D**	*9*
I.04	Check marking & labelling of pipes & equipment	V	-	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen	JOINT PROTOCOL	√	
J	**ERECTION COMPLETION CHECKS**									
J.01	Erection Completion Check for each equipment / system, Handing over for commissioning & Handing over of erection inspection records, Logsheets & protocols as per the Contract.	V & R	-	A	100%	Drawings	Drawings	JOINT PROTOCOL	√	Review of all Inspection records, Log Sheets, protocols for completeness and disposition status of NCRs (if any)

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RECORD OF QUALITY CHECKS

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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-ST-44C
PROJECT					REV. NO.: 1
UNIT NO.					LOG SHEET NO. : L-00
RATING					PAGE 1 OF 1

□ROTOCOL

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			NAME	SIGNATURE & DATE	FQP NO.: QPE-MTE-660-ST-44C
PROJECT		INSPECTED BY			REV. NO.: 1
UNIT NO.		CLEARED BY			
RATING		CUSTOMER			

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UNID

System / Component (KKS):
SGen5-3000W (125/67)

Belonging to Assembly Instruction (gehört zu Montageanweisung)
2.2-G001-A-002179 to 2.2-G053-A-002179

Erection Company:

Appendices:

ECCN: EAR99 AL: N

Preparation of Field Quality Plan (Erstellung des Montageprüffolgeplans)					
	Prepared (erstellt) **Contractor (delivery)** (Hersteller)	**Checked** (geprüft): **Contractor (delivery)** (Hersteller)	**Checked** (geprüft): **Sie...**	**Checked** (geprüft): **Siemens QMiP**	**Released** (freigegeben): **Siemens GPM**
Company (Firma):					
Name / Dept. (Name/Abt.):					
Date (Datum):					
Signature (Unterschrift):					

Rev.	**Date** (Datum)	**Description of revision** (Änderungsbeschreibung)	**Prepared** (erstellt):	**Checked** (geprüft):	**Released** (freigegeben):
C					
B					
A	2015-09-10	First Edition			

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	1	Aufstellen der Generator-Versorgungsanlagen (Beginn) Set up Generator Auxiliaries (Beginning)	P		+					2.7-7100-0001
1	2	Einrichten der Generator-Baustelle Set up Equipment on Site, Set up Site Stores	S		+					
1	3	Angelieferte Generatorteile einlagern (Beginn) Store of Delivered Generator Parts (Beginning)	P		+					2.7-0021-0004
2	4	Fundamentkontrolle Foundation Check	P		+					2.7-2105-0001
2	5	Montage der Fundamentbalken und Auflageplatten Installing the Foundation Beams and the Sole Plates	P		+					WPS (the document is to be provided by the responsible erection company)
2	5.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive Test of weld seams	P		+	I				WPS (the document is to be provided by the responsible erection company) PV 0026.0-00000-X
2	6	Montage der Stromdurchführungen und Ringkernwandler Installing the High-Voltage Bushings and the Current	P		+					2.7-1660-0003 2.7-6600-0001 2.7-1655-0001

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		Transformers								
2	7	Einhängen des Stromdurchführungskastens Positioning of Terminal Box	S		+					KUN 678.16
2	8	Generatorgehäuse auf Platten absetzen Lower the Generator Frame on Plates	P		+					2.7-0013-0001 2.7-0200-0001
2	9	Stromdurchführungskasten montieren und prüfen Assembling the Terminal Box and Testing	P		+					KUN 678.16 2.7-0013-0001 2.7-1001-0001 2.7-5710-0002 2.7-0016-0001
2	10	Anbau des Kühlerkopfes, Dichtnaht schweißen und prüfen Mounting of Cooling Header, External Seal Welding, Leak Test	P		+					WPS (the document is to be provided by the responsible erection company) KUN 678.16 2.7-0013-0001 2.7-1001-0001 2.7-5710-0002 2.7-0016-0001
2	10.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive Test of weld seams	P		+	I				WPS (the document is to be provided by the responsible erection company) PV 0026.0-00000-X

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	11	Generator absetzen und vorrichten Lower Generator and Perform Preliminary Alignment	P		+					2.7-1307-0001
2	12	Fundamentbalken zum Generatorgehäuse ausrichten und anschrauben Aligning the Foundation Beams with and Bolting them to the Generator	S		+					2.7-1220-0001
2	13	Ausrichtkonsolen montieren Installation of Alignment Brackets	P		+					WPS (the document is to be provided by the responsible erection company)
2	13.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive Test of weld seams	P		+	I				WPS (the document is to be provided by the responsible erection company) PV 0026.0-00000-X
2	14	Stromausleitung montieren Installing the Current Connectors	P		+					2.7-1650-0002 2.7-6670-0002
2	15	Schildlager - Unterteile vorbereiten Prepare the Bottom-Half End Shield Bearings	P		+					2.7-2410-0002 2.7-0016-0001 2.7-0016-0005
2	16	Läufereinbau vorbereiten Preparing of Rotor for Installation	P		+					2.7-0016-0001 2.7-1320-0001

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	17	Läufereinbau Installation of Rotor	P		+	H ✓ mandatory				2.7-0016-0001
2	18	Schildlager - Unterteile anbauen und Läufer lagern Mounting of Bottom-Half End Shield Bearing, Emplacement of the Rotor	P		+					2.7-1001-0001 2.7-2410-0002 2.7-0016-0001
2	19	Läufer axial zum Gehäuse verlegen Lay Rotor Axial to the Generator Frame	P		+					2.7-1305-0001
2	20	Luftspaltdichtung montieren Installation of Air-Gap Seal	P		+					2.7-0016-0001 2.7-1731-0003
2	21	Montage der äußeren Stromverbindungen (Beginn) Installation of External Current Connectors (Beginning)	P		+					2.7-1650-0008 2.7-4601-0001
2	22	Generator zur Anschlussfreigabe vorrichten Alignment of Generator for Release for External Connections	S		+					
2	23	Lagerspiele messen	P		+					2.7-1430-0002 2.7-1420-0002

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		Measuring the Bearing Clearances								2.7-1410-0001 2.7-1420-0001 2.7-1430-0001 2.7-1410-0002
2	24	Innere Kammringe vormontieren Pre-assembling of Inner Oil Wipers	S		+					
2	25	Maßaufnahme am Dichtring und Dichtringhalter Recording the Dimensional Data of the Seal Ring and the Seal Ring Holder	P		+					2.7-1760-0002 2.7-1770-0003 2.7-1770-0004
2	26	Gebläse montieren Mounting of Compressor	P		+					2.7-0016-0001 2.7-1732-0001
2	27	Schildlager - Oberteile montieren Mounting the End Shield Bearing Top Halves	P		+					2.7-1001-0001 2.7-1723-0001 2.7-0016-0001
2	28	Anbau der inneren Kammringe Installation of Inner Oil Wipers	P		+					2.7-2410-0002 2.7-1747-0001 2.7-1745-0002
2	29	Gebläse ausrichten Alignment of Compressor	P		+	H ✓ mandatory				2.7-0016-0001 2.7-6305-0001

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	30	Generatorkupplung zur Turbinenkupplung ausrichten Alignment of Generator Coupling to Turbine Coupling	P		+					2.7-1350-0003 2.7-1301-0002
2	31	Untergießen der Fundamentbalken Grouting of Foundation Beams	P		+					WPS (the document is to be provided by the responsible erection company) KUN 664.65 2.7-1150-0001 2.7-1100-0001
2	31.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive Test of weld seams	P		+	I				WPS (the document is to be provided by the responsible erection company) PV 0026.0-00000-X
2	32	Einbau der Gasführung Installation of Gas Distribution System	P		+					2.7-0016-0001
2	33	H2-Kühler montieren Mounting of H2 Cooler	P		+					2.7-0016-0001
2	34	Spannen der Ankerschrauben Tensioning of Foundation Anchor Bolts	P		+					2.7-1000-0017 2.7-1000-0016

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	35	Endkontrolle des Generatorinneren und Anbau der Mannlochdeckel Final Inspection of the Generator Interior and Mounting the Manhole Covers	P		+					2.7-0070-0001 2.7-0017-0001
2	36	Lager- und Dichtölsystem zum Ölspülen vorbereiten Preparation of the Bearing and Seal Oil Systems for Flushing	S		+					
2	37	Instrumentierung überprüfen und Dichtölanlage inbetriebsetzen (Beginn) Checking Instrumentation and Commisioning Seal Oil System (Beginning)	S		+					
2	38	Montage von Firmen- und Leistungsschild Installation of Name Plate and Rating Plate	P		+					WPS (the document is to be provided by the responsible erection company)
2	38.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive Test of weld seams	P		+	I				WPS (the document is to be provided by the responsible erection company) PV 0026.0-00000-X
2	39	Füllen der Schildlagerdichtnuten Filling the End Shield Bearing Seal Grooves	S		+					
2	40	Montage der H2 Wellendichtung Installation of H2 Shaft Seal	P		+	H	Manufacturer			2.7-1725-0006 2.7-2410-0002 2.7-1721-0001

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	41	Generator-Dichtprobe (Luft) Generator - Leakage Test (Air)	P		+	H ✓ mandatory				2.7-1710-0004/1-3
2	42	Endausrichtung des Generators zur Turbine Final Alignment of Generator to Turbine	P		+	H ✓ mandatory				WPS (the document is to be provided by the responsible erection company) 2.7-1300-0001 2.7-1350-0001
2	42.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive Test of weld seams	P		+	I				WPS (the document is to be provided by the responsible erection company) PV 0026.0-00000-X
2	43	Lagerräume verschließen Closing of Bearing Chambers	P		+					2.7-1001-0001 2.7-1741-0001 2.7-1430-0002 2.7-2410-0002 2.7-0016-0001 2.7-1430-0001
2	44	Erdungsbürsten montieren Installation of Grounding Brushes	P		+					2.7-1390-0001
3	45	Übergabe der Kundenwerkzeuge	P		+					2.7-0020-0002

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		Handover of Customer Tools								
3	46	Auflösen der Generator-Baustelle Winding Up Assembly Site	S		+					
2	47	Freigabe Ölleitungsanschluss an den Schildlagern Release for the Oil Line Connection to the End Shield Bearings	P		+					2.7-0060-0002 2.7-0016-0005
2	48	Freigabe Primärwasseranschluss an Generator Release for Primary Water Line Connections to Generator	P		+					2.7-0060-0003 2.7-0016-0005
2	49	Freigabe zur Montage der Fundamentabdeckung Release for Installing the Foundation Cover	P		+					2.7-0060-0004
2	50	Freigabe Kühlwasseranschluss (H2 Kühler) Release for Cooling Water Line Connections (H2 Cooler)	P		+					2.7-0060-0005 2.7-0016-0005
2	51	Freigabe Stromschienenanschluss an den Stromdurchführungen Release for Bus Bar Interface at the Terminal Bushings	P		+					2.7-0060-0006

FOR TENDER PURPOSE ONLY

MAITREE STPP : TURBO GENERATOR UNIT#1 (Unit II)

Siemens AG

Field Quality Plan (Montageprüffolgeplan) **FQP 1965**

Handling: Handhabung:

For internal use only Nur für internen Gebrauch

Gadarwara	IN1061	20MK	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SGen5-3000W (125/67)

Belonging to Assembly Instruction (gehört zu Montageanweisung)
2.2-G001-A-002179 to 2.2-G053-A-002179

Page: (Seite): 11 of (von) 12

*) Erklärung der Abkürzungen am Ende der Tabelle/Legend of abbreviations at the end of the table

Phase	No.	Description of inspection / activity (Beschreibung der Inspektion / Aktivität)	Doc.Code (Art der Dok.)	Date (Datum)	Category of Participation by (Prüfdurchführung und Teilnahme von) Signature (Kurzzeichen)					Remarks/ References/ Verifying Doc. Identification (Anmerkung/ Referenzdokumente/ Art der Ergebnisprotokolle)
					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	52	Freigabe zum Kuppeln der Turbine Release for Coupling of the Turbine	P		+					2.7-0061-0002 2.7-1330-0001
3	53	Übergabe an Inbetriebsetzung Hand Over to Commissioning	P		+					ECC

Bemerkungen/Remarks:
Durchführung und Dokumentation der Arbeitsschritte entsprechend Montagehandbuch.
EXECUTION AND DOCUMENTATION OF WORKING STEPS ACCORDING TO ASSEMBLY MANUAL.

FOR TENDER PURPOSE ONLY

Siemens AG

Field Quality Plan (Montageprüffolgeplan) FQP 1965

Handling: Handhabung:

For internal use only Nur für internen Gebrauch

Gadarwara	IN1061	20MK	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No	UNID

System / Component (KKS):
SGen5-3000W (125/67)

Belonging to Assembly Instruction (gehört zu Montageanweisung)
2.2-G001-A-002179 to 2.2-G053-A-002179

FOR TENDER PURPOSE ONLY

Legend:

Documentation code (Doc. Code)

P = Documentation of test or inspection step by record necessary.
S = Stamp / short sign in FQP. **No** additional formal approval required.

T = Test certificate/stamp issued by authorized inspector necessary (e.g. notified body)

Involved parties

AI/NoBo = Authorized inspector (third party organization / notified body, etc.)
CON = Contractor (erection)
O = Owner (client / customer or its representative)
SC = Subcontractor or Contractor's (delivery) advisor / supervisor
SM = Technician representative of Site Management having contracted the Contractor (erection)

Inspections codes

H = Hold point. Formal notification is mandatory. Attendance & signatures of participating representatives are mandatory. Inspection to be carried out before proceeding with next step.
D = Document review: check of documentation or final data package
I = Information point. Parties have to be notified prior to check. The erection continues whether the parties are there or not.

W = Witness point. Formal notification is mandatory. Tests to be executed 100% at arranged time, whether the invited representatives show up or not.

$\underline{W_x}$ = [x =percentage of inspection scope] spot witness point. To be handled like a witness point with following deviation. Formal invitation only for the first of repeated activities or on demand by deficiencies. W_x serves the purpose to check the correctness of the working procedure.

\+ = Carrying out the test step and signature /stamp.

Legende:

Dokumentationscodes

P = Dokumentation des Test- oder Prüfschrittes durch ein Protokoll erforderlich.
S = Stempel / Kurzzeichen im FQP. **Keine** zusätzlichen formalen Genehmigungen erforderlich.
T = Testzertifikat/Stempel durch einen unabhängigen Prüfer (z. B. benannte Stelle).

Beteiligte

AI/NoBo = Unabhängiger Prüfer (Prüforganisation / benannte Stelle etc.)
CON = Montagefirma
O = Kunde (Betreiber oder dessen Vertreter)
SC = Auftragnehmer oder Advisor / Supervisor des Herstellers
SM = Technischer Vertreter der Baustellenleitung, die die Montagefirma beauftragt hat

Inspektionscodes

H = Haltepunkt. Formale Anmeldung sowie die Teilnahme & Unterschrift durch die Beteiligten sind zwingend erforderlich. Prüfschritt muss abgeschlossen sein, bevor der nächste Schritt durchgeführt werden darf.
D = Dokumentprüfung: Prüfung der Dokumentation oder endgültiger Daten.
I = Informationspunkt. Die Beteiligten sind vor dem Prüfschritt zu informieren. Die Montage wird fortgesetzt, unabhängig davon, ob die Beteiligten während des Prüfschrittes anwesend waren oder nicht.
W = Meldepunkt. Formale Anmeldung ist zwingend erforderlich. Prüfschritt wird komplett zum vereinbarten Zeitpunkt durchgeführt, unabhängig davon, ob die Beteiligten während des Prüfschrittes anwesend waren oder nicht.
$\underline{W_x}$ = [x =Prozentsatz des Prüfumfangs] Stichprobe. Wird analog zu Meldepunkt durchgeführt, jedoch mit folgender Änderung: Formale Anmeldung nur für den ersten von immer wieder kehrenden Prüfschritten oder auf Verlangen bei Mängeln. W_x dient dem Zweck die Richtigkeit der Arbeitsanweisung zu überprüfen.
\+ = Durchführen des Prüfschrittes, unterschreiben/abstempeln.

FIELD QUALITY PLAN

FOR

TURBOGENERATOR OF UNIT # 2

(Erection)

2X660MW MAITREE STPP

BHARAT HEAVY ELECTRICALS LIMITED

FOR TENDER PURPOSE ONLY

Doc No.: AA/CQ/SFQP/660/TG/01
Rev No. 00

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUX.** (ERECTION)	FQP NO.: AA/CQ/SFQP/660/TG/01 REV NO. 00 SHEET 1 / 1 SHEETS

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2.	AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECK	1
3.	STATEMENT OF CHECKS FOR ERECTION	
	3.1 GENERATOR	16

FOR PURPOSE ONLY

RECORD OF REVISIONS

REVSION NO.	DATE OF REVISION	DETAILS OF REVISION
00 (1st Issue)	**28/12/17**	**Made first time as SFQP by the task force mentioned in page no. 2. Reference taken from FQPs of different supercritical projects of all regions.**

FOR TENDER PURPOSE ONLY

BHEL	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUX.** (ERECTION)	FQP NO.: AA/CQ/SFQP/660/TG/01
		REV NO. 00
		Sheet 1 / 1 Sheet

AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECKS

Classification of Check Symbol	Description	Inspection Agency	Accepting authority
A	Critical	BHEL, QAE & Customer	Customer
B	Major	Task Performer	HOS
C	Minor	Task Performer	Task Performer

Legend: Customer : Customer or any other agency authorized by customer.

BHEL : Concerned engineers of BHEL – Task Performer.

HOS : Head Of Section for BHEL

QAE : BHEL Quality Assurance Engineer

NOTE :

1. Quantum of check shall be 100% for all characteristics unless otherwise mentioned in reference documents.
2. Customer shall witness A category checks. He is also authorised to carry out Surveillance in any of the B & C category of checks at his discretion.
3. In case of non-conformity, accepting authority shall ensure dispositioning before accepting and the dispositioning shall be reflected in log sheets / protocols. Dispositioning of non-conformities to be authorised by Head/TSX with intimation to Head/Quality.
4. QAE is also authorized to carry out Surveillance in any of the “B” and “C” category of checks at his discretion.
5. Instruments with valid calibration to be used for measurements.

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUX.** (ERECTION)	FQP NO.: AA/CQ/SFQP/660/TG/01
		REV NO. 00
		SHEET 1 / 16 SHEETS

STATEMENT OF CHECKS

Capacity	:	660MW
System	:	Turbogenerator & Auxiliaries
Sub-system	:	Generator
Area	:	Erection

NOTES :

1. For checks where logsheets are not called for, suitable records should be maintained in the form of logsheets / protocols.
2. As an evidence of having carried out the work satisfactorily, a general purpose logsheet, L-00 shall be maintained for all the checks.
3. Abbreviations used in column Type of Check are :

   M : Measurement
   V : Visual
   R : Record Verifications
   T : Test

4. The task performer at site should refer the latest drawings and fill up nominal values and drawing numbers in the respective logsheets.

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUXILIARIES** (STATEMENT OF CHECKS)	FQP NO.: AA/CQ/SFQP/660/TG/01 REV NO. 00 SHEET 2 / 16 SHEETS

SYSTEM: Turbogenerator & Auxiliaries | SUB-SYSTEM : Generator | AREA : Erection

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	GENERATOR								
	Receipt, Storage & Preservation								
1.	Ensure the checks as per storage & preservation manual are carried out		B	V		Product Standard-TG50008 Storage & Preservation	Product Standard-TG50008 Storage & Preservation		
2.	Ensure that availability of shop assembly and testing records from concerned MU		B	V		Assembly & test records	Assembly & test records		
	WELDING & NDT								
1.	Check the availability of WPS. WPS approved & qualified at respective W.T. Centers of Units shall be used.		A	V	100%	Welding Manual, WPS, ASME Section-IX		WPS	
2.	Welding consumables shall be as per BHEL approved list.		B	V	100%	Welding consumables list			
3	Qualification of welders at Site by physical test.		A	T	100%	Welding Manual, WPS/ ASME Section-IX			
4	Weld fit-up		B	M/V	100%	Drawing / Welding Manual		Log book	
5.	Review of calibration certificates of heating & baking ovens, temperature indicators and current regulators etc.		B	V	100%	Welding/HT Manual			
6	Welding and NDT.		A	V/T		Drawing/FWS/ Welding Manual	NDE Manual	Test Reports	

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUXILIARIES** (STATEMENT OF CHECKS)	FQP NO.: AA/CQ/SFQP/660/TG/01 REV NO. 00 SHEET 3 / 16 SHEETS
SYSTEM: Turbogenerator & Auxiliaries	SUB-SYSTEM : Generator	AREA : Erection

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.0	**Foundation/ Layout**								
1.1	Check for correctness /soundness of civil foundations (UT Test report) and its cleanliness (free from oil, grease etc.)		B	V/R	100%	Drawing	Drawing	Protocol	
2.0	**Elevation of Foundation & Leveling**								
2.1	Check for permanent benchmarks at convenient places with elevations marked on them. Check elevation at different points on generator / exciter foundation/ pipes.	Level Gauge	B	M	100%	Drawing	Drawing	Protocol	
2.2	Check leveling of foundation plate over the base plates with respect to permanent benchmarks	Level Gauge	C	M	100%	Drawing	Drawing	Log book	
3.0	Ensure that machined surface of base plates and foundation plates are free from rust & clean if required		C	V	100%		Cleanliness	Log book	
4.0	Ensure that the dimensions are maintained correctly as per the generator foundation drawing.	Measuring Tape	B	M	100%	Drawing	Drawing	Protocol	

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUXILIARIES** (STATEMENT OF CHECKS)	FQP NO.: AA/CQ/SFQP/660/TG/01 REV NO. 00 SHEET 4 / 16 SHEETS
SYSTEM: Turbogenerator & Auxiliaries	SUB-SYSTEM : Generator	AREA : Erection

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
5.0	Ensure the distance between centre of foundation bolt hole and centre line of generator is maintained.	Measuring Tape	B	M	100%	Drawing	Drawing	Protocol	
5.1	Check Contact of foot plate of stator and foundation/ base plate With surface plate		B	V	Once				
5.2	Check contact between anchor plate and embedment at the bottom of the TG deck. Note: For any major gaps follow related drawing.		B	V	100%	Drawing			
6.0	**Assembly of terminal box**								
6.1	Ensure Cleanliness of joining surface		C	V	100%		Cleanliness	Log book	
6.2	Check rubber cord for any cracks and physical damage.		C	V	100%		No visible damage	Log book	
6.3	Check that irregularities, if any in grooves provided at terminal box are smoothened for proper seating.		C	V	100%	Drawing		Log book	
6.4	Check that fasteners (between terminal bushing and connecting bus bar) used are non-magnetic including spring washers.		B	V	100%	Drawing	Non-magnetic		
6.5	Check for torque tightness		B	V	100%	Drawing/ Erection manual	Drawing		
6.6	NDT of External Seal weld between Terminal Bushing Box and Stator	DP	B	T	100%	Drawing	No defect	NDT Report	
6.7	Leakage test of weld seam	Pneumatic	B	T	100%	Drawing	No Leakage		

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUXILIARIES** (STATEMENT OF CHECKS)	FQP NO.: AA/CQ/SFQP/660/TG/01 REV NO. 00 SHEET 5 / 16 SHEETS

SYSTEM: Turbogenerator & Auxiliaries | SUB-SYSTEM : Generator | AREA : Erection

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
7.0	**Assembly of bushings on terminal box**								
7.1	Check terminal bushings for any cracks/ damage. Take 03 photographs of each bushing (each photograph covering 120 angle view) after assembly.		B	V	100%		No visible damage	Protocol	
7.2	Check IR of individual bushings	5 KV Meggar	B	M	100%		100 M ohms	Protocol	
7.3	Check cleanliness of joining surfaces.		C	V	100%		Cleanliness	Log book	
8.0	**Assembly of Cooler housing**								
8.1	Check that grooves provided in cooler housing frame are smooth.		C	V	100%		No damage & Smooth		
8.2	Check that the rubber cord is free from cracks and physical damage.		C	V	100%		No damage	Protocol	
9.0	**Pre alignment of stator**								
9.1	Pneumatic test with nitrogen of stator winding at 6 kg/cm2 for 24 hrs without End shield in position and each water box to be checked	Pressure Gauge	A	M	100%		No leakage	Site Protocol	
9.2	Ensure that cables for stator winding and core temp measurement RTD are laid properly inside stator and terminated with heat shrink sleeves at lead in plate.		C	V					

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUXILIARIES** (STATEMENT OF CHECKS)	FQP NO.: AA/CQ/SFQP/660/TG/01 REV NO. 00 SHEET 6 / 16 SHEETS
SYSTEM: Turbogenerator & Auxiliaries	SUB-SYSTEM : Generator	AREA : Erection

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
9.3	Assembly of cooler housing wrt stator and tightening torque is maintained as per the drawing (Torque value mentioned in drg).	Torque Wrench	C	M	100%	Drawing/ Erection manual	Drawing	Siemens log sheet to be taken	
9.4	Welding and NDT of External Seal weld between Cooler Housing and Stator	DP	B	T	100%	Drawing	No defect		
9.5	Leakage test of weld seam at 6kg/cm2 for 30 minutes	Pneumatic	B	T	100%	Drawing	No Leakage		
9.6	Centering of stator.	Piano wire, Micrometer	C	M	100%	Drawing/ Erection Manual	Drawing	Log book	
10.0	**Primary Water**								
10.1	Check conical strainers for cleanliness and see for any damages /rupture of strainer holes.		C	V	100%		No visible damage	Log book	
11.0	**Connection piece assembly**								
11.1	Check for contact grease applications in the connectors.		C	V	100%	Drawing		Log book	.

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUXILIARIES** (STATEMENT OF CHECKS)	FQP NO.: AA/CQ/SFQP/660/TG/01 REV NO. 00 SHEET 7 / 16 SHEETS

SYSTEM: Turbogenerator & Auxiliaries	SUB-SYSTEM : Generator	AREA : Erection

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
12.0	**Lower End Shields (Prior to rotor insertion)**								
12.1	Cleaning of Pre Chamber		C	V	100%				
12.2	Cleaning of all sealing Grooves		C	V	100%				
12.3	Checking of availability and thoroughness of holes/ grooves provided for filling of sealing compound by blowing compressed air .		C	V	100%			L00	
12.4	Check the matching of parting plane of lower and upper halves of end-shields for smoothness (Note: 0.03 mm feeler should not go)		C	V	100%		See note	Log book	
12.5	Check for any blockage of the bearing oil inlet/ outlet, seal oil inlet/ outlet, jacking oil inlet, ring relief oil inlet and passages, using compressed air and visual inspection with boroscope.		B	V	100%		No blockage	Protocol	
12.6	Check that all machined surfaces of flanges are free from any damage		C	V	100%		No visible damage	Log book	
13.0	**Stator**								

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUXILIARIES** (STATEMENT OF CHECKS)	FQP NO.: AA/CQ/SFQP/660/TG/01 REV NO. 00 SHEET 8 / 16 SHEETS
SYSTEM: Turbogenerator & Auxiliaries	SUB-SYSTEM : Generator	AREA : Erection

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
13.1	IR value and PI of stator winding. PI value before charging with Primary Water	5 KV megger	A	M	100%	Erection Manual	PI >=2, IR>= 100 M ohm	L-02	
13.2	Measure DC resistance of stator winding before and after bolting of terminal bushing (prior to rotor insertion) and compare with shop records (after temperature correction)	Micro ohmmeter	B	M	100%	Shop Test Certificate	Variation allowed is ±3%	L-02	
13.3	Ensure all checks on the stator as per rotor insertion protocol are implemented.		B	V	100%	Erection Manual		L-02	
13.5	Ensure that stator overhang vibration probes are mounted, if applicable.		B	V	100%	Drawing	Drawing	Protocol	
14.0	**Rotor (Prior to insertion)**								
14.1	Check journal diameter on both TE & EE	Vernier / Micrometer	B	M	Once	Drawing	Drawing	L-14	
14.2	Check IR value of winding	500V Megger.	B	M	100%	Erection manual	Min 1.3M ohm at 40°C	L-02	
14.3	Measure DC resistance and impedance of rotor winding and compare with shop records.	Micro ohmmeter, Voltmeter, Ammeter, Variac (3 phase, 15 amp)	B	M	100%	Shop Test Certificate	Variation allowed is ±3% for resistance	L-02	
14.4	Ensure all checks as per rotor insertion protocol are implemented.		A	V	100%	Erection manual		L-21	

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUXILIARIES** (STATEMENT OF CHECKS)	FQP NO.: AA/CQ/SFQP/660/TG/01 REV NO. 00 SHEET 9 / 16 SHEETS

SYSTEM: Turbogenerator & Auxiliaries | SUB-SYSTEM : Generator | AREA : Erection

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
15.0	**Bearing Assembly (Prior to Rotor Insertion)**								
15.1	Check for any damage to the babbit surface.		C	V	100%		No visible damage	Log book	
15.2	Ensure that there is no blockage in oil inlet & jacking oil holes.		C	V	100%		No Blockage	Log book	
15.3	Measure ID of the bearings	Micrometer	B	M	100%	Drawing	Drawing	Protocol	
15.4	Ensure matching at parting planes	Feeler gauge	C	V	Once	Drawing	0.03 mm feeler gauge should not go	Log book	
15.5	Contact between bottom half bearing liner & support ring of spherical seating. It should have 80% contact in the 60º arc of lower half bottom most area.		B	V	Once				
15.6	Record IR value between the bearing shell and the end shield(both on TE & EE) (After insertion value to be checked with documents)	100/ 500V Megger	B	M	Once	Drawing	IR value should not be less than 25 M ohms before rotor placement and 10 M ohms after rotor placement	L-01	
15.7	Ensure rotor insertion as per procedure		B	V	Once	Erection Manual		L-02	

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUXILIARIES** (STATEMENT OF CHECKS)	FQP NO.: AA/CQ/SFQP/660/TG/01 REV NO. 00 SHEET 10 / 16 SHEETS

SYSTEM: Turbogenerator & Auxiliaries | SUB-SYSTEM : Generator | AREA : Erection

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
16.0	**Bearing clearances**								
16.1	Measure and record radial clearances of bearing & oil catchers.	Feeler gauge	A	M	Once	Drawing	Drawing	L-03 & L-04	
16.2	Gap between the top half of the bearing shell and its support in the upper half of the end shield	Feeler gauge	B	V	100%	Drawing	Drawing	L03, L04	
16.3	Measure and record radial gap between bearing and support ring at the parting plane.	Feeler gauge	B	M	Once	Shop Protocol	Shop Protocol	Protocol	
17.0	**"Erection Setting Clearances" between stator and rotor**								
17.1	Achieve Magnetic Centre of Stator by adjusting dimension "B" marked (by Haridwar) in the lower part of the end shield	Measuring Tape	B	M	100%	Drawing	Drawing	L-12	
17.2	Check that required assembly offset is provided for thermal expansions	Measuring Tape/ Steel Scale	B	M	100%	Drawing	Drawing	L-12	
17.3	Measure and record air gap on both TE & EE.	Vernier	B	M	100%	Drawing	Drawing	L-12	

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUXILIARIES** (STATEMENT OF CHECKS)	FQP NO.: AA/CQ/SFQP/660/TG/01 REV NO. 00 SHEET 11 / 16 SHEETS

SYSTEM: Turbogenerator & Auxiliaries | SUB-SYSTEM : Generator | AREA : Erection

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
18.0	**Preliminary Alignment of Generator to LP shaft:**								
18.1	Check axial run out of the half- coupling flanges of both rotors. Check radial runout of the front coupling for record purpose.	Dial gauge	B	M	100%	Erection manual	Erection Manual	L-14	
18.2	Check radial run out of the rotor.	Dial gauge	B	M	100%	Erection manual	Erection Manual	L-14	
19.0	**Compressor Assembly**								
19.1	Measure and record IR value of the Baffle ring before mounting.	500V Megger	B	M	100%		Minimum Value 100K ohms	L-09	
19.2	Record axial gap between baffle ring Carrier and end shield	Feeler Gauge	A	M	100%	Drawing	Drawing	L-13,L-08	
19.3	Record radial & axial clearances of baffle ring carrier assembly	Feeler Gauge	A	M	100%	Drawing	Drawing	L-08	
19.4	Measure and record blower blade radial and axial clearances	Feeler Gauge	A	M	100%	Drawing	Drawing	L-08	
20.0	**Assembly of Air Gap Seal**								
20.1	Measure & record air Gap Seal radial clearances	Feeler Gauge	B	M	100%	Drawing	Drawing	L-10	
20.2	Check tightness of bolts & locking of washers.		C	V	Once	Drawing	Proper Tightening & Locking	Protocol	

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUXILIARIES** (STATEMENT OF CHECKS)	FQP NO.: AA/CQ/SFQP/660/TG/01 REV NO. 00 SHEET 12 / 16 SHEETS
SYSTEM: Turbogenerator & Auxiliaries	SUB-SYSTEM : Generator	AREA : Erection

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
21.0	**Oil Catchers(H_2 side)TE & EE**								
21.1	Ensure cleaning the oil catcher and its rubber cord seal groove		C	V	100%	Drawing		Log book	
21.2	Ensure contact at the parting plane of oil catchers	Feeler Gauge	B	V	100%		0.03mm feeler gauge should not go	Protocol	
21.3	Record the IR value between oil catcher and end shield	100V Megger	B	M	100%	Drawing	IR value not less than 25M ohms	L-01	
21.4	Measure radial & axial clearances on H2 side and air side.	Feeler Gauge	B	M	100%	Drawing	Drawing	L-05,L-06 & L-12	
22.0	**Seal Ring**								
22.1	Check for damage to the babbit surface and the faces		C	V	100%	Drawing	No damage	Log book	
22.2	Check cleanliness of the oil supply holes against any blockage using compressed air.		C	V	100%		Cleanliness & No blockage	Log book	
22.3	Check ID of the seal ring on both TE & EE.	Micrometer	B	M	100%	Drawing	Drawing	L-07	
23.0	**Shaft Seal Assembly**								
23.1	Ensure cleanliness of seal ring holder & seal ring groove.		C	V	100%		Cleanliness	Log book	
23.2	Check for any damage to the insulating ring.		C	V	100%		No visible damage	Log book	
23.3	Ensure that there is no blockage in the ring relief oil passage in the seal ring holder.		B	V	100%		No blockage	Protocol	
23.4	Ensure contact between joining surface of the two halves and two seal holders.		B	V	100%		Minimum Contact 80%	Protocol	

FOR TENDER PURPOSE ONLY

SYSTEM: Turbogenerator & Auxiliaries | SUB-SYSTEM : Generator | AREA : Erection

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
23.5	Axial run out measurement on the end shield seal holder seating surface	Dial Gauge	B	M	100%	Erection Manual/Drawing		L-11	
23.6	Seal body parting plane to be checked wrt hole of parting plane bolt (to avoid possibility of oil leakage).		C	V	100%				
23.7	Record IR between seal body and end shield (both on TE & EE)	100V Megger	B	M	100%		IR Value should not be less than 25 M ohms	L-01	
23.8	Measure and record shaft seal radial & axial clearances	Feeler Gauge	B	M	100%	Drawing	Drawing	L-05,L-06 & L-07	
24.0	**Bearings**								
24.1	Install upper half of the bearing and ensure a gap of 0.3-0.4 mm between the bearing shell and its support in the upper end shield	Feeler Gauge	B	M	100%	Drawing/Erection Manual		L-03 & L-04	
25.0	**GENERATOR BOXING UP**								
25.1	Ensure checks are carried out as per Boxing-up protocol.		B	V	100%	Erection Manual	Boxing up Protocol	L-16	
26.0	**Assembly of Hydrogen cooler**								
26.1	Prior to inserting, the cooler & cooler housing should be thoroughly checked and ensure for cleanliness for residual dust or other foreign bodies. All compartments and surfaces in cooler should be subjected to vacuum cleaning		C	V	100%		Cleanliness	Log book	

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUXILIARIES** (STATEMENT OF CHECKS)	FQP NO.: AA/CQ/SFQP/660/TG/01 REV NO. 00 SHEET 14 / 16 SHEETS

SYSTEM: Turbogenerator & Auxiliaries | SUB-SYSTEM : Generator | AREA : Erection

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
26.2	Hydraulic testing of hydrogen coolers (tube side) at 6 kg/cm2) pressure for 30 minutes.		B	T	100%	Drawing/ Erection Manual	No Leakage allowed	Protocol	
26.3	Check condition of cooler elements/ fins for looseness, prior to assembly.		C	V	100%	Drawing	No visible damage	Log book	
26.4	Check the groove & mating surface of cooler housing for smoothness. Also check rubber cord for any damage & free from dust, dirt.		C	V	100%		No damage	Log book	
26.5	Locking of all Hydrogen cooler fasteners.		C	V	100%	Drawing	Locked	Log book	
27	Final inspection of Generator interiors at both the end from manholes of cooler housing, end shield and terminal box.		A	V	100%			Log book	
28.1	Ensure installation of dehumidifier immediately after box up till commissioning.		C	V	100%	Drawing		logbook	
28.2	Check and record IR value of stator winding on weekly basis till charging of primary water in stator winding.		B	M	100%	Drawing		Logbook	
29.0	**Final Alignment**								
29.1	Check IR of Generator rotor prior to coupling to LP rotor.		A	M	100%	Drawing	Drawing	Log sheet	
29.2	Before final alignment check of generator, ensure tightening and elongation of stator anchor bolt as per drawing.		A	M	100%	Drawing	Drawing	Log sheet	

FOR TENDER PURPOSE ONLY

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	steam space 3: In case of spring loaded deck procedure of deck floating to be followed)								
29.4	Check coupled run out		B	M	100%	Erection Manual	Erection Manual	L-15	
30.0	Ensure tack welding of locking plates/ wedges and full welding of anchoring block		B	V	100%	Drawing	Drawing	Protocol	
31.0	**Rotor Shaft Grounding System**				100%				
31.1	Ensure that brushes are placed keeping in view the direction of rotation such that the carbon layer is leading the silver layer.		C	V	100%	Drawing		Log book + L-22	
32.0	**Reaming of coupling holes**								
32.1	Ensure that opposite holes is reamed to the same size.		B	M	100%	Drawing	O vality and taper of holes should not be more than 0.025mm	L-15	
32.2	Ensure that all coupling bolts and nuts are within ±5 grams		B	M	100%	Drawing	Weight within ±5 grams	L-15	
32.3	Ensure locking of coupling nuts and **caulking of grub screws**		B	V	100%	Drawing	Drawing	Log book	
32.4	Ensure fixing of coupling guard and its locking (caulking of CSK screws)		B	V	100%				
32.5	Ensure fixing of coupling guard and its locking (caulking of CSK screws)		B	V	100%				

FOR TENDER PURPOSE ONLY

	STANDARD FIELD QUALITY PLAN FOR **TURBOGENERATOR & AUXILIARIES** (STATEMENT OF CHECKS)	FQP NO.: AA/CQ/SFQP/660/TG/01 REV NO. 00 SHEET 16 / 16 SHEETS
SYSTEM: Turbogenerator & Auxiliaries	SUB-SYSTEM : Generator	AREA : Erection

Sl. No.	Activity & Operation	Characteristics / Instruments	Class Of Check	Type Of Check	Quantum Of Check	Reference Document	Acceptance Norms	Format of Records	Remarks
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
34.0	**Installation of external current connectors**								
34.1	Ensure installation of external current connector as per check list.		A					L-23	
34.2	Ensure torque tightening of joint bolt as per drg			M					
34.3	Check and record gap between joint face at measuring point as per log sheet.								
34.4	Take 03 photographs of each connectors along with bushing (each photograph covering 120 angle view) after assembly								

FOR TENDER PURPOSE ONLY

BHEL's CLARIFICATIONS TO BIFPCL/FICHTNER COMMENTS ON PAINTING SCHEME FOR PIPING Ref: Maitree-00-CFQA-732812-PC

S NO	BIFPCL/FICHTNER COMMENTS	BHEL's CLARIFICATIONS
1.	For the Maitree Project, both BIFPCL and OE have decided that there will be only one document for painting requirement for the whole plant vide Doc.No.Maitree- 0-BFA-Ff-10000 Latest Rev. If BHEL needs this document to be approved, the Approval can be given only as AOC, with the condition that this will be annexed to the main document, after Final Approval. In the interim, in addition to the Painting scheme , BHEL has to attach Pages 2 to 7 of 34 of the main Painting Schedule, detailing Code Requirements, Surface Preparation, cleaning at site, Application Procedure etc.	Agreed. Pages 2 to 7 of 34 of the main Painting Schedule, detailing Code Requirements, Surface Preparation, cleaning at site, Application Procedure etc. enclosed along with the Painting Scheme.
2.	BHEL is requested to respond to the following comments also. Sl.No.1: Shade Color to be specified.	Shade has been mentioned.
3.	Sl.No.5 : Hangers and Supports (other than CLH & VLH) Primer to be changed as Red Oxide Zinc Phosphate (Alkyd Base) Also, System 15 of Reference Document Maitree-0-BFA- FF-10000 Latest Revision specifies 2 coats of Primer & 2 Coats of Finish Paint and thus 2 coats of Primer to be specified.	Comments incorporated.
4.	Sl.No.6 : System 18 of Reference Document Maitree-0-BFA- FF-10000 Latest Revision for Valves etc. specifies 2 coats of Primer & 2 Coats of Finish Paint and thus a total of 80 microns. So, BHEL is requested to change Sl.No.6 in line with this.	Comments incorporated.

01	22.12.2018	All comments incorporated	JN	CVN	CVN
00	12.12.2018	Fresh Issue	JN	VIVEK	CVN
REV	DATE	DESCRIPTION / NOTE	PRD	CHD	APD

REVISIONS

TITLE:

PAINTING SCHEME FOR PIPING

OWNER / PROJECT: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY PVT. LTD, DHAKA, BANGALADESH 2x660 MW MAITREE STPP, RAMPAL, BANGLADESH

CUSTOMER CONSULTANT:

FICHTNER

M/s FICHTNER GmbH & Co KG,
Stuttgart, GERMANY

EPC CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD PIPING CENTRE, CHENNAI

	NAME	DATE	
PREPARED BY	JN	22.12.2018	STATUS : *FOR APPROVAL*
CHECKED BY	CVN	22.12.2018	BHEL CUST NO : 7328, 7329, 7330, 7331 & 7332
APPROVED BY	CVN	22.12.2018	BHEL DOC NO : **QP NO.:7328:QPC:11**
			REV NO : 01
			SHEET NO : 1 OF 1

CUSTOMER DRG./DOC NO.: Maitree-00-CF-QA-732812-PC REV 01

BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE, CHENNAI– 17
QUALITY ASSURANCE & CONTROL DEPT.

PAINTING SCHEME FOR PIPING

PROJECT NAME : -BIFPCL MAITREE STPP - 2X660 MW
BHEL CUSTOMER Nos : 7328, 7329, 7330, 7331 & 7332

QPNo: 7328:QPC:11
REV.NO: 01
Date : 22.12.18

Sl. NO	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat			Finish coat			Total DFT Microns (Min.)	REMARKS
			Primer	No of coats & DFT	Paint	No of coats & DFT	Shade	Paint	No of coats & DFT	Shade		
1	2	3	4	5	6	7		9	10	11	12	13
1	Insulated Piping, components (MS / HRH / CRH / Aux Steam lines, Tanks & Vessels ...& Pipe Clamps).	SSPC-SP3/ Power Tool Cleaning	Zinc EthySilicate	1 (75 microns per coat)	-----	-----	-----			Grey	75	Note:1
2	Uninsulated Piping, components (Spray Water / Condensate lines, Pipe Clamps...,Tanks & Vessels)	Abrasive Blast cleaning to SA2 ½ (Near white metal) Min 35 Micron	Zinc - Epoxy	1 (min.DFT = 80 Micron)	Epoxy High Solid	1 (DFT=160 Micron Min)	-----	$ 2-Comp Polyurethane	1 $ (min.DFT = 50 Microns per Coat) +	Window Grey to RAL7040	240 at shop + 50 at site	$: To be applied at site
3	Structures & All auxiliary structural steel components for pipe supports	Abrasive Blast cleaning to SA2 ½ (Near white metal) Min 35 Micron	Zinc - Epoxy	1 (min.DFT = 80 Micron)	Epoxy High Solid	1 (DFT=160 Micron Min)	-----	$ 2-Comp Polyurethane	1 $ (min.DFT = 50 Microns per Coat) +	Window Grey to RAL7040	240 at shop + 50 at site	$: To be applied at site
4	Hangers & Supports-(CLH,VLH - Spring Assemblies)	Blast cleaning to Sa2½ with surface profile 35-50 microns	Epoxy Zinc rich primer Gr.II,% VS = 35 Min	1 (40 microns per coat)	-----	-----	-----	Aliphatic Acrylic Polyurethane paint ,%VS = 40 min	1 (30 microns per coat)	Phirozi Blue	70	
5	Hangers & Supports- Other than CLH,VLH	Blast cleaning to Sa2½ with surface profile 35-50 microns	Red oxide Zinc Phosphate Primer (Alkyd Base)	2 (30 microns per coat.)	-----	-----	-----	Synthetic enamel paint long oil alkyd	2 (20 Microns per Coat)	Smoke Grey	100	
6	Valves & Gr-91 Clamps	Blast cleaning to Sa2½ with surface profile 35-50 microns	Heat resistant Aluminum Paints - Gr.I	2 (20 microns per coat)	-----	-----	-----	Heat resistant Aluminum Paints - Gr.I	2 (20 microns per coat)	Aluminum	80	
7	Stainless steel / Galvanized items	No paint										
8	Temporary Piping (for Hydro test at site)	SSPC-SP3/ Power Tool Cleaning	Red oxide Zinc Phosphate Primer	1 (30 microns per coat.)	-----	-----	-----	Synthetic enamel paint long oil alkyd	2 (20 Microns per Coat)	Smoke Grey	70	
9	Internal surface coating for ECW Tank	Blast cleaning to Sa2½ with surface profile 35-50 microns	Epoxy Zinc rich primer	2 (35 microns per coat)	-----	-----	-----	Epoxy based Polyamide cured finish paint	2 (65 microns per coat)	Smoke Grey	200	

Note.1:Piping above 60 Deg C are insulated.
2:For bought-out and Sub-Vendor items falling under the scope of BHEL, the same scheme as for main equipment as covered in this shall be followed.
3:Plates, Pipes & Tubing Cut to size at site : Shall follow 2 coats of 60 microns of Red oxide Zinc Phosphate Primer (Alkyd Base).
4:The final colour shade to be applied at site after erection shall be as per BIFPCL approved colour coding scheme.
5:Paint application may be by Brush or Spray method.

PREPARED BY : J NANTHINI, Sr.Engr/QA	APPROVED BY: C VAITHIANATHAN,AGM/Q	For BIFPCL use :	DOC. NO.: Maitree-00-CF-QA-732812-PC REV..... CAT.....			Page 1/1
			REVIEWED BY	APPROVED BY ENGG.DIV./QA&I	APPROVAL SEAL	

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2. General Requirements
3. Codes & Standards
4. Surface Preparation and Cleaning of Surfaces in the Shop
5. Cleaning to be performed on site
6. Cleaning of prime and intermediate coats (if required)
7. Application procedure
8. Galvanizing
9. Appendix-A

1. Scope & Philosophy

This document covers the Painting Scheme including Corrosion Protection, Coating and Galvanizing requirements applicable for the entire power plant packages, equipment, structures, piping etc. and any other surfaces.

Corrosion Protection, Coating and Galvanizing requirements shall conform to Contractual requirement stipulated in B0.6.5.

This documents contains list of annexure (mentioned at appendix-A) for Painting Scheme to be followed for various packages, equipment, items and structures.

Painting scheme shall be approved item/ equipment wise and not package wise i.e Painting scheme once approved for any equipment, items and structures etc shall be applicable for all similar equipment, items and structures in entire power plant.

2. General Requirement

Coating material shall only be supplied by manufacturers with international experience and their products can be obtained internationally.

It is the responsibility of the Contractor to ensure that, for all supplied equipment (including that from sub suppliers):

- The protection system is perfectly suitable for the Site conditions and for the specific purpose.
- The shop paints provide a sufficient protection during transport, storage and erection.
- The shop paints are suitable for handling and erection conditions (slinging, Site welding works etc.) and are compatible with the Site finishing coats
- All necessary precautions are taken in order to prevent damage to paints during storage, handling, welding.
- The necessary repairs are carefully executed as soon as possible.
- The colour RAL number of the finishing coat has been approved by the Employer, including identification code for piping.
- All items/equipment shall be painted as per the specification.

3. Codes and standards

Corrosion Protection, Coating and Galvanizing requirements will conform to the below mentioned applicable standards or equivalent:

- Product data of coating manufacturer
- DIN 2403 Indication of pipe-lines according to flowing material
- DIN 4762 Surface roughness
- ISO 8503 Surface roughness
- DIN 8201 Part 1-9 tight blasting agents

- DIN 50976 Corrosion protection, hot dip batch galvanizing of single parts, requirements and testing
- DIN 55928 Part 1-9 corrosion protection of structural steel work through protective coatings and topcoats
- ISO 8501 Preparation of steel substrates before application of paints and associated products
- ISO 12944 Paints and varnishes corrosion protection of steel structures by protective paint systems
- RAL Colour card
- ISO 8501-1 Preparation of steel substrates before application of paints and related products
- SSPC Vol. 1 and 2 Steel structure painting council

4. Surface Preparation and Cleaning of Surfaces in the Shop

All surfaces to be painted will be thoroughly cleaned of all grease, oil, paint residues, welding splashes, loose mill scale, dust, rust and any other foreign matter. Mechanical cleaning by power tool and scrapping with steel wire brushes will be adopted to clear the surfaces. However, in certain locations where power tool cleaning cannot be carried out, sand scrapping may be permitted with steel wire brushes and/or abrasive paper. Cleaning with solvents will be resorted to only in such areas where other methods specified above have not achieved the desired results. Cleaning with solvents will be adopted only after written approval of the Purchaser/Consultant.

Sharp edges have to be rounded off. Contaminations caused by salts, acids and alkali solutions shall be eliminated by rinsing with water up to a pH value of 6-8. Soluble salt contamination is to be tested using the Weber Reilly test method (or similar approved) and pH is to be tested using universal indicator paper strips prior to continuation with the blasting.

The preparation of substrates shall be carried out on the basis of the specifications of ISO 12944 part 4 and ISO 8501. The preparation of steel before application of paint and related products shall be in line with ISO 11124 for metallic blast cleaning abrasives and ISO 11126 for non-metallic blast cleaning abrasives. No recycled blast grit may be utilised.

After blasting, an anchor profile of 25 - 50 µm shall be achieved. Blasted surfaces have to be provided with a prime coat of the approved coating system immediately within 4 hours of blasting. All blasting and priming must take place outside of the high humidity periods of the day (i.e. maximum relative humidity of 80%).

5. Cleaning to be performed on site

Steel work protected by shop primer after arrival on site must be cleaned of salt, sand, oil, etc. before the first coat of paint is applied on site. Shop rimer damaged during transport must be rectified by blast-cleaning and coating before application of the site coats. Wood surfaces shall be sanded clean. All nail holes shall be puttied and sanded before priming, unless the specific coating system allows for coating onto damp concrete, in which case only with approval from the Employer.

If a protective coating of concrete is required, concrete shall be allowed to cure before painting. Transport and erection damages, as well as damages which result out of additional welding have to be repaired as soon as possible. The damaged areas have to be derusted with rotating or steel brushes, abrasive wheels, and abrasive blasting according to DIN ISO 8501-1.

6. Cleaning of prime and intermediate coats (as required)

To prevent contamination by mineral oil products, areas with prime and intermediate coat have to be treated with suitable cleaning agent. Cleaning has to be done free of residues, e.g. with alkaline detergents and thorough washing done with fresh water. Rusty spots have to be removed according to required purity. Metallic areas which are provided with temporary corrosion protection have to be cleaned. No oxidation products shall remain on the surface. Further care shall be taken that on hot components, no destructive or reaction products will be released when heating which could injure insulation.

7. Application procedure

When using the provided coating material, strict adherence to all application instructions given in product data of coating manufacturer is necessary. To obtain the maximum performance, technical data as well as application instructions for the individual coating material have to be strictly followed.

For a multi-layer coating system each layer has to have a different colour shade in order to clearly identify number of coats applied. The last finish coat has to be applied in the specified colour shade.

All paintings shall be performed according to ISO 12944. The durability of all paintings shall be high which corresponds to 15 years.

The interval between applying the different coats has to follow according to suppliers specifications. Each layer shall be cleaned and released from spray dust before the next layer will be applied. Prior to applying a further layer, the last one has to be repaired. All coatings have to be applied without retarding.

Following application procedures are allowed:

- prime coats by airless spray
  areas like disconnections, angles, corners, etc. which are difficult to be reached can be applied by brush or roller
- finish coats
  - at works by airless spray, roller or brush
  - at site by roller or brush or airless spray.

Control areas in accordance with the coating supplier's instructions have to be applied. For this procedure, a schedule for control areas has to be prepared by the Contractor and coating supplier which corresponds with the requirements of the warranty agreement.

Number and performance of the control areas have to be done in accordance with ISO 12944 part 7 and have to be documented in writing. No application shall take place either

in the condition of the relative humidity not within the given limit or in case of poor weather conditions such as fog, dust, rain, snow, hail or when it can be assumed that such conditions of poor weather will arise within 2 hours after application. Temperature of the coated parts has always to be above 5 °C and 3 K above dew point.

All specified dry film thicknesses (DFT) are minimum thicknesses. Welding seams executed at site have to be taped with an adhesive tape of about 30-50 mm after surface preparation (blasting or manual derusting) and prior to application in the manufacturing plant and to be coated with stripping coat.

Chequered plates, nap plates, etc. have not to be covered with adhesive tape, but have to be coated with stripping coat in a dry film thickness of at least 150 µm. Edging lines on steel structure have to be taped prior to application and after blasting in sufficient width or have to be protected with varnish before application. Thickness of prime coat may be 50 µm maximum. During repairing works at site on shop-primed structures, it is important that different coats will have different colour shades. Numbers of layers have to be the same as the original coating system to be used.

Application of temporary primer on structures which have to be insulated has to be in accordance with a sufficient corrosion protection for the period of storage respectively erection time.

8. Galvanizing

Galvanizing work shall conform in all respects to ISO 1461 or equivalent standards and shall be performed by the hot dip process unless otherwise specified.

It is essential that details of steel members and assemblies which are to be hot-dip galvanized should be designed to suit the requirements of the process. They should be in accordance with ISO 12944.

Vent holes and drain holes shall be provided to avoid high internal pressures and air locks during immersion and to ensure that molten zinc is not retained in pockets during withdrawal. Careful cleaning of welds is necessary before welded assemblies are dipped.

All defects of the steel surface including cracks, surface laminations, laps and folds shall be removed in accordance with BS 4360. All drilling, cutting, welding, forming and final fabrication of unit members and assemblies shall be completed, where feasible, before the structures are galvanized.

The minimum coating thickness shall be as specified in Table 1 of BS 729. Structural steel items shall be first grit-blasted to BS 4232, second quality, (Sa 2 1/2) or pickled in a bath, and the minimum average coating weight on steel Sections 5 mm thick and over shall be 900 g/m2, on steel Sections 2 – 5 mm thick 600 g/m2.

Galvanized contact surfaces to be joined by high-tensile friction-grip bolts shall be roughened before assembly so that the required slip factor is achieved. Care shall be taken to ensure that the roughening is confined to the area of the mating faces.

Protected slings must be used for off-loading and erection. Galvanized work, which is to be stored at the works or on site shall be stacked so as to provide adequate ventilation for all surfaces to avoid wet storage staining (white rust).

Small areas of the galvanized coating damaged in any way shall be restored

by:

- cleaning the area of any weld slag and thorough wire brushing to give a clean surface
- The application of two coats of zinc-rich paint, or the application of a low melting point zinc alloy repair rod or powder to the damaged area, which is heated to 300 °C or the treatment with suitable cold galvanizing paint, such as ORAPI n.z.a.b 706. All zinc rich paint used for such repairs must contain a minimum of 81% by mass of zinc in the dry film.

Connections between galvanized surfaces and copper, copper alloy or aluminium surfaces shall be protected by suitable tape wrapping.

05	**18.12.2018**	**Revision 05- Incorporation of comments on Rev 04 & Approval of painting scheme for MPS-11 to 17**	**YS**	**KSB**	**JPS**
04	08,10.2018	Revision 04- *Changes in Page No. 15,16 & 30 & Approval sought for MPS-10 (Page 33 & 34)*	YS	KSB	JPS
03	04.06.2018	Revision 03	YS	KSB	JPS
02	05.03.2018	Revision 02	YS	KSB	JPS
01	16.12.2017	Revision 01	YS	KSB	JPS
00	09.10.2017	FRESH ISSUE	YS	KSB	JPS
	DATE	DESCRIPTION/ NOTE	PRD	CHD	APD

REVISIONS

TITLE:

PAINTING SCHEDULE FOR ENTIRE PLANT

OWNER/ PROJECT:

BANGLADESH-INDIA FRIENDSHIP POWER PVT. LTD, DHAKA, BANGALADESH 2x660 COMPANY MW MAITREE STPP, RAMPAL, BANGLADESH

OWNER CONSULTANT:

FICHTNER

M/s FICHTNER GmbH & Co KG,

Stuttgart, GERMANY

EPC CONTRACTOR :

BHARAT HEAVY ELECTRICALS LTD.

	NAME		
PREPARED BY	**YS**		**STATUS: FOR APPROVAL**
CHECKED BY	**KSB**		**REV 05**
APPROVED BY	**JPS**		

DOC NO.: MAITREE-0-BFA-FF-100000-GEN	**Rev 05**

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Sharp edges have to be rounded off. Contaminations caused by salts, acids and alkali solutions shall be eliminated by rinsing with water up to a pH value of 6-8. Soluble salt contamination is to be tested using the Weber Reilly test method (or similar approved) and pH is to be tested using universal indicator paper strips prior to continuation with the blasting.

The preparation of substrates shall be carried out on the basis of the specifications of ISO 12944 part 4 and ISO 8501. The preparation of steel before application of paint and related products shall be in line with ISO 11124 for metallic blast cleaning abrasives and ISO 11126 for non-metallic blast cleaning abrasives. No recycled blast grit may be utilised.

After blasting, an anchor profile of 25 - 50 µm shall be achieved. Blasted surfaces have to be provided with a prime coat of the approved coating system immediately within 4 hours of blasting. All blasting and priming must take place outside of the high humidity periods of the day (i.e. maximum relative humidity of 80%).

5. Cleaning to be performed on site

Steel work protected by shop primer after arrival on site must be cleaned of salt, sand, oil, etc. before the first coat of paint is applied on site. Shop rimer damaged during transport must be rectified by blast-cleaning and coating before application of the site coats. Wood surfaces shall be sanded clean. All nail holes shall be puttied and sanded before priming, unless the specific coating system allows for coating onto damp concrete, in which case only with approval from the Employer.

If a protective coating of concrete is required, concrete shall be allowed to cure before painting. Transport and erection damages, as well as damages which result out of additional welding have to be repaired as soon as possible. The damaged areas have to be derusted with rotating or steel brushes, abrasive wheels, and abrasive blasting according to DIN ISO 8501-1.

6. Cleaning of prime and intermediate coats (as required)

To prevent contamination by mineral oil products, areas with prime and intermediate coat have to be treated with suitable cleaning agent. Cleaning has to be done free of residues, e.g. with alkaline detergents and thorough washing done with fresh water. Rusty spots have to be removed according to required purity. Metallic areas which are provided with temporary corrosion protection have to be cleaned. No oxidation products shall remain on the surface. Further care shall be taken that on hot components, no destructive or reaction products will be released when heating which could injure insulation.

7. Application procedure

When using the provided coating material, strict adherence to all application instructions given in product data of coating manufacturer is necessary. To obtain the maximum performance, technical data as well as application instructions for the individual coating material have to be strictly followed.

For a multi-layer coating system each layer has to have a different colour shade in order to clearly identify number of coats applied. The last finish coat has to be applied in the specified colour shade.

All paintings shall be performed according to ISO 12944. The durability of all paintings shall be high which corresponds to 15 years.

The interval between applying the different coats has to follow according to suppliers specifications. Each layer shall be cleaned and released from spray dust before the next layer will be applied. Prior to applying a further layer, the last one has to be repaired. All coatings have to be applied without retarding.

Following application procedures are allowed:

- prime coats by airless spray
  areas like disconnections, angles, corners, etc. which are difficult to be reached can be applied by brush or roller
- finish coats
  - at works by airless spray, roller or brush
  - at site by roller or brush or airless spray.

Control areas in accordance with the coating supplier's instructions have to be applied. For this procedure, a schedule for control areas has to be prepared by the Contractor and coating supplier which corresponds with the requirements of the warranty agreement.

Number and performance of the control areas have to be done in accordance with ISO 12944 part 7 and have to be documented in writing. No application shall take place either

in the condition of the relative humidity not within the given limit or in case of poor weather conditions such as fog, dust, rain, snow, hail or when it can be assumed that such conditions of poor weather will arise within 2 hours after application. Temperature of the coated parts has always to be above 5 °C and 3 K above dew point.

All specified dry film thicknesses (DFT) are minimum thicknesses. Welding seams executed at site have to be taped with an adhesive tape of about 30-50 mm after surface preparation (blasting or manual derusting) and prior to application in the manufacturing plant and to be coated with stripping coat.

Chequered plates, nap plates, etc. have not to be covered with adhesive tape, but have to be coated with stripping coat in a dry film thickness of at least 150 µm. Edging lines on steel structure have to be taped prior to application and after blasting in sufficient width or have to be protected with varnish before application. Thickness of prime coat may be 50 µm maximum. During repairing works at site on shop-primed structures, it is important that different coats will have different colour shades. Numbers of layers have to be the same as the original coating system to be used.

Application of temporary primer on structures which have to be insulated has to be in accordance with a sufficient corrosion protection for the period of storage respectively erection time.

8. Galvanizing

Galvanizing work shall conform in all respects to ISO 1461 or equivalent standards and shall be performed by the hot dip process unless otherwise specified.

It is essential that details of steel members and assemblies which are to be hot-dip galvanized should be designed to suit the requirements of the process. They should be in accordance with ISO 12944.

Vent holes and drain holes shall be provided to avoid high internal pressures and air locks during immersion and to ensure that molten zinc is not retained in pockets during withdrawal. Careful cleaning of welds is necessary before welded assemblies are dipped.

All defects of the steel surface including cracks, surface laminations, laps and folds shall be removed in accordance with BS 4360. All drilling, cutting, welding, forming and final fabrication of unit members and assemblies shall be completed, where feasible, before the structures are galvanized.

The minimum coating thickness shall be as specified in Table 1 of BS 729. Structural steel items shall be first grit-blasted to BS 4232, second quality, (Sa 2 1/2) or pickled in a bath, and the minimum average coating weight on steel Sections 5 mm thick and over shall be 900 g/m2, on steel Sections 2 – 5 mm thick 600 g/m2.

Galvanized contact surfaces to be joined by high-tensile friction-grip bolts shall be roughened before assembly so that the required slip factor is achieved. Care shall be taken to ensure that the roughening is confined to the area of the mating faces.

Protected slings must be used for off-loading and erection. Galvanized work, which is to be stored at the works or on site shall be stacked so as to provide adequate ventilation for all surfaces to avoid wet storage staining (white rust).

Small areas of the galvanized coating damaged in any way shall be restored

by:

- cleaning the area of any weld slag and thorough wire brushing to give a clean surface
- The application of two coats of zinc-rich paint, or the application of a low melting point zinc alloy repair rod or powder to the damaged area, which is heated to 300 °C or the treatment with suitable cold galvanizing paint, such as ORAPI n.z.a.b 706. All zinc rich paint used for such repairs must contain a minimum of 81% by mass of zinc in the dry film.

Connections between galvanized surfaces and copper, copper alloy or aluminium surfaces shall be protected by suitable tape wrapping.

Appendix-A

#	Painting Schedule for	Document No.	Remarks
1.	Steam Generator & Aux	MPS-1	
2.	Turbogenerator, Steam Turbine, Condenser, Turbine Integral System, Auxiliaries, Control Instrument of STG & Associated Auxiliaries.	MPS-2	
3.	Fire Protection System	MPS-3	
4.	Flue Das Desulphurization (FGD) System	MPS-4	
5.	Power House Structures, Bunker Shells, AHP/CHP Structures, RODM & Sub Station Structures	MPS-5	
6.	Air Pre Heater (APH), Electrostatic Precipitator (ESP) FAN and Gates & Dampers	MPS-6	
7.	MISC TANKS – SITE FABRICATED I.E. CONDENSATE STORAGE TANKS, DM WATER STORAGE TANKS, SERVICE WATER STORAGE TANKS AND DESALINATED WATER STORAGE TANK	MPS-7	
8.	Low Pressure Piping	MPS-8	UNDER HOLD
9.	Limestone & Gypsum Handling Plant	MPS-9	
10.	Mill Reject System		
11.	Chimney		
12.	D/G EOT Cranes		
13.	Sewage Treatment Plant		
14.	Pre Treatment Plant		
15.	Fuel Oil Handling System		
16.	Weigh Bridge		
17.	Electrical & Associated Systems		
18.	Other Balance of Plant Packages		
19.	Coal Handling Plant*	Maitree-00-EAF-PA-175272-ISG	RECLAIMER MACHINES
		Maitree-00-EAC-PA-175110-ISG	MECHANICAL
20.	Ash Handling System*	Maitree-00-ETG-DC-176111-ISG	
21.	Dry Bottom Ash Handling system*	Maitree-00-HDA-DC-176223-ISG	
22.	Bowl Mills	MPS-10	
23.	MISC. TANKS, FLASH TANKS, RE JOINTS, BF VALVES	MPS-11	
24.	Generator Transformer, ICT, Reactor, SUT,ST,UAT,CHPAT, AHPAT & NGR	MPS-12	
25.	Piping	MPS-13	
26.	BFP Drive Turbine	MPS-14	
27.	Pumps & Heat Exchanger	MPS-15	
28.	HT Motors & Switchgear	MPS-16	
29.	400kV &230kV GIS	MPS-17	

** Approval of these documents is being sought separately in PEDM. After approval these documents shall be annexed to this document.*

BHARAT HEAVY ELECTRICALS LIMITED, Tiruchirappalli - 620 014
PAINTING SCHEDULE FOR BOILER COMPONENTS

MPS-1

Coating System (refer Contract Book No.3 Clause B0.6.5)

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat microns	Total DFT (Micro m)
1	**Structural steel works, piping, vessels, tanks INDOOR**	**Boiler scope of components doesn't fall under this category**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Finish	1	Epoxy High Solid	80	80
									160
2	**Structural steel works, piping, vessels, tanks OUTDOOR**	**Buck stays 08-001,003,006,007,111,380,501,503, 08-901,910; 34-100,101,102,103,104,200,300,390,441, 34-442,443,444,445,511,512,513,514,515; Boiler supporting structures, Columns, Girders, Bracings 35-131,132,133,134,135,136,137,141, 35-142,143,144,145,146,147,151,152,153, 35-154,155,156,157,181,182,183,184,185, 35-186,187,211,212,213,214,221,222,231, 35-232,311,312,321,322,331,332,341,342, 35-351,352,361,362,371,372,374,375,381, 35-382,383,384,385,386,387,388,390,441, 35-442,443,444,445,446,447,448,451,452, 35-453,454,455,456,457,458,511,512,513, 35-514,515,516,517,518,521,522,523,524, 35-525,526,527,528,531,532,533,534,535, 35-536,537,538; 36-110,150,311,312,313,314; 36-315,316,321,322,323,324,325,326,331; Galleries, Stair-ways & inter connecting Walkways 36-332,333,334,335,336,337,338,341,342; 36-343,344,345,346,351,352,353,354,355; 36-356,361,362,363,364,365,366,371,372; 36-373,374,375,376,377,391,392,393,394; 36-395,610,620,621,740;38-210,299,310; 38-381,410,510,610,611,710;39-101,102, 39-141,142,150,299,300,301,304,305,306; 48-015,115,225,265,385,435,465,485,495; 48-665,911,912;**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Intermediate	1-2	Epoxy High Solid	160	160
					Finish*	1	2-Comp Polyurethane Shade: Window Grey to RAL 7040	50	50
									290
* Finish paint To be applied at site									
3	**Piping, tanks, etc INDOOR and OUTDOOR, Insulated**	**Boiler scope of components doesn't fall under this category**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	50	50
					Primer	1	Zinc-Epoxy	80	80

4	**Pump, motors, other equipment OUTDOOR**	**Boiler scope of components doesn't fall under this category**	upto 120	SA 2.5	Intermediate	1	Epoxy High Solid	110	110
					Finish	1	2-Comp Polyurethane	50	50
									240
5	**Pump, motors, other equipment INDOOR**	**Boiler scope of components doesn't fall under this category**	<120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Finish	2	Epoxy High Solid	50	100
									180
6	**Piping, reactors OUTDOOR Insulated**	**Components >95° C Insulated other than components in Sl.No.6 &8 Ring Headers, Down Comers, Hot air Headers outside the gas path etc. 05-155,227,231,251,327,330,350; 07-102,110,125,223,231,232,317; 10-174,178,191,194,195,274,278,283,284, 10-285,291,294,295,315,687;12-178,900; 15-136,178;15-236,278;17-504,900,903; 18-001,002,010;19-701,702,903; 21-600; 24- 800,805,806,807,808,809, 24-811,815;32-010,210; 33-970; 37-010; Hot Air: 48-202, 207,212,214, 48-222,224,262,264,662,664,667. Flue Gas: 48-372,382,384,432,434 48-462,464,482, 484,492,494;**	>120	SA 2.5	Primer	1	Zinc-Ethysilicate Shade: Grey	75	75
7	**Stack OUTDOOR**	**Boiler scope of components doesn't fall under this category**							
8	**Steel Surfaces Uninsulated**	**Components >95° C and <450° C uninsulated other than components coming in gas path. Valves, exhause pipes, man hole doors 20-511; 24-820,824,835,860,865,867; 42-200,300; 48-200,915;**	95-450	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75
					Finish	2	Silicone Aluminium Gr.II Shade: aluminium	25	50
									125
9	**Galvanized Surfaces**	**Boiler scope of components doesn't fall under this category**	upto 120	Mechanical cleaning from contaminants and zinc salts by means of washing or steam jetting or sweep-blasting with fine stand	When finish coat is required, such as sea climate with chloride exposure	1	Epoxy High Solid *	125	125

* Additional 1xFinish Coat 2-Comp. Polyurethane,50µm

Already Approved as AOC at R03
No Change Proposed

10	**Steel Surfaces permanently in contact with water, also river water splash zone**	**Boiler scope of components doesn't fall under this category**	medium temp upto 60 degree Celsius	SA 2.5	Prime and finish coat in one	1	Glassfake reinforced High Solid Epoxy	500	500
11	**Plant/Cooling Water pipes**	**Boiler scope of components doesn't fall under this category**	GRP, or steel lined concrete pipes with cathodic protection and coating according to AWWA C 203						
12	**NOT GIVEN IN THE TENDER SPECIFICATION**	**Collector & Separator Vessels (Except Internals), Supports 04 –147,321,547;**	upto 200	SA 2.5	PRIMER	1	Zinc-Ethysilicate	75	75
					FINISH	1	Epoxy polyamide cured finish paint Smoke grey	30	30
									105
13	**NOT GIVEN IN THE TENDER SPECIFICATION**	**Collector & Separator Vessels Internals & foundation materials 04-347; Machined components and threaded surfaces (Dd items): 07-302,309,331,361,362,393;12-314,317; 12-324,327,328,344,348,354,393;17-304; 17-306,319;19-306,307;21-602,605; 24-352,803,813,818,823,827,842;28-700; 32-700; 35-010,190,700,701; 36-700,701;39-012,700; 41-710;42-700,710; 43-710;45-710;47-710;48-019,913; 65-710;67-710; All Columns below '0' level (embedded in concrete) PGs 34,35,36,38 39**	---	SA 2.5	PRIMER	2	Sea worthy Rust Preventive Fluid Shade: Amber	25	50
									50
14	**NOT GIVEN IN THE TENDER SPECIFICATION**	**Loose tubes, SH, RH & Eco. coils, 11-074,078,095,374,378,395,406,416,467, 11-469, 474,487,494,606,608,684,694,716, 11-717,718,767,768,769,787, 791,916,917, 11-918,967,968,969,987,991; 12-179,181,184,187,368,395,403,405,495, 12-514,515,517,524,528,544,548,554,568, 12-619,800,803,805,850,852,903,914,917, 12-924,927,928,944,948,954,968; 16-079,201,202,203,270,379; 19-092,802,814,824,884; 19-914,924,984;**	COMING IN THE GAS PATH	SSPC – SP6 or SSPC – SP3 Commercial Blast cleaning/ Power tool cleaning	PRIMER	2	*Red Oxide Zinc Phosphate Dip coat primer to PR: CHEM: 09 – 03 Shade: Red oxide	35	70
									70
*-In lieu of dip painting, 2 coats of brush painting of Red oxide Zinc Phosphate primer to a coating thickness of 60µ is also permitted in line with Sr.No.16									

15	**NOT GIVEN IN THE TENDER SPECIFICATION**	**Miscellaneous casing sheets, fuel firing, duct plates, expansion joints and coal handling items** **07-409,431,460,461,462,502,503,531,560, 07-561; 12-906,907;21-601,604,700; 24-350,700,804;** **24-817,822,825,826,836,837,840;** **24-841,855,950; 30-219,233,234,235; 35-995;** **36-396, 611, 613,999; 38-993; 39-302; 41-350,390,500;** **42-001,002,005,010,046,065,070,120,152, 42-154,157;43-004,005,104,105,200; 45-200,801;** **45-802,804,805,858;47-281,283,858;** **Cold Air** **48-012,014,112,114,141;** **Tempering Air:** **48-142,144,145,204,205;** **65-736;67-204,272,276,283,801,802,803;** **95-088,089,091,485;96-186; 97-585,591,592;** **Handling equipment** **99-100,300,400,514,600;**	---	SA 2.5	PRIMER	2	Red Oxide Zinc Phosphate Primer (Alkyd Base)	30	60
				FINISH	2	Synthetic Enamel paint (Long Oil Alkyd) DFT= 20µm per coat Smoke grey	20	40
								100
16	**NOT GIVEN IN THE TENDER SPECIFICATION**	**Components >95° C coming in the gas path, Headers, Commissioning Spares &erection Materials, Miscellaneous materials etc.,** **05-137,147;06-400,401,431,434,437,441;** **06-444,447,451,453,455,500,501,731,732;** **06-734,735,737,741,744,745,747,751,752;** **06-753,755,759;07-315,316,318,423,993;** **10-182,183,184,185;11-491;12-993;** **17-174,474,476,506; 19-753,763,783,793,850,851,852,853;** **20-998;24-993; 30-215;** **30-223,224; 31-010,104,993;** **35-993; 38-993;39-993;** **42-858;** **48-993;65-200;67-200;97-282,590;** **99-099;20-988;21-987,988;24-987,988;** **24-989;41-988;42-988;**		SA 2.5	PRIMER	2	Red Oxide Zinc Phosphate Primer (Alkyd Base)	30	60
				FINISH	1	Synthetic Enamel paint (Long Oil Alkyd) Smoke grey	20	20
								80

Already Approved as AOC at R03
No Change Proposed

17	**B0-97, 8140A01/FICHT-15702705-v5 BIFPCL/ EPC-Main Plant/ 2015/ 1/**	**Hand rails and posts, ladders / rungs** **34 - 820,850** **35 - 821,822, 823,851** **36 -820,851,852,853;** **38 - 820,850** **39 - 820,850** **Floor Grills, Guard plates** **34-810;35 -811,812;36-811,812,813,814;** **38 -810;39 – 810;**	---	Acid pickling to SSPC-SP8	Hot dip Galvanizing to a coating weight 600 g/m2 for 2-5mm thickness and 900 g/m2 for thickness more than 5mm. Refer Notes given below **					
			Notes **: Hood ladders, Stringer channels and Guard plates shall be painted as per painting scheme prescribed in System. No: 02							
18	**NOT GIVEN IN THE TENDER**	**Cast carbon steel valves (Conventional)** **Cast alloy steel valves (Conventional)** **All API valves, QCNRV, SV & SRV Silencers,** **24-885;** **21-800,825** **Safety valves & ERV** **21-850; 24-880,881,883,885;** **Seal Boxes & Doors etc.** **09-003,004,005;28-220;**	> 400	SA 2.5	PRIMER	2	Heat Resistant Aluminium Paint to Gr. I	20	40	
					FINISH	2	Heat Resistant Aluminium Paint to Gr. I Shade: Aluminium	20	40	
									80	
19	**NOT GIVEN IN THE TENDER SPECIFICATION**	**Forged valves**	Phosphating to a coating weight of 1500 mg per Sq. ft.							
20	**NOT GIVEN IN THE TENDER SPECIFICATION**	**Soot Blower components (Outside surface – shell)** **20-051,054,201,204,794,962;** **For CLH & VLH$** **PGs 07,08,12,17,19,21,24,47,48 &80** **07-402,403,405;17-519,904,906,919;** **19-506,507,906,907;** **24-351,353, 801,810; 48-206,395;**		SA 2.5	PRIMER	1	Epoxy zinc rich Primer	40	40	
					FINISH	1	Aliphatic acrylic poly-urethane paint %VS = 35(min) Shade: Phirozi Blue	30	30	
									70	
$- For components other than CLH & VLH, Painting scheme shall be as given in System. No. 15										
21	**NOT GIVEN IN THE TENDER SPECIFICATION**	**HP / LP system**		**SSPC-SP3/Power Tool Cleaning**	PRIMER	2	Heat Resistant Aluminium Paint to Gr. I Shade: Aluminium	20	40	
					PRIMER	1	Zinc-Ethysilicate	65	65	

22	**NOT GIVEN IN THE TENDER SPECIFICATION**	**Components >95 C & < 150 C, un-insulated Fuel pipes** **47-289, 858.**		SA 2.5	FINISH	2	Heat resistant Aluminium paint Gr.II Shade: aluminium	20 40
								105

NOTES:
1. Seaworthy Rust Preventive Coating should be given on HSFG Bolt and nut threads.
2. All threaded and other surfaces of foundation bolts and its materials, insulation pins, Anchor channels, Sleeves, machined surfaces and retainers shall be coated with Seaworthy Temporary Rust Preventive Fluid and during execution of civil works; the dried film of coating shall be removed using organic solvents.
3. Ground shade/ colour of Finish paints & identification tag/Band for equipments, pipings pipe service, boiler supporting structures and other boiler components shall be followed.
4. Refer respective engineering document for all sub-vendor items not covered under this document.
5. No painting is required for Stainless Steel, non-ferrous & galvanized components. Abrasive blast cleaning to SSPC-SP6 (Sa2) shall be done to prepare the surfaces of hot worked pipes prior to application of primer.
6. Wherever inside surfaces of components under PGMA 48 – XXX & others, need protection till erection, two coats of Red-oxide zinc phosphate primer paint to IS12744 to a DFT of 60 microns followed by 1 coat of synthetic enamel paint – shade smoke grey shall be applied, after blast cleaning. It is not applicable for sealed channel boxes of duct supports e.g. 48-485. For items meant for spares and subcontracting where no further processing is involved, the painting scheme selected shall be the same as that of similar product configuration/ description.
07. The Temporary Rust Preventive coating that already been applied on any components, tubes, pipes etc., shall be visually inspected for good adherence. If the coating is intact, direct coating of alkyd based red oxide paints over the coating is permitted. In case the coating has peeled off over a large area, the coating is to be removed by suitable solvents / heating to 350 –400 □C for an hour before primer paint application –but, in this case, it should be ensured that the minimum surface cleanliness required for primer paint application shall be SSPC – SP2 (equivalent – Hand Tool cleaning).
08. In components, wherever plates / sheets of thickness less than or equal to 5 mm and rods of <25mm/tubes/drain pipes are used, power tool / hand tool cleaning to SSPC – SP3 shall be followed and the painting shall be done as described in Sl.No.15.
09. For all commissioning components-erection materials (xx-993) two coats of Redoxide Zinc Phosphate Primer shall be applied to meet the temporary protection till erection, after power tool cleaning.
10. Touch-up painting of damaged areas shall be carried out as per clause of Page. No. B0-95 of Amendment no. 06, Part 01, Annexure 01, Fichtner's doc. no: 8140A01/FICHT-15702705-v5 BIFPCL/EPC-Main Plant/2015/1/ – 2x660MW MAITREE STPP.
11. All components covered under different PGMA's are to be painted in case any component is left out, the same shall be deemed to be included under the relevant section based on paint logic approved.
12. For very small components like clamps etc. Sl.no.15 shall be followed with power tool cleaning.
13. Only weldable primer 2 coats to a DFT of 50µ (2x25µ) shall be applied on both external and internal surfaces within 50mm from the end of the component to be welded subsequently at site. At those locations no other paint shall be applied. All small components (less than 300x300 mm in dimension) shall be given only weldable primer.
14. DUs coming under Constant Load Hangers (CLH)/ Variable Load Hangers (VLH) shall be painted as per the system - PS 15 indicated in Sl. No. 20 of the table. However, for DUs other than CLH/VLH, the painting shall be as per Painting Scheme PS 1JS indicated in Sl. No. 15 of the table. (i.e., two coats of Red Oxide Zinc Phosphate Primer followed by two coats of Synthetic Enamel Paint –shade smoke grey, total DFT – 100 microns)
15. For internal protection of Pipes, tubes, headers and other pressure parts, Volatile Corrosion Inhibitor (VCI) pellets shall be put (after sponge testing/ draining/ or drying) and subsequently end capped. The dosage of VCI pellets shall be approximately 100 g/ Cu.m. For tubes typically 4 – 5 tablets per end are to be put. For C & I items the dosage of self-indicating Silica Gel (colourless) shall be 250 g/ cu.m. (About 2 to 3 bags weighing approximately 100 grams each). VCI pellets shall not be used for stainless steel components and its composite associates.
16. All threaded components of spring assemblies and turnbuckles shall be galvanized and achromatized to 15 microns minimum thickness.
17. Soot blower components i.e Valve head assembly having high surface temperature (> 200 and <600 deg. C) shall be applied with HR aluminium IS13183 Gr.II paint (up to 400 deg.C) and Gr.I paint (up to 600 deg.C)
18. Handrails of PGMA under Sl. No. 2 need to be galvanized in line with scheme for handrails (i.e. Sl .No. 17). For chequered plates having thickness <=5mm, surface preparation can be power tool cleaning to St3 and painting shall be in line with Sl. No. 15.
19. It is mandatory that for finish coat each layer shall have a permanent DFT and free from any paint defects like sags, wrinkles etc. Total DFT of a component correspond to respective painting scheme has to be ensured.
20. Periodical maintenance shall be carried out after thorough inspection of painted components, till they are erected.
21. Stenciling is preferably screen printed using lacquer paints.
22. Blast cleaning to SA2½ (Near white metal) shall be done with surface profile, 25-50 microns.

Details for paint procurement & application purposes (In accordance with ISO 12944)

Sl. No.	Generic nature of paint	Theoretical Covering Capacity Sq.m per Litre.	No. of pack	Volume solids, % (min)**	DFT in microns per coat (approx.)	Shade	Mode of appln.	Over coating interval, Hrs.
1	Inorganic ethyl zinc silicate primer, % Zn content in non volatile portion of paint = 75 minimum	8	2	60	75	Grey	Spray only	16
2	Polyamide cured Epoxy based MIO pigmented intermediate coat (epoxy high solid)	7	2	60	80	Brown	## Spray	24
3	Epoxy based polyamide cured finish paint. (Smooth and Glossy finish (Gloss @ 60 deg. angle of incidence = 61 min) Acid/alkali resistance (10 percent Nitric acid at 27 ± 2°C — 24 h, 20 percent sulphuric acid at 27 ± 2°C — 16 h, 25 percent, caustic soda at 27 ± 2°C — 24 h, 10 percent hydrochloric acid at 27 ± 2°C — 48 h. The loss of gloss shall not be more than 50 percent of the original gloss))	10	2	40	35	Smoke Grey	Spray	24
4	Aliphatic acrylic polyurethane paint. (Resistance to acid, alkali, oil and solvents. Smooth and Glossy finish (Gloss @ 45 deg. angle of incidence = 52 min))	8	2	40	50	Phirozi Blue/ Window Grey to RAL 7040	Spray	24
5	Heat resistant Aluminium paint (Silicone aluminium). Heat resistance up to 600 deg.C for Gr.I and 400 deg.C for Gr.II. Salt spray resistance for 96 hours.	10	1	--	20 - 25	--	Spray or Brush	24
6	Red oxide zinc phosphate primer paint (Zinc phosphate percent by mass on pigment = 16 min)	10	1	--	25-30	Red oxide	Spray or Brush	12
7	Red oxide Zinc Phosphate Dip coat primer paint to PR: CHEM: 09-03	10	1	--	35	Red oxide	Dip	12
8	Long oil alkyd synthetic enamel finish paint. (1. Accelerate storage stability test @60 deg.C shall pass for 96 hours; 2. Pthalic anhydride content of non-volatile vehicle, percent by mass = 20 min; Gloss @60 deg = above 71)	10	1	35	15-20	Corrpdg. Shade no	Spray or Brush	12

9	Sea worthy Temporary Rust preventive fluid to PR: CHE: 09 – 06	10	1	--	25	Amber	Spray	12
10	HB Epoxy zinc rich primer (zinc - epoxy). % Zinc dust pigment content = 80 minimum.	7	2	60	80	grey	Spray	24
11	Epoxy Zinc rich primer (for Soot blowers and CLH/VLH) % Metallic Zn content = 85 minimum.	8	2	35	40	Grey	Spray	24

Brush painting is accepted, if recommended by the Paint suppliers. The covering capacity of paints specified is only approximate.

Records of revision

Revision No.	Date	Details of revision	Remarks
1	04-06-2018	Coating thickness in system no.17 is changed as per technical spec. Heat resistant aluminium paint is indicated in system no.22. Description of items included in system no. 8. Brush application removed in sheet 07 of 07.	As per BIFPCL comments on painting scheme approval.
4	29-09-2018	Mode of application under Details for paint procurement & application purposes, S.No. 5,6 & 8 amended as "Spray or Brush"	The mode of application is in-line with contractual specifications (B0.6.5)

PAINTING SCHEDULE FOR 2X660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH
(EPC MAIN PLANT PACKAGE)
BHARAT HEAVY ELECTRICAL LTD.
HEAVY ELECTRICAL EQUIPMENT PLANT RANIPUR, HARIDWAR

MSP-2

Already Approved as AOC at R03
No Change Proposed

A: PAINTING SCHEME FOR TURBOGENERATOR & AUXILIARIES

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)	Final Paint Shade	Remark
1	Turbogenerator (Stator, end-shields etc.)	-	<120	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70	-	I Final painting is done at site.
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70	-	
					Finish	1	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	60	60	Blue; RAL 5012	
									200		
2	Exciter	-	<120	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70		
					Int/Finish	NA	NA	NA	NA	NA	
									70		
3	Exciter Cover	-	<120	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70	-	n Final painting is done at site.
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70	-	
					Finish	1	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	60	60	Blue; RAL 5012	
									200		
4	Generator Auxiliaries (S.O. Unit, S.O. Storage Tank, Liquid Detector Rack, Gas Unit, H2 Distributor, CO2 Distributor, N2 Distributor, CO2 Vapouriser, Refrigeration Gas Dryer, Bearing Vapour Exhauster, PW unit, PW tank, PW coolers, Alkaliser Unit)	-	<120	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70	-	
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70	-	
					Finish	1	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	60	60	Grey RAL 9002	
									200		
5	Generator Seal Oil Piping	-	<120	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70	Final Shade: Grey RAL 9002 Identification Band Colour for piping: Light Brown, ISC 410. Legend on piping-SO	I Final painting is done at site.
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70		
					Finish	1	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	60	60		
									200		
6	Generator H2 piping.	-	<120	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70	Final Shade: Grey RAL 9002 Identification Band Colour for piping:Canary Yellow ISC 309. Legend on piping-H	I Final painting is done at site.
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70		
					Finish	1	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	60	60		
									200		

PAINTING SCHEDULE FOR 2X660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH
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HEAVY ELECTRICAL EQUIPMENT PLANT RANIPUR, HARIDWAR

7	Generator CO2 piping		<120	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70	Final Shade: Grey RAL 9002 Identification Band Colour for piping:Canary Yellow ISC 309. Legend on piping-CO2	I Final painting is done at site.
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70		
					Finish	1	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	60	60		
									200		
8	ACW Piping for Generator H2 coolers	-	<120	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70	Final Shade: Grey RAL 9002 Identification Band Colour for piping:Sea Green,ISC 217 Legend on piping-ACW	I Final painting is done at site.
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70		
					Finish	1	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	60	60		
									200		
9	PW Piping including impulse piping	-	<120	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70	Final Shade: Grey RAL 9002 Identification Band Colour for piping:Sea Green,ISC 217 Legend on piping-DMW	I Final painting is done at site.
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70		
					Finish	1	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	60	60		
									200		
10	Hanger & Pipe supports for generator pipings.	-	<120	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70	Final Shade: Black, RAL 9011	I Final painting is done at site.
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70		
					Finish	1	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	60	60		
									200		

Note: For painting in BHEL scope at site:- For painting work at Site and for touch-up paints (if required), the procurement & application of paint & painting materials are in BHEL-Site (P.S.) scope inline with earlier projects.

B: PAINTING SCHEME FOR STEAM TURBINE & AUXILIARIES

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)	Final Paint Shade	Remark
1	HP Outer Casing IP Outer Casing	-	<600	Manual wire brush/emary paper/Solvant cleanng	–	–	–	–	–	–	
						–	–	–	–	–	
					Finish	2	Aluminum Paint	20	**40**		
2	IP Inlet	-	<600	Manual wire brush/emary paper/Solvant cleanng	–	–	–	–	–	–	
						–	–	–	–	–	
					Finish	2	Aluminum Paint	20	**40**		
3	Cross Over Pipe	-	<400	Manual wire brush/emary paper/Solvant cleanng	–	–	–	–	–	–	
						–	–	–	–	–	
					Finish	2	Aluminum Paint	20	**40**		
				Manual wire	Primer	2	Epoxy based Zinc rich primer paint	35	70	-	

Already Approved as AOC at R03
No Change Proposed

4	Front Wall & Side Wall	-	<120	Manual wire brush/emary paper/Solvant cleanng	Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70	-	
					Finish	2	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	30	60	Light Blue (RAL5012)	
									200		
5	LP Outer Casing Upper Part	-	<120	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70	–	
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70	–	
					Finish	2	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	30	60	Light Blue (RAL5012)	
									200		
6	Overload Valve Assembly	-	<600	Manual wire brush/emary paper/Solvant cleanng	–	–	–	–	–	–	
						–	–	–	–	–	
					Finish	2	Aluminum Paint	20	**40**		
7	Bearing Pedestals & Covers	-	<150	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70	–	
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70	–	
					Finish	2	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	30	60	Light Blue (RAL5012)	
									200		
8	Shaft Lifting Device (LPT) Assembly Fixture for HPT	-	-	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70	–	
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70	–	
					Finish	2	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	30	60	Light Blue (RAL5012)	
									200		
9	E.S.V. & C.V. Casing	-	<600	Manual wire brush/emary paper/Solvant cleanng	–	–	–	–	–	–	
						–	–	–	–	–	
					Finish	2	Aluminum Paint	20	**40**		
10	IV & CV Casing	-	<600	Manual wire brush/emary paper/Solvant cleanng	–	–	–	–	–	–	
						–	–	–	–	–	
					Finish	2	Aluminum Paint	20	**40**		
11	ESV, HPCV, IV & IPCV Servomotor	-	<150	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70	–	
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70	–	
					Finish	2	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	30	60	Canary Yellow ISC No. 309	
									200		
12	LPBP Stop/Control Valve Servomotor	-	<150	Manual wire brush/emary paper/Solvant cleanng	Primer	2	Epoxy based Zinc rich primer paint	35	70	–	
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cured Paint	70	70	–	
					Finish	2	Aliphatic Acrylic 2 Pack Polyurethane Finish paint	30	60	Canary Yellow ISC No. 309	
									200		

C: PAINTING SCHEME FOR CONDENSER & AUXILIARIES

PAINTING SCHEDULE FOR 2X660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH
(EPC MAIN PLANT PACKAGE)
BHARAT HEAVY ELECTRICAL LTD.
HEAVY ELECTRICAL EQUIPMENT PLANT RANIPUR, HARIDWAR

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)	Final Paint Shade	Remark
1	Structural steel works, piping, vessels, tanks INDOOR	Outside surfaces of: 1. Condenser 2. L.P. Heater No. 1 3. Hydrogen Cooler	upto 120	SA 2.5	Primer	2	Epoxy base zinc rich primer paint	35	70		
					Intermediate Paint	1	Epoxy TiO2 Pigmented Polyamide cured paint	70	70		
					Finish	2	Aliphatic Acrylic 2 Pack Polyurethane Finish Paint	30	60		
									200 (180 min.)		
		Inside surfaces of: 1. Condenser 2. L.P. Heater No. 1 3. Hydrogen Cooler		NA	Inside surfaces are supplied coated with steam washable paint at works. This paint is to be washed before commissioning.						
2	Structural steel works, piping, vessels, tanks OUTDOOR	N.A.	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80		
					Intermediate	1-2	Epoxy High Solid	160	160		
					Finish	1	2-Comp Polyurethane	50	50		
									290		
3	Piping, tanks, etc INDOOR and OUTDOOR, Insulated	N.A.	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	50	50		
4	Pump, motors, other equipment OUTDOOR	N.A.	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80		
					Intermediate	1	Epoxy High Solid	110	110		
					Finish	1	2-Comp Polyurethane	50	50		
									240		
5	Pump, motors, other equipment INDOOR	1. Vacuum Pump	upto 50	SA 2.5	Primer	1	Zinc-Epoxy	80	80		
					Finish	2	Epoxy High Solid	50	100		
									180		
		2. GSC Air Exhauster	upto 80								
6	Piping, reactors OUTDOOR Insulated	N.A.	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75		
7	Stack OUTDOOR	N.A.	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75		
					Finish	2	Silicone Acrylic	50	100		
									175		
8	Steel Surfaces Uninsulated	N.A.	200-450	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75		
					Finish	2	Silicone Aluminium	25	50		
									125		
9	Galvanized Surfaces	N.A.	upto 120	Mechanical cleaning from contaminants and zinc salts by means of washing or steam jetting or sweep-blasting with fine stand	When finish coat is required, such as sea climate with chloride exposure	1	Epoxy High Solid *	125	125		

Already Approved as AOC at R03
No Change Proposed

10	Steel Surfaces permanently in contact with water, also river water splash zone	1. Waterbox inside surface. 2. Water side portion of Water Chamber not cladded with titanium.	medium temp upto 60 degree Celsius	SA 2.5	Prime and finish coat in one	3	Glassflake reinforced High Solid Epoxy	1000	3000		
11	Plant/Cooling Water pipes	To be filled in by BHEL Units	GRP, or steel lined concrete pipes with cathodic protection and coating according to AWWA C 203								
* Additional 1 x Finish Coat 2-Comp. Polyurethane, 50 micro m, when exposed to UV or weathering conditions and color retention is required											

Deviation Sought

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat	Total DFT (Micro m)	Justification/ Reasoning
D-1	**Steel Surface uninsulated**	Turbine oil cooler- Part of oil module skid- indoor	100	-	-	-	-	-	-	Cooler is of Stainless steel, hence no painting is required.

D: PAINTING SCHEME FOR TURBINE INTEGRAL SYSTEM

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)	Final Paint Shade	Remark
1	**Structural steel works, piping, vessels, tanks INDOOR**	Spring Cages	<60	SA 2.5	Primer	1	Epoxy Base Zinc Rich	35	35		
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cure	70	70		
					Finish	2	Aliphatic Acrylic 2 Pack Polyurethane	37.5	**75**		
					TOTAL:				**180**		
		Oil tank (MOT)	>60	SA 2.5	Primer	1	Epoxy Base Zinc Rich	35	35		
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cure	70	70		
					Finish	2	Aliphatic Acrylic 2 Pack Polyurethane	37.5	**75**		
					TOTAL:				**180**		
		MOP,EOP, JOP (With Motors)	>60	SA 2.5	Primer	1	Epoxy Base Zinc Rich	35	35		
					Intermediate	1	Epoxy TiO2 Pigmented Polyamide Cure	70	70		
					Finish	2	Aliphatic Acrylic 2 Pack Polyurethane	37.5	**75**		
					TOTAL:				**180**		
* Additional 1 x Finish Coat 2-Comp. Polyurethane, 50 micro m, when exposed to UV or weathering conditions and color retention is required											

E: PAINTING SCHEME FOR CONTROL INSTRUMENT OF STG & AUXILIARIES

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)	Final Paint Shade	Remark
1	**Pump, motors, other equipment INDOOR (STARTER PANELS)**	-	>120	SA 2.5	Primer	1	Zinc-Epoxy	80	80		
					Finish	2	Epoxy High Solid	50	100		
									180		

Already Approved as AOC at R03
No Change Proposed

PAINTING SCHEDULE FOR 2X660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH
(EPC MAIN PLANT PACKAGE)
BHARAT HEAVY ELECTRICAL LTD.
HEAVY ELECTRICAL EQUIPMENT PLANT RANIPUR, HARIDWAR

*** Additional 1 x Finish Coat 2-Comp. Polyurethane, 50 micro m, when exposed to UV or weathering conditions and color retention is required**

Deviation Sought

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)	Justification/ Reasoning
D-1	INDOOR	DC STARTER PANELS & GIC	Ambient (0-50 C)	7 tank process	Powder coating	1	Epoxy based powder	75	75	

Already Approved as AOC at R03
No Change Proposed

Already Approved as AOC at R03
No Change Proposed

MSP-3

Coating System (refer Contract Book No.3 Clause B0.6.5)

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)	REMARKS
1	Structural steel works, piping, vessels, tanks INDOOR	1. HYDRANT COMPONENTS PACKAGE 2. WATER SPRAY SYSTEM (for Structural steel, Pylon Pipes, detection pipes, equipmnets like DV, Nozzles, QBD, instruments, Valves etc.) 3. Piping & structurals for Inert Gas Extinguishing system 4. Foam system	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80	A) PIPING:(Surface preparation, Primer and finish coats at site) BASE COLOR : SIGNAL RED / RAL : 3001 LETTERING : SIGNAL WHITE / RAL :9003 B) EQUIPMENTS like DV, Nozzles, QBD, instruments, Valves etc : (Surface preparation, Primer and finish coats at shop) Final shade:WINDOW GREY / RAL 7040 C) DV LOCAL CONTROL PANELS:(Surface preparation, Primer and finish coats at shop) Final shade: LIGHT GREY / RAL 7035 D) STRUCTURAL STEEL:((Surface preparation, Primer and finish coats at site) Final shade:WINDOW GREY / RAL 7040 E)
					Finish	1	Epoxy High Solid	80	80	
									160	
2	Structural steel works, piping, vessels, tanks OUTDOOR	1. HYDRANT COMPONENTS PACKAGE 2. WATER SPRAY SYSTEM (for Structural steel, Pylon Pipes, detection pipes,equipmnets like DV, Nozzles, QBD, instruments, Valves etc.) 3. Piping & structurals for Inert Gas Extinguishing system 4. Foam system	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80	A) PIPING:(Surface preparation, Primer,intermediate and finish coats at site) BASE COLOR : SIGNAL RED / RAL : 3001 LETTERING : SIGNAL WHITE / RAL :9003 B) EQUIPMENTS like DV, Nozzles, QBD, instruments, Valves etc: (Surface preparation, Primer,intermediate and finish coats at shop) Final shade: WINDOW GREY / RAL 7040 C) DV LOCAL CONTROL PANELS: (Surface preparation, Primer,intermediate and finish coats at shop) Final shade: LIGHT GREY / RAL 7035 D) STRUCTURAL STEEL:((Surface preparation, Primer,intermideate coat and finish coats at site) Final shade:WINDOW GREY / RAL 7040
					Intermediate	1-2	Epoxy High Solid	160	160	
					Finish	1	2-Comp Polyurethane	50	50	
									290	
3	Piping, tanks, etc INDOOR and OUTDOOR, Insulated	NA for FPS	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	50	50	
4	Pump, motors, other equipments OUTDOOR	NA for FPS	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80	
					Intermediate	1	Epoxy High Solid	110	110	
					Finish	1	2-Comp Polyurethane	50	50	
									240	
5	Pump, motors, other equipments INDOOR	1. Hydrant System 2. Water Spray System 3. Foam System	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80	Shade: RAL 3001
					Finish	2	Epoxy High Solid	50	100	
									180	
6	Piping, reactors OUTDOOR Insulated	NA for FPS	>120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75	
7	Stack OUTDOOR	NA for FPS	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75	
					Finish	2	Silicone Acrylic	50	100	
									175	
8	Steel Surfaces Uninsulated	NA for FPS	200-450	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75	
					Finish	2	Silicone Aluminium	25	50	
									125	

9	**Galvanized Surfaces**	**1. WATER SPRAY SYSTEM (for Galvanized Pipes)**	upto 120	Mechanical cleaning from contaminants and zinc salts by means of washing or steam jetting or sweep-blasting with fine stand	When finish coat is required, such as sea climate with chloride exposure	1	Epoxy High Solid *	125	125	A) PIPING(Galvanizing is at shop, and finish coat will be at site) BASE COLOR : SIGNAL RED / RAL : 3001 LETTERING : SIGNAL WHITE / RAL :9003
10	**Steel Surfaces permanently in contact with water, also river water splash zone**	**NA for FPS**	medium temp upto 60 degree Celsius	SA 2.5	Prime and finish coat in one	1	Glassfake reinforced High Solid Epoxy	500	500	
11	**Plant/Cooling Water pipes**	**NA for FPS**	GRP, or steel lined concrete pipes with cathodic protection and coating according to AWWA C 203							
12	**Fire detection and Alarm System panels**	**Fire detection and Alarm System**								Shall be as per OEM Standrard
13	**PLC Panels**	**PLC for Fire water pumps operation**								Shall be as per OEM Standrard
14	**Inert gas cylinders, Gas release panel, Inhibit/Release push button and Inert gas components for Inert gas systems**	**Inert Gas Extinguishing System**								Shall be as per OEM Standrard

** Additional 1 x Finish Coat 2-Comp. Polyurethane, 50 micro m, when exposed to UV or weathering conditions and color retention is required*

Deviation Sought, if any

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)	Justification/ Reasoning
D-1										
D-2										
D-3										
D-4										
D-5										
D-6										
D-7										
D-8										
D-9										

Already Approved as AOC at R03
No Change Proposed

Painting Scheme for Flue Gas Desulphurization (FGD) System

Coating System (refer Contract Book No.3 Clause B0.6.5)

MPS-4

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)
1	**Structural steel works, piping, vessels, tanks INDOOR**	**Indoor surfaces (Structural steel works, piping, vessels, tanks) of FGD system**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Finish	1	Epoxy High Solid	80	80
									160
2	**Structural steel works, piping, vessels, tanks OUTDOOR**	**Outdoor surfaces (Surface exposed to atmosphere of Structural steel work, piping, vessel, tanks) of FGD system**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Intermediate	1-2	Epoxy High Solid	160	160
					Finish	1	2-Comp Polyurethane	50	50
									290
3	**Piping, tanks, etc INDOOR and OUTDOOR, Insulated**	**Piping, Tanks Indoor and Outdoor (Insulated) of FGD system**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	50	50
4	**Pump, motors, other equipment OUTDOOR**	**Pumps, motor and other equipment (Outdoor) of FGD system**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Intermediate	1	Epoxy High Solid	110	110
					Finish	1	2-Comp Polyurethane	50	50
									240
5	**Pump, motors, other equipment INDOOR**	**Pumps, motor and other equipment (Indoor) of FGD system**	>120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Finish	2	Epoxy High Solid	50	100
									180
6	**Piping, reactors OUTDOOR Insulated**	**Piping, reactors Outdoor (Insulated) of FGD system**	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75
7	**Stack OUTDOOR**	**FGD System components does not fall under this category**	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75
					Finish	2	Silicone Acrylic	50	100
									175
8	**Steel Surfaces Uninsulated**	**FGD System components does not fall under this category**	200-450	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75
					Finish	2	Silicone Aluminium	25	50
									125
9	**Galvanized Surfaces**	**Floor grills, Hand rails and Step Treads (As specified in drawing; if not specified, system 2.0 to be followed for painting)- Hot dip galvanizing to a coating weight of 610 gm per sq.M (minimum) and to a coating thickness of 85 microns (min) on steel sections 2-5mm thick and 900 gm per sq.M (minimum) for steel sections more than 5mm thick.**	upto 120	Mechanical cleaning from contaminants and zinc salts by means of washing or steam jetting or sweep-blasting with fine stand	There is no finish coat on galvanized surfaces as there is no sea climate with chloride exposure	-	-	-	-
10	**Steel Surfaces permanently in contact with water, also river water splash zone**	**Steel surfaces permanently in contact with water such as process water tank and Emergency water tank of FGD system**	medium temp upto 60 degree Celsius	SA 2.5	Prime and finish coat in one	1	Glassfake reinforced High Solid Epoxy	500	500
11	**Plant/Cooling Water pipes**	**Plant / cooling water pipes of FGD system**	GRP, or steel lined concrete pipes with cathodic protection and coating according to AWWA C 203						

** Additional 1 x Finish Coat 2-Comp. Polyurethane, 50 micro m, when exposed to UV or weathering conditions and color retention is required*

PAINTING SCHEME FOR
Power House Structures, Bunker Shells, AHP/CHP Structures, RODM & Sub Station Structures

MPS-5

Coating System (refer Contract Book No.3 Clause B0.6.5)									
System No.	**Surface location**	**Item Description/ PGMA details**	**Temp in Celsius**	**Surface Preperation**	**Coating systems**	**No. of coats**	**Generic type**	**Dry film thickness (DFT) per coat micro m**	**Total DFT (Micro m)**
1	**Structural steel works, piping, vessels, tanks INDOOR**	**Power House Structures, Bunker Shells, AHP/CHP Structures, RODM & Sub Station Structures does not fall under this category**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Finish	1	Epoxy High Solid	80	80
									160
2	**Structural steel works, piping, vessels, tanks OUTDOOR**	**Structural steel of AHP/ CHP, PHS, RODM Structures & Bunkers and supporting structures**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Intermediate	1-2	Epoxy High Solid	160	160
					Finish	1	2-Comp Polyurethane	50	50
									290
3	**Piping, tanks, etc INDOOR and OUTDOOR, Insulated**	**Power House Structures, Bunker Shells, AHP/CHP Structures, RODM & Sub Station Structures does not fall under this category**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	50	50
4	**Pump, motors, other equipment OUTDOOR**	**Power House Structures, Bunker Shells, AHP/CHP Structures, RODM & Sub Station Structures does not fall under this category**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Intermediate	1	Epoxy High Solid	110	110
					Finish	1	2-Comp Polyurethane	50	50
									240
5	**Pump, motors, other equipment INDOOR**	**Power House Structures, Bunker Shells, AHP/CHP Structures, RODM & Sub Station Structures does not fall under this category**	>120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Finish	2	Epoxy High Solid	50	100
									180
6	**Piping, reactors OUTDOOR Insulated**	**Power House Structures, Bunker Shells, AHP/CHP Structures, RODM & Sub Station Structures does not fall under this category**	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75
7	**Stack OUTDOOR**	**Power House Structures, Bunker Shells, AHP/CHP Structures, RODM & Sub Station Structures does not fall under this category**	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75
					Finish	2	Silicone Acrylic	50	100
									175
8	**Steel Surfaces Uninsulated**	**Power House Structures, Bunker Shells, AHP/CHP Structures, RODM & Sub Station Structures does not fall under this category**	200-450	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75
					Finish	2	Silicone Aluminium	25	50
									125
9	**Galvanized Surfaces**	**Floor grills, Hand rails, Step Treads and Switchyard Structures (As specified in drawing; if not specified, system 2.0 to be followed for painting)- Hot dip galvanizing to a coating weight of 610 gm per sq.M (minimum) and to a coating thickness of 85 microns (min) on steel sections 2-5mm thick and 900 gm per sq.M (minimum) for steel sections more than 5mm thick.**	upto 120	Mechanical cleaning from contaminants and zinc salts by means of washing or steam jetting or sweep-blasting with fine stand		-	-	-	-

10	**Steel Surfaces permanently in contact with water, also river water splash zone**	**Power House Structures, Bunker Shells, AHP/CHP Structures, RODM & Sub Station Structures does not fall under this category**	medium temp upto 60 degree Celsius	SA 2.5	Prime and finish coat in one	1	Glassfake reinforced High Solid Epoxy	500	500
11	**Plant/Cooling Water pipes**	**Power House Structures, Bunker Shells, AHP/CHP Structures, RODM & Sub Station Structures does not fall under this category**	GRP, or steel lined concrete pipes with cathodic protection and coating according to AWWA C 203						

MPS-6

Already Approved as AOC at R03
No Change Proposed

Ranipet	Painting schedule for APH, ESP FAN and Gates & Damper for Maitree Super Thermal Power Project,Rampal District –Bagerhat, Bangladesh India Friendship Power Company(Pvt.) Limited(BIFPCL) (BHEL WO NO: R676-R677,R4M8-R4M9,R4N2 & R4N0))	PS MAIT Rev 01 DTD 24/10/2017
		Page No: 1 of 1

Sl No	Description	Surface preparation	Primer/ DFT	Intermediate DFT	Finish DFT	Total DFT
1.0	Indoor surfaces (Structural steel works,piping,vessels,tanks, pump,motor, other parts/equipment of APH, ESP,FAN, Gate and Damper,etc)	Blast cleaning SA2.5	One coat of Epoxy zinc phosphate, 80 µm per coat	NIL	One coat of Epoxy high solid paint, , 80 µm per coat	160 µm (min)
2.0	Outdoor surfaces (Surface exposed to atmosphere of APH, ESP,FAN and Gates&Damper,etc)	Blast cleaning SA2.5	One coat of Epoxy zinc phosphate, 80 µm per coat	One/two coats of epoxy high solid, total dft of 160 µm	One coat of 2-component polyurethane paint, 50 µm per coat	290 µm (min)
3.0	Insulated parts of indoor/outdoor surfaces	Blast cleaning SA2.5	One coat of Epoxy zinc phosphate, 80 µm per coat	NIL	NIl	80µm (min)
4.0	Uninsulated steel surfaces of temperature 200-450 deg celsius	Blast cleaning SA2.5	One coat of Inorganic ethyl zinc silicate, 75 µm per coat	NIL	Two coats of Silicone Aluminium, 25 µm per coat	125µm (min)
5.0	Outdoor stacks	Blast cleaning SA2.5	One coat of Inorganic ethyl zinc silicate, 75 µm per coat	NIL	Two coats of Silicone Acrylic, 50µm per coat	175µm (min)
6.0	Floor grills , step treads , Hand rails,etc of ESP and other items	Hot dip galvanizing to a coating weight of 610 gm per sq.M (minimum) and to a coating thickness of 85 microns (min)				

1. Painting of APH, ESP, Fan and G&D commissioning spares and Mandatory spares shall be as per respective items as above.
2. No painting for SS, Aluminium and Galvanized items.
3. All components covered under different SL no. are to be painted. Incase any component is left out, the same shall be deemed to be included under the relevant section.

PAINTING SCHEME FOR

Item Description: MISC TANKS – SITE FABRICATED I.E. CONDENSATE STORAGE TANKS, DM WATER STORAGE TANKS, SERVICE WATER STORAGE TANKS AND DESALINATED WATER STORAGE TANK

MPS-7

Coating System (refer Contract Book No.3 Clause B0.6.5)

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)
1	**Structural steel works, piping, vessels, tanks INDOOR**	**INTERNAL SURFACE OF TANK, PIPE SUPPORTS AND ROOF STRUCTURE**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Finish	1	Solvent Free Epoxy	100	100
									180
2	**Structural steel works, piping, vessels, tanks OUTDOOR**	**EXTERNAL SURFACE OF TANK, PIPE SUPPORTS AND APPURTENANCES EXPOSED TO ATMOSPHERE**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Intermediate	1-2	Epoxy High Solid	160	160
					Finish	1	2-Comp Polyurethane	50	50
									290
3	**Piping, tanks, etc INDOOR and OUTDOOR, Insulated**	**Not Applicable for above mentioned Items**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	50	50
4	**Pump, motors, other equipment OUTDOOR**	**Not Applicable for above mentioned Items**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Intermediate	1	Epoxy High Solid	110	110
					Finish	1	2-Comp Polyurethane	50	50
									240
5	**Pump, motors, other equipment INDOOR**	**Not Applicable for above mentioned Items**	>120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Finish	2	Epoxy High Solid	50	100
									180
6	**Piping, reactors OUTDOOR Insulated**	**Not Applicable for above mentioned Items**	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75
7	**Stack OUTDOOR**	**Not Applicable for above mentioned Items**	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75
					Finish	2	Silicone Acrylic	50	100
									175
8	**Steel Surfaces Uninsulated**	**Not Applicable for above mentioned Items**	200-450	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75
					Finish	2	Silicone Aluminium	25	50
									125
9	**Galvanized Surfaces**	**Not Applicable for above mentioned Items**	upto 120	Mechanical cleaning from contaminants and zinc salts by means of washing or steam jetting or sweep-blasting with fine stand	When finish coat is required, such as sea climate with chloride exposure	1	Epoxy High Solid *	125	125
10	**Steel Surfaces permanently in contact with water, also river water splash zone**	**Not Applicable for above mentioned Items**	medium temp upto 60 degree Celsius	SA 2.5	Prime and finish coat in one	1	Glassfake reinforced High Solid Epoxy	500	500
11	**Plant/Cooling Water pipes**	**Not Applicable for above mentioned Items**	GRP, or steel lined concrete pipes with cathodic protection and coating according to AWWA C 203						

** Additional 1 x Finish Coat 2-Comp. Polyurethane, 50 micro m, when exposed to UV or weathering conditions and color retention is required*
COLOR SHADE SIGNAL GREEN (RAL 6032), SIGNAL WHITE (RAL 9003) FOR LETTERING

Other Locations										
System No.	**Surface location**	**Item Description/ PGMA details**	**Temp in Celsius**	**Surface Preperation**	**Coating systems**	**No. of coats**	**Generic type**	**Dry film thickness (DFT) per coat micro m**	**Total DFT (Micro m)**	**Justification/ Reasoning**
12	**UNDERNEATH SURFACE OF BOTTOM PLATE**	UNDERNEATH SURFACE OF BOTTOM PLATE	-	Cleaning to ST-3	Primer Coat	2	High Build Coal TAR Epoxy	145	290	

BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE, CHENNAI– 17
QUALITY ASSURANCE & CONTROL DEPT.

PAINTING SCHEME FOR LOW PRESSURE PIPING

(CW / ACW / ECW / Plant water, Air Piping, etc…,)

PROJECT NAME : - BIFPCL MAITREE STPP - 2X660 MW
BHEL CUSTOMER Nos : 7328, 7329, 7330, 7331.

MPS-8

UNDER HOLD

Sl. NO	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat			Finish coat			Total DFT Microns (Min.)	REMARKS
			Primer	No of coats	Paint	No of coats	Shade	Paint	No of coats	Shade		
1	2	3	4	5	6	7	8	9	10	11	12	13
1	(a) Internal Surface - CW Pipe (for pipe - dia - 350 mm to 1200mm)	Blast Cleaning SSPC SP-10 / SA 2½	Rubber lining								5000 Microns / 5mm *(Refer Note 3)*	
	(b) Holiday test (Refer Note 3)	Holiday test @ 5KV/mm. Holiday test Equipment to be calibrated before testing.										
2	(a) Internal Surface - CW Pipe (for pipe - dia - 1200 mm and above)	Blast Cleaning SSPC SP-10 / SA 2½	POLY - URETHANE COATING OF 2000 MICRONS DRY FILM THICKNESS . (Refer Note 2)								2000 Microns *(Refer Note 3)*	
	(b) Holiday test (Refer Note 3)	Holiday testing as per AWWA C222 and Paint Manufacturer recommendation. Holiday test Equipment to be calibrated before testing.										
3	External Surface of CW --Buried Piping / Encased in concrete (For pipe dia- 1000 mm and above) (Temporary Protection for transportation from works to site). **Further protection to be done by BHEL Erection Group as per Contract requirement.	Blast Cleaning SSPC SP-10 / SA 2½	Epoxy Zinc Phosphate	1 (40 Microns per coat)	-----	-----	-----	-----	-----	-----	40 Microns	
4	External Surface (over ground piping) of CW,ACW.(For all diameters)	Blast Cleaning SSPC SP-10 / SA 2½	Epoxy Polyamide resin based Zinc Phosphate Primer	2 (35 microns per coat)	Epoxy resin with MIO	1 (75 microns per coat.)	-----	Epoxy Polyamide finish Paint	1 $ (40 microns per coat)	Smoke Grey Shade No 692 of IS 5 (Refer Note-4)	145 at shop + 40 at site	$: 1 coat of DFT-40 microns finish coat at site
5	External Surface of ECW, Plant water (For all diameters)	Blast Cleaning SSPC SP-10 / SA 2½	Epoxy Polyamide resin based Zinc Phosphate Primer	2 (35 microns per coat)	Epoxy resin with MIO	1 (75 microns per coat.)	-----	Epoxy Polyamide finish Paint	1 $ (40 microns per coat)	Smoke Grey Shade No 692 of IS 5 (Refer Note-4)	145 at shop + 40 at site	$: 1 coat of DFT-40 microns finish coat at site
6	Galvanised and Stainless steel Piping	No painting										

Notes:

1. Blast cleaning to near white metal to obtain roughness as per epoxy paint data sheet.
2. Application of Poly-Urethane coating shall be done as per manufacturer's data sheet / recommendation, meeting the thickness requirements as per this document.
3. Witness by BHEL / BHEL nominated inspection agency.
4. Shade for finish coat to be done at site shall be as per project specification/contract requirement.

PAINTING SCHEME FOR

Item Description: Limestone & Gypsum Handling Plant, Mill Reject System, Chimney, D/G EOT Cranes, Sewage Treatment Plant, Pre Treatment Plant, Fuel Oil Handling System, Weigh Bridge, Electrical & Associated Systems, Other Balance of Plant Packages

MPS-9

Coating System (refer Contract Book No.3 Clause B0.6.5)

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)
1	**Structural steel works, piping, vessels, tanks INDOOR**	**As above**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Finish	1	Epoxy High Solid	80	80
									160
2	**Structural steel works, piping, vessels, tanks OUTDOOR**	**As above**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Intermediate	1-2	Epoxy High Solid	160	160
					Finish	1	2-Comp Polyurethane	50	50
									290
3	**Piping, tanks, etc INDOOR and OUTDOOR, Insulated**	**As above**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	50	50
4	**Pump, motors, other equipment OUTDOOR**	**As above**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Intermediate	1	Epoxy High Solid	110	110
					Finish	1	2-Comp Polyurethane	50	50
									240
5	**Pump, motors, other equipment INDOOR**	**As above**	>120	SA 2.5	Primer	1	Zinc-Epoxy	80	80
					Finish	2	Epoxy High Solid	50	100
									180
6	**Piping, reactors OUTDOOR Insulated**	**As above**	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75
7	**Stack OUTDOOR**	**As above**	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75
					Finish	2	Silicone Acrylic	50	100
									175
8	**Steel Surfaces Uninsulated**	**As above**	200-450	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75
					Finish	2	Silicone Aluminium	25	50
									125
9	**Galvanized Surfaces**	**As above**	upto 120	Mechanical cleaning from contaminants and zinc salts by means of washing or steam jetting or sweep-blasting with fine stand	When finish coat is required, such as sea climate with chloride exposure	1	Epoxy High Solid *	125	125
10	**Steel Surfaces permanently in contact with water, also river water splash zone**	**As above**	medium temp upto 60 degree Celsius	SA 2.5	Prime and finish coat in one	1	Glassfake reinforced High Solid Epoxy	500	500
11	**Plant/Cooling Water pipes**	**As above**	GRP, or steel lined concrete pipes with cathodic protection and coating according to AWWA C 203						

** Additional 1 x Finish Coat 2-Comp. Polyurethane, 50 micro m, when exposed to UV or weathering conditions and color retention is required*

PAINTING SCHEDULE FOR BOWL MILLS

MPS-10

Coating System (refer Contract Book No.3 Clause B0.6.5)

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)	Finish Paint Shade	Remarks
1	**Structural steel works, piping, vessels, tanks INDOOR**	**Bowl Mills- Interior Surfaces & Foundation items of Mill (Except insulated surfaces)**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80	---	**Mill is an outdoor equipment. Finish coat not required for interior sufaces and foundation items of Mill**
					Finish	--	--	--	--	N.A	
									80	---	
2	**Structural steel works, piping, vessels, tanks OUTDOOR**	**Not applicable**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80	---	
					Intermediate	1-2	Epoxy High Solid	160	160	---	
					Finish	1	2-Comp Polyurethane	50	50	---	
									290		
3	**Piping, tanks, etc INDOOR and OUTDOOR, Insulated**	**Not applicable**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	50	50	---	
4	**Pump, motors, other equipment OUTDOOR**	**Bowl Mills- All Exterior Surfaces of Mill (Except the Mill Side Assembly and Bowl and Bowl Hub Assembly)**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80	---	
					Intermediate	1	Epoxy High Solid	110	110	---	
					Finish	1	2-Comp Polyurethane	50	50	**Grey RAL 7035**	
									240		
5	**Pump, motors, other equipment INDOOR**	**Bowl Mills- Interior Surfaces of Mills (Except insulated surfaces)**	> 120	SA 2.5	Primer	1	Zinc-Epoxy	80	80	--	**Mill is an outdoor equipment. Finish coat not applicable for interior sufaces**
					Finish	--	--	--	--	N.A	
									80		
6	**Piping, reactors OUTDOOR Insulated**	**Not applicable**	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75	---	
7	**Stack OUTDOOR**	**Not applicable**	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75	---	
					Finish	2	Silicone Acrylic	50	100	---	
									175		
8	**Steel Surfaces Uninsulated**	**Exterior surface of Mill Mill Side Assembly & Bowl& Bowl Hub Assembly**	200-450	SA 2.5	Primer	1	Zinc-Ethysilicate	75	75	---	**Mill is an outdoor equipment.**
					Finish	2	Silicone Aluminium	25	50	**Grey RAL 9006**	
									125		
9	**Galvanized Surfaces**	**Not applicable**	upto 120	Mechanical cleaning from contaminants and zinc salts by means of washing or steam jetting or sweep-blasting with fine stand	When finish coat is required, such as sea climate with chloride exposure	1	Epoxy High Solid *	125	125	---	
10	**Steel Surfaces permanently in contact with water, also river water splash zone**	**Not applicable**	medium temp upto 60 degree Celsius	SA 2.5	Prime and finish coat in one	1	Glassfake reinforced High Solid Epoxy	500	500	---	
11	**Plant/Cooling Water pipes**	**Not applicable**	GRP, or steel lined concrete pipes with cathodic protection and coating according to AWWA C 203								

** Additional 1 x Finish Coat 2-Comp. Polyurethane, 50 micro m, when exposed to UV or weathering conditions and color retention is required*

BHEL, BHOPAL - PAINTING SCHEME FOR MISC. TANKS, FLASH TANKS, RE JOINTS, BF VALVES

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)	Remarks
1	**Structural steel works, piping, vessels, tanks INDOOR**	**Outdoor Surfaces of : Clean Oil Tank Dirty Oil Tank Oil Unloading Vessel**	upto 120	SA 2.5	Primer	2	High Build Epoxy	75	150	
					Finish	2	Chlorinated Rubber	30	60	
									210	
2	**Structural steel works, piping, vessels, tanks OUTDOOR**	**Outdoor Surfaces of : DMCW Tank**	upto 120	SA 2.5	Primer	2	High Build Epoxy	75	150	
					Finish	2	Chlorinated Rubber	30	60	
									210	
3	**Piping, tanks, etc INDOOR and OUTDOOR, Insulated**	**Outdoor Surfaces of : Flash Tanks**	upto 210	SA 2.5	Primer	2	High Build Epoxy	75	150	
					Finish	2	Chlorinated Rubber	30	60	
									210	
4	**Steel Surfaces permanently in contact with water, also river water splash zone**	**Outdoor Surfaces of : RE Joints**	medium temp upto 60 degree Celsius	SA 2.5	Primer	3	High build Chlorinated Rubber based Zinc Phosphate	50	150	
					Finish	2	Chlorinated Rubber	30	60	
									210	
5	**External Surface (over ground piping) of CW,ACW,DMCW,PW (For all diameters)**	**Outdoor Surfaces of : BF Valves**	medium temp upto 60 degree Celsius	SA 2.5	Primer	2	Chemical Resistant (Zinc chromate / Zinc phosphate)	25	50	
					Finish	2	Chemical Resistant Epoxide Finishing Paint	75	150	
									200	

PAINTING SCHEDULE FOR Generator Transformer, ICT,SUT,ST,UAT,CHPAT, AHPAT, Reactor & NGR MPS-12

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)	Finish Paint Shade	Remarks
D-1	**Transformer Top & Bottom Tank,Turrets, Inspection Covers, Conservator, Headers, Pipe Works etc., Reactor & NGR**	**a. Inside Surface**	**upto 120**	**SA 2.5**	WHITE EPOXY PAINT	1	Chemical & Thermal Resistant Epoxy White Paint (Paint Shade RAL9010)	50	**50**		
		b. Outside Surface	**upto 120**	**SA 2.5**	PRIMER	1	i. Chemical & Thermal Resistance Epoxy Zinc Phosphate Primer	80	80		
					INTERMEDIATE	1	ii. Epoxy HB MIO	75	75		
					FINISH	2	iii. Polyurethane Finishing (Paint shade RAL7035)	25	50		
									205		
D-2	**Radiator, Reactor & NGR**	**a. Inside Surface**	**upto 120**	**SA 2.5**	VARNISH	1	i. Flushed with Varnish				
		b. Outside Surface	**upto 120**	**SA 2.5**	PRIMER	1	i.Chemical & Thermal Resistance Epoxy Zinc Phosphate Primer	50	50		
					FINISH	2	ii.Polyurethane Finishing Paint (Paint Shade RAL7035)	25	50		
									100		
D-3	**A- Frame**						Spray Galvanisation				

MPS-13

BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE, CHENNAI– 17
QUALITY ASSURANCE & CONTROL DEPT.

PAINTING SCHEME FOR PIPING

PROJECT NAME : -BIFPCL MAITREE STPP - 2X660 MW
BHEL CUSTOMER Nos : 7328, 7329, 7330, 7331 & 7332

QPNo: T
REV.NO: 00
Date : 10.12.18

Sl. NO	PGMA / Description	Surface Preparation & Surface Profile	Primer coat		Intermediate coat			Finish coat				REMARKS
			Primer	No of coats & DFT	Paint	No of coats & DFT	Shade	Paint	No of coats & DFT	Shade	Total DFT Microns (Min.)	
1	2	3	4	5	6	7		9	10	11	12	13
1	Insulated Piping, components (MS / HRH / CRH / Aux Steam lines, Tanks & Vessels …& Pipe Clamps).	SSPC-SP3/ Power Tool Cleaning	Zinc EthySilicate	1 (75 microns per coat)	-----	-----	-----				75	Note:1
2	Uninsulated Piping, components (Spray Water / Condensate lines, Pipe Clamps…,Tanks & Vessels)	Abrasive Blast cleaning to SA2 ½ (Near white metal) Min 35 Micron	Zinc - Epoxy	1 (min.DFT = 80 Micron)	Epoxy High Solid	1 (DFT=160 Micron Min)	-----	$ 2-Comp Polyurethane	1 $ (min.DFT = 50 Microns per Coat) +	Window Grey to RAL7040	240 at shop + 50 at site	$: To be applied at site
3	Structures & All auxiliary structural steel components for pipe supports	Abrasive Blast cleaning to SA2 ½ (Near white metal) Min 35 Micron	Zinc - Epoxy	1 (min.DFT = 80 Micron)	Epoxy High Solid	1 (DFT=160 Micron Min)	-----	$ 2-Comp Polyurethane	1 $ (min.DFT = 50 Microns per Coat) +	Window Grey to RAL7040	240 at shop + 50 at site	$: To be applied at site
4	Hangers & Supports-(CLH,VLH - Spring Assemblies)	Blast cleaning to Sa2½ with surface profile 35-50 microns	Epoxy Zinc rich primer Gr.II,% VS = 35 Min	1 (40 microns per coat)	-----	-----	-----	Aliphatic Acrylic Polyurethane paint ,%VS = 40 min	1 (30 microns per coat)	Phirozi Blue	70	
5	Hangers & Supports- Other than CLH,VLH	Blast cleaning to Sa2½ with surface profile 35-50 microns	Red oxide Zinc Phosphate Primer	1 (30 microns per coat.)	-----	-----	-----	Synthetic enamel paint long oil alkyd	2 (20 Microns per Coat)	Smoke Grey	70	
6	Valves & Gr-91 Clamps	Blast cleaning to Sa2½ with surface profile 35-50 microns	Heat resistant Aluminum Paints - Gr.I	1 (20 microns per coat)	-----	-----	-----	Heat resistant Aluminum Paints - Gr.I	1 (20 microns per coat)	Aluminum	40	
7	Stainless steel / Galvanized items	No paint										
8	Temporary Piping (for Hydro test at site)	SSPC-SP3/ Power Tool Cleaning	Red oxide Zinc Phosphate Primer	1 (30 microns per coat.)	-----	-----	-----	Synthetic enamel paint long oil alkyd	2 (20 Microns per Coat)	Smoke Grey	70	
9	Internal surface coating for ECW Tank	Blast cleaning to Sa2½ with surface profile 35-50 microns	Epoxy Zinc rich primer	2 (35 microns per coat)	-----	-----	-----	Epoxy based Polyamide cured finish paint	2 (65 microns per coat)	Smoke Grey	200	

Note.1:Piping above 60 Deg C are insulated.
2:For bought-out and Sub-Vendor items falling under the scope of BHEL, the same scheme as for main equipment as covered in this shall be followed.
3:Plates, Pipes & Tubing Cut to size at site : Shall follow 2 coats of 60 microns of Red oxide Zinc Phosphate Primer (Alkyd Base).
4:The final colour shade to be applied at site after erection shall be as per BIFPCL approved colour coding scheme.
5:Paint application may be by Brush or Spray method.

PAINTING SCHEME FOR BFP DRIVE TURBINE & AUXILARIES								MPS-14	
System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)
1	**Structural steel works, piping, vessels, tanks INDOOR**	**Lube Oil reservoir Lube oil Piping (CS)**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	**80**
					Finish	1	Epoxy High Solid	80	**80**
									160
2	**Structural steel works, piping, vessels, tanks OUTDOOR**	**NA**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	**80**
					Intermediate	1-2	Epoxy High Solid	160	**160**
					Finish	1	2-Comp Polyurethane	50	**50**
									290
3	**Piping, tanks, etc INDOOR and OUTDOOR, Insulated**	**NA**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	50	**50**
4	**Pump, motors, other equipment OUTDOOR**	**NA**	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	**80**
					Intermediate	1	Epoxy High Solid	110	**110**
					Finish	1	2-Comp Polyurethane	50	**50**
									240
5	**Pump, motors, other equipment INDOOR**	Lube oil pump Lube Oil Pump motor Emergency Oil Pump Emergency Oil Pump motor	upto 120	SA 2.5	Primer	1	Zinc-Epoxy	80	**80**
					Finish	2	Epoxy High Solid	50	**100**
									180
6	**Piping, reactors OUTDOOR Insulated**	**NA**	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	**75**
7	**Stack OUTDOOR**	**NA**	<120	SA 2.5	Primer	1	Zinc-Ethysilicate	75	**75**
					Finish	2	Silicone Acrylic	50	**100**
									175
8	**Steel Surfaces Uninsulated**	**NA**	200-450	SA 2.5	Primer	1	Zinc-Ethysilicate	75	**75**
					Finish	2	Silicone Aluminium	25	**50**
									125
9	**Galvanized Surfaces**	**NA**	upto 120	Mechanical cleaning from contaminants and zinc salts by means of washing or steam jetting or sweep-blasting with fine stand	When finish coat is required, such as sea climate with chloride exposure	1	Epoxy High Solid *	125	**125**
10	**Steel Surfaces permanently in contact with water, also river water splash zone**	**NA**	medium temp upto 60 degree Celsius	SA 2.5	Prime and finish coat in one	1	Glassfake reinforced High Solid Epoxy	500	**500**
11	**Plant/Cooling Water pipes**	**NA**	GRP, or steel lined concrete pipes with cathodic protection and coating according to AWWA C 203						

** Additional 1 x Finish Coat 2-Comp. Polyurethane, 50 micro m, when exposed to UV or weathering conditions and color retention is required*

Deviation Sought, if any										
PRODUCT : BFP DRIVE TURBINE & AUXILARIES										
System No.	**Surface location**	**Item Description/ PGMA details**	**Temp in Celsius**	**Surface Preperation**	**Coating systems**	**No. of coats**	**Generic type**	**Dry film thickness (DFT) per coat micro m**	**Total DFT (Micro m)**	**Justification/ Reasoning**
D-1	Steam Turbine equipment	Turbine outer casing-insulated, Auxiliary Control valve(In steam supply from aux.steam line)	>120	Blasting SA2 1/2	Primer	2	Heat resistant air drying Aluminium	25	50	These items are not covered in customers list/schedule.
D-2	Steam Turbine equipment Un-insulated	TURBINE EXHAUST HOOD / TURBINE EXHAUST CONNECTION.	≤120	BlastingSA 2 1/2	Primer	1	Inorganic Zinc silicate	80	80	
					Finish	2	Heat resistant air drying Aluminium	40	80	
									160	
D-3	Steam Turbine equipment Un-insulated	Steam turbine equipmet - Bearing pedestals, bed plates, coupling guard, rotor lifting equipment, governing assemblies.	upto 120	BlastingSA 2 1/2	primer	1	Epoxy zinc rich	50	50	
					Intermediate	1	Epoxy High Solid	100	100	
					Finish	1	Aliphatic urethane	50	50	
									200	
D-4	TDBFP- INTEGRAL PIPING (INDOOR) Un Insulated	OIL PIPING (SS)	<120	Painting/coating for SS piping are not required						
D-5	TDBFP- INTEGRAL PIPING (INDOOR) Insulated	Steam Piping- CS	250 -300	SA 21/2	Primer	1	Inorganic Zinc silicate	80	80	Deviation is sought as piping Temp >120 degc, but in customer list piping is covered upto 120degc.

PAINTING SCHEDULE FOR PUMPS & HEAT EXCHANGERS MPS-15

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)
D-1	**Pump, motors, other equipment INDOOR Insulated**	**Drain Cooler, LP Heaters & HP Heaters**	>120	SA 2.5	Primer	NA	NA	-	-
					Finish	2	Heat resisting air drying Aluminium	20	40
									40
D-2	**Pump, motors, other equipment OUTDOOR Insulated**	**Spray Tray Deaerator**	>120	SA 2.5	Primer	1	Zinc Silicate primer	25	25
					Finish	2	Heat resisting air drying Aluminium	20	40
									65
D-3	**Pump, motors, other equipment INDOOR**	**ASSEMBLED BFP & BP (INSULATED AT SITE)**	>120	SA 2.5	Primer	1	INORGANIC ZINC PHOSPHATE PRIMER	25	25
					Finish	2	WHITE ALUMINIUM	25	50
									75
		BASE PLATES OF BFP & BP	>120	SA 2.5	Primer	1	SYNTHETIC AIR DRYING ENAMEL	25	25
					Finish	2	LIGHT GRAY	40	80
									105
		COUPLING GUARDS OF BFP & BP	>120	SA 2.5	Primer	1	SYNTHETIC AIR DRYING ENAMEL	25	25
					Finish	2	LIGHT GRAY	40	80
									105
D-4	**Pump, motors, other equipment INDOOR**	**CANISTER**	>120	SA 2.5	Primer				
					Finish	1	JET BLACK	100	100
									100
		HEAD GEAR & MOTOR STOOL	>120	SA 2.5	Primer	1	SYNTHETIC AIR DRYING ENAMEL	25	25
					Finish	2	LIGHT GRAY	40	80
									105
D-5	**Pump, motors, other equipment INDOOR**	**CANISTER**	>120	SA 2.5	Primer				
					Finish	1	JET BLACK	100	100
									100
		SUCTION BELL & STAGE CASINGS OF DRIP PUMP	>120	SA 2.5	Primer				
					Finish	1	JET BLACK	100	100
									100
		HEAD GEAR & MOTOR STOOL	>120	SA 2.5	Primer	1	SYNTHETIC AIR DRYING ENAMEL	25	25
					Finish	2	LIGHT GRAY	40	80
									105

PAINTING SCHEDULE FOR HT MOTORS & MV SWITCHGEAR MPS-16

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)
1	**MV SWITCHGEAR- INDOOR PANELS**	**Indoor switchgear panels, Control & relay panels**	upto 60	Zinc Phosphating of Ferrous Surfaces by Hot Immersion Process	Finish coat	1	epoxy polyester resin powder	60	60
2	**HT MOTORS**	**HT MOTORS- Stator Frame, Base Frame, endshield, Heat exchanger, Side cover, Top cover, Terminal Boxes**	< 120	SA 2.5	PRIMER	2	Chemical & Thermal Resistance Epoxy Zinc Phosphate Primer	25	50
					INTERMEDIATE	3	High Build Intermediate epoxy paint	35	105
					FINISH	3	Polyurethane Finishing Paint shade RAL5012	35	105
									260

PAINTING SCHEME FOR 400kV & 230kV GIS

MPS-17

System No.	Surface location	Item Description/ PGMA details	Temp in Celsius	Surface Preperation	Coating systems	No. of coats	Generic type	Dry film thickness (DFT) per coat micro m	Total DFT (Micro m)
1	**External of enclosures(Aluminum)**	**230kV & 400kV GIS**	80～90	SA 2.5	Primer	1	Epoxy polyamide	⩾20	⩾20
					Finish	2	RAL7035 Polyurethane acrylic	⩾25	⩾50
									⩾70
2	**External of mechanism box**	**230kV & 400kV GIS**	80～90	SA 2.5	Primer	1	Epoxy polyamide	⩾20	⩾20
					Finish	2	RAL7035 Polyurethane acrylic	⩾25	⩾50
									⩾70
3	**Steel support(indoor & outdoor)**	**230kV & 400kV GIS**	450～460	SA 2.5	One coat	1	Hot-dip galvanizing	80	80
4	**External of SF6 to air bushing**	**230kV GIS**	Brown glazed, original color of the material						
5	**External of SF6 to air bushing**	**400kV GIS**	White, original color of the material						
6	**External of Local control cubicle**	**230kV & 400kV GIS**	180～200	SA 2.5	One coat	1	RAL7035 Pure polyester powder	⩾70	**⩾70**
7	**Inner of Local control cubicle**	**230kV & 400kV GIS**	180～200	SA 2.5	One coat	1	RAL7035 Pure polyester powder	⩾70	**⩾70**
8	**Mimic single line diagram on the pannel**	**230kV & 400kV GIS**	Room Temp.	SA 2.5	One coat	1	RAL 4001 Acrylic	⩾20	**⩾20**

** Additional 1 x Finish Coat 2-Comp. Polyurethane, 50 micro m, when exposed to UV or weathering conditions and color retention is required*

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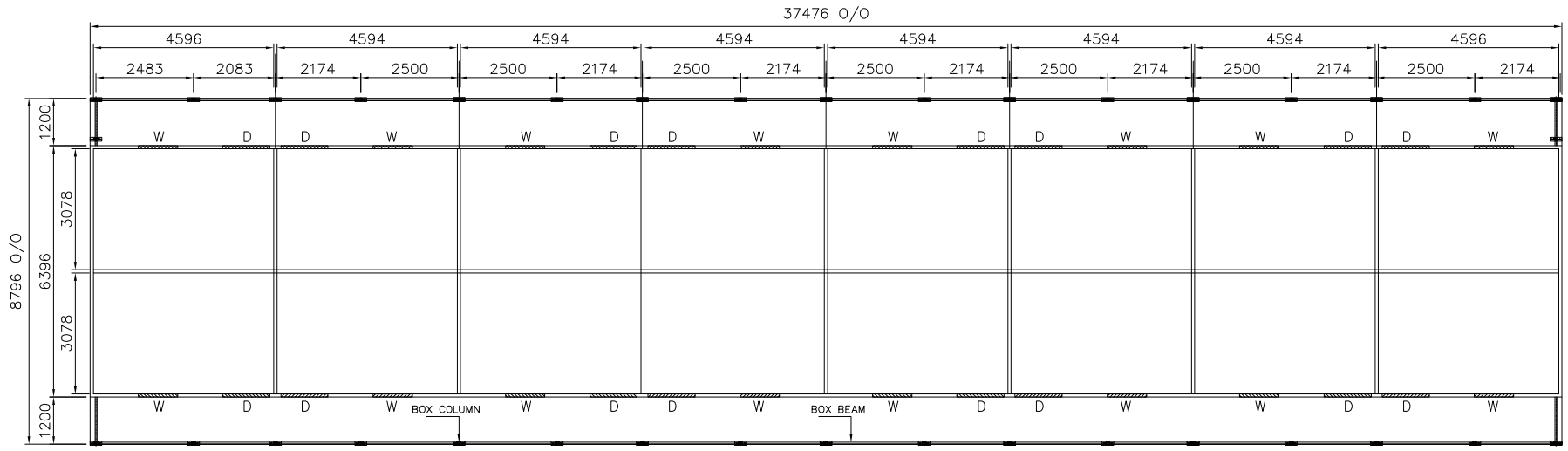
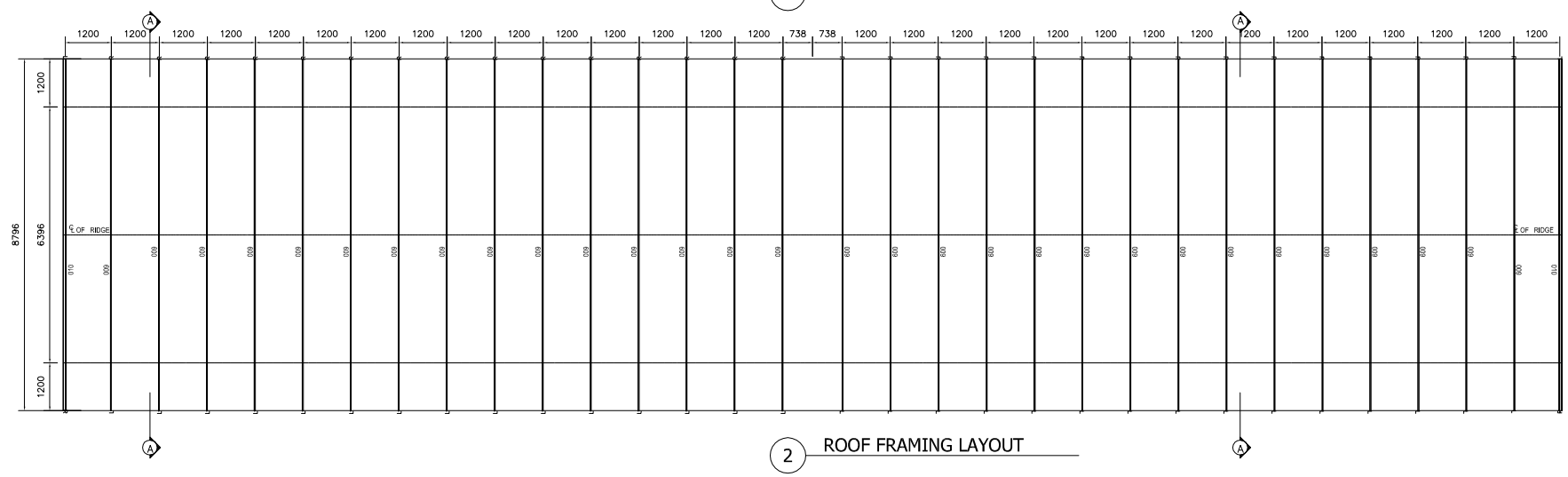
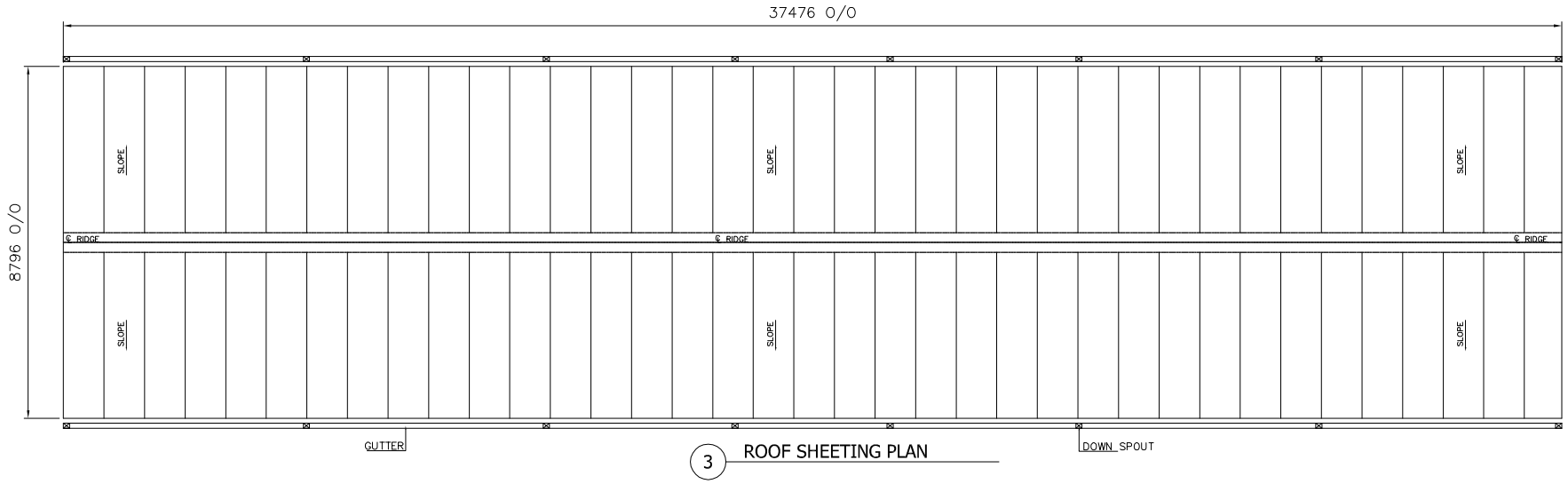


1 WALL FRAME LAYOUT



2 ROOF FRAMING LAYOUT



3 ROOF SHEETING PLAN

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
Hinjewadi, Taluka Mulshi,
Pune – 411 057 (India)
Tel : +91 20 6674 2000
Fax : +91 20 6674 2001

LEGEND:
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NOTES:–
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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:
PROPOSAL DRAWING

JOB SITE LOCATION : ENQ/WB/1735B		
QUOTE NO : Kolkata		REV: 0
DRG NO : E1	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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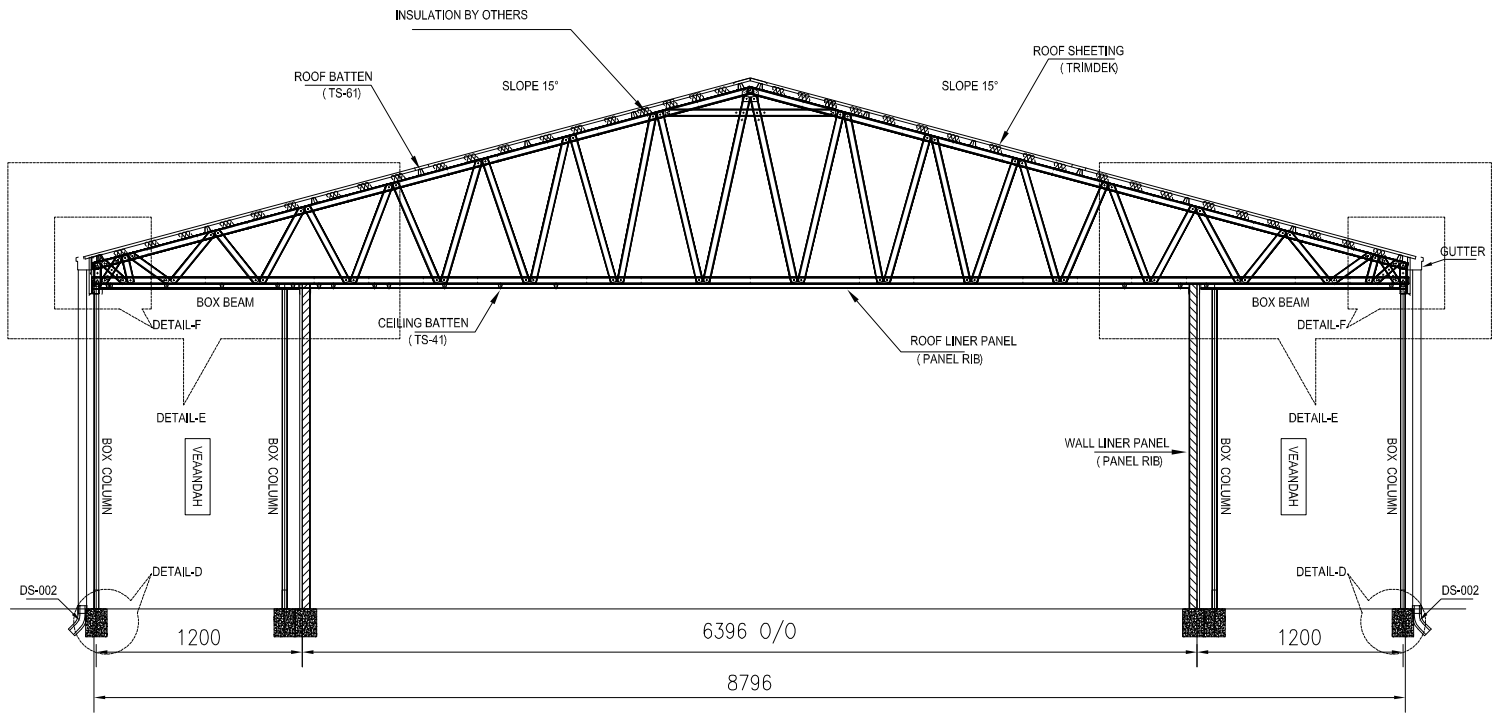
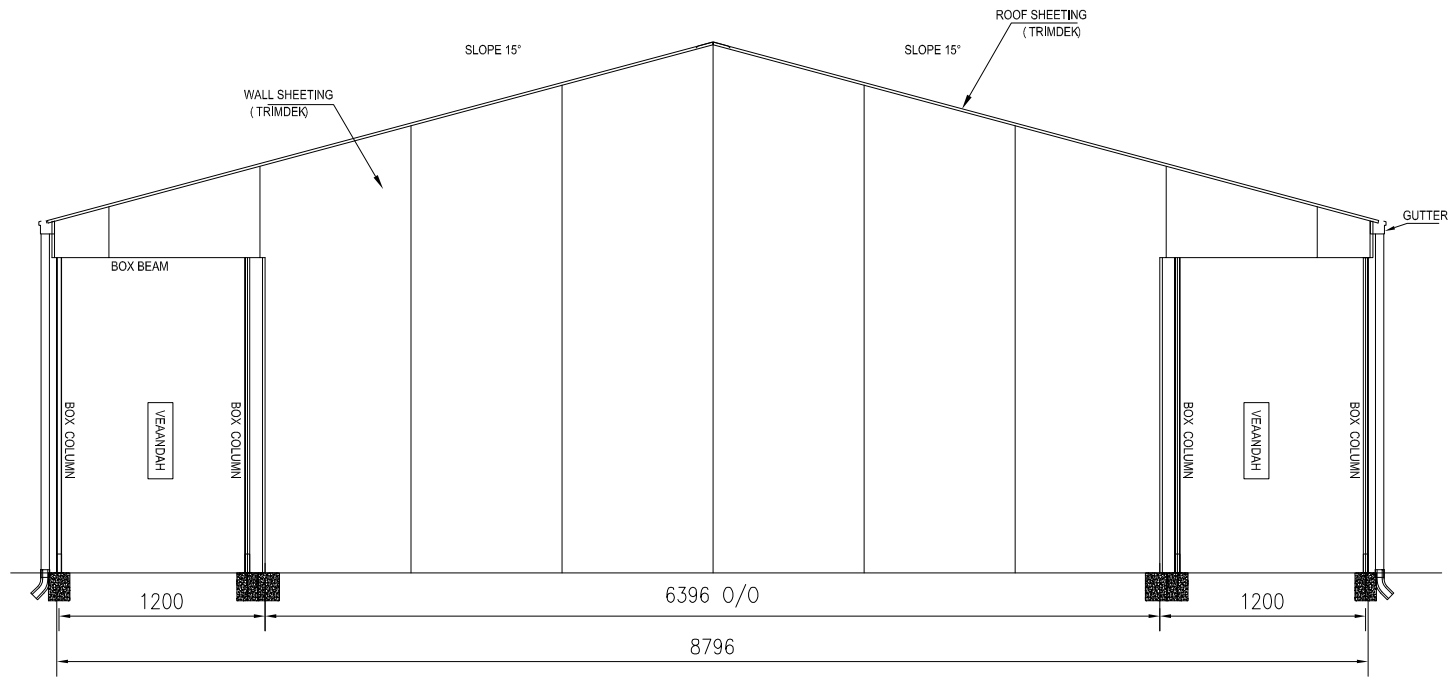
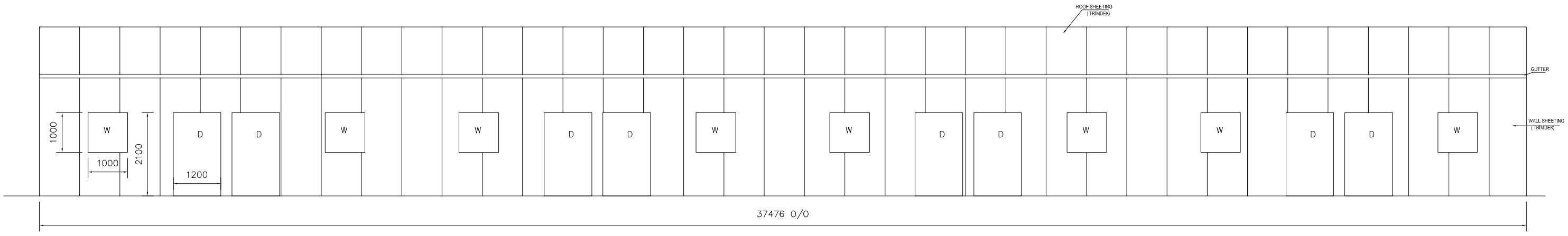


4 TYPICAL CROSS SECTION A-A



5 GABLE SHEETING ELEVATION



6 SIDE WALL SHEETING ELEVATION

NOTE :
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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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QUOTE NO : Kolkata		REV: 0
DRG NO : E2	SCALE : NTS	
DRN : NMT	DATE : 26.04.17	
CHK : NMT	REV DATE : 00.00.00	
DSN : WAQ	SENT ON : 26.04.17	A3

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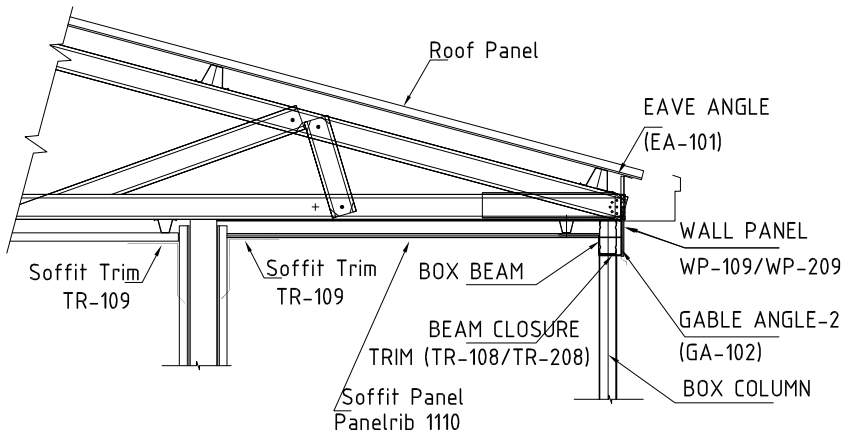
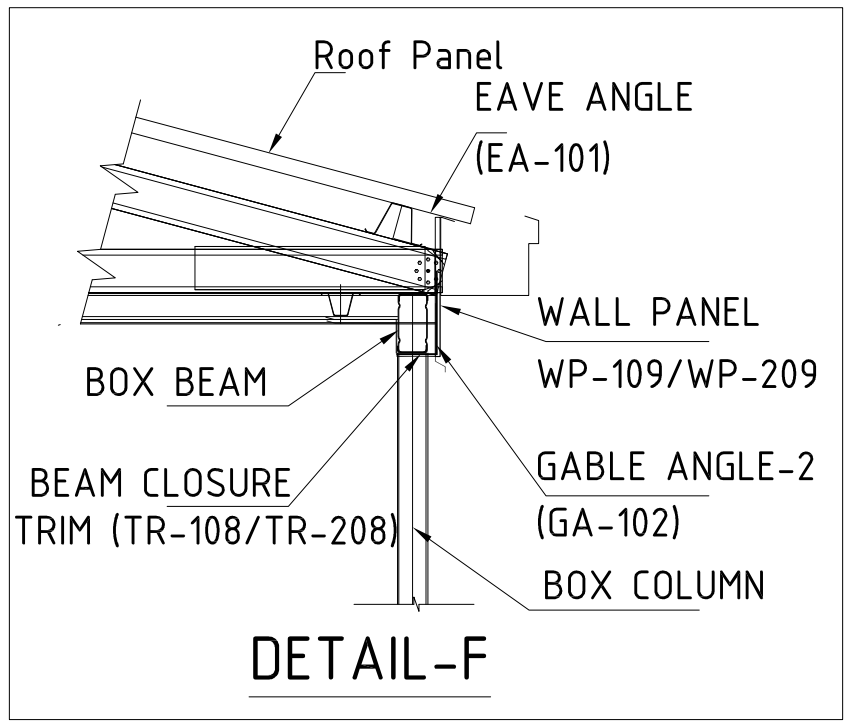
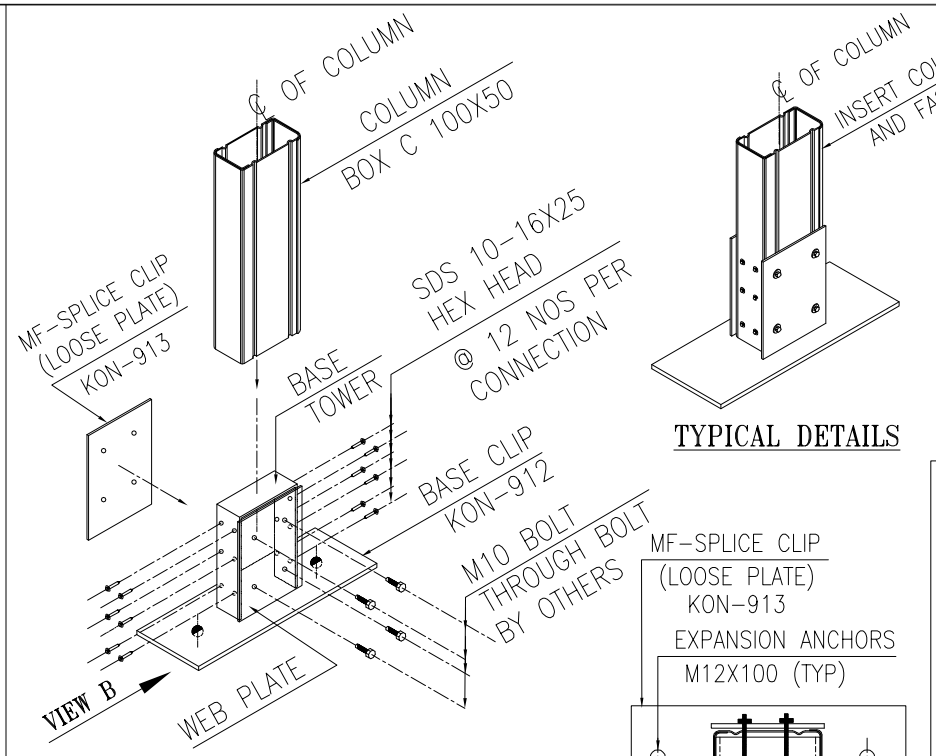


VARANDH PORTION DETAIL-DETAIL-E

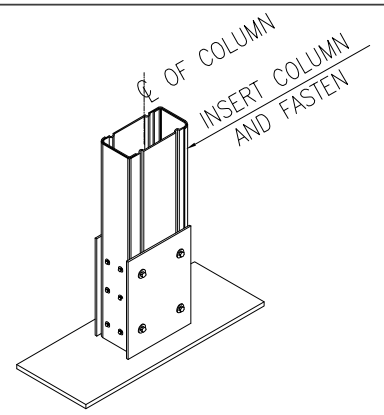


DETAIL-F

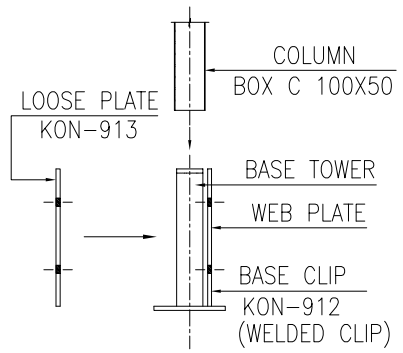


MAIN/END COLUMN BASE CLIP CONNECTION DETAILS

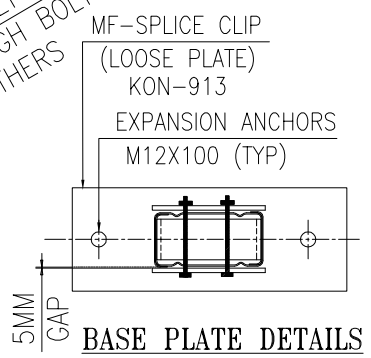
(DETAIL @ A)



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

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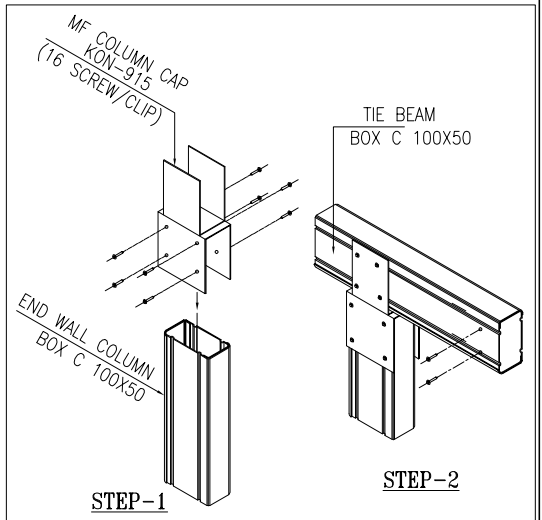
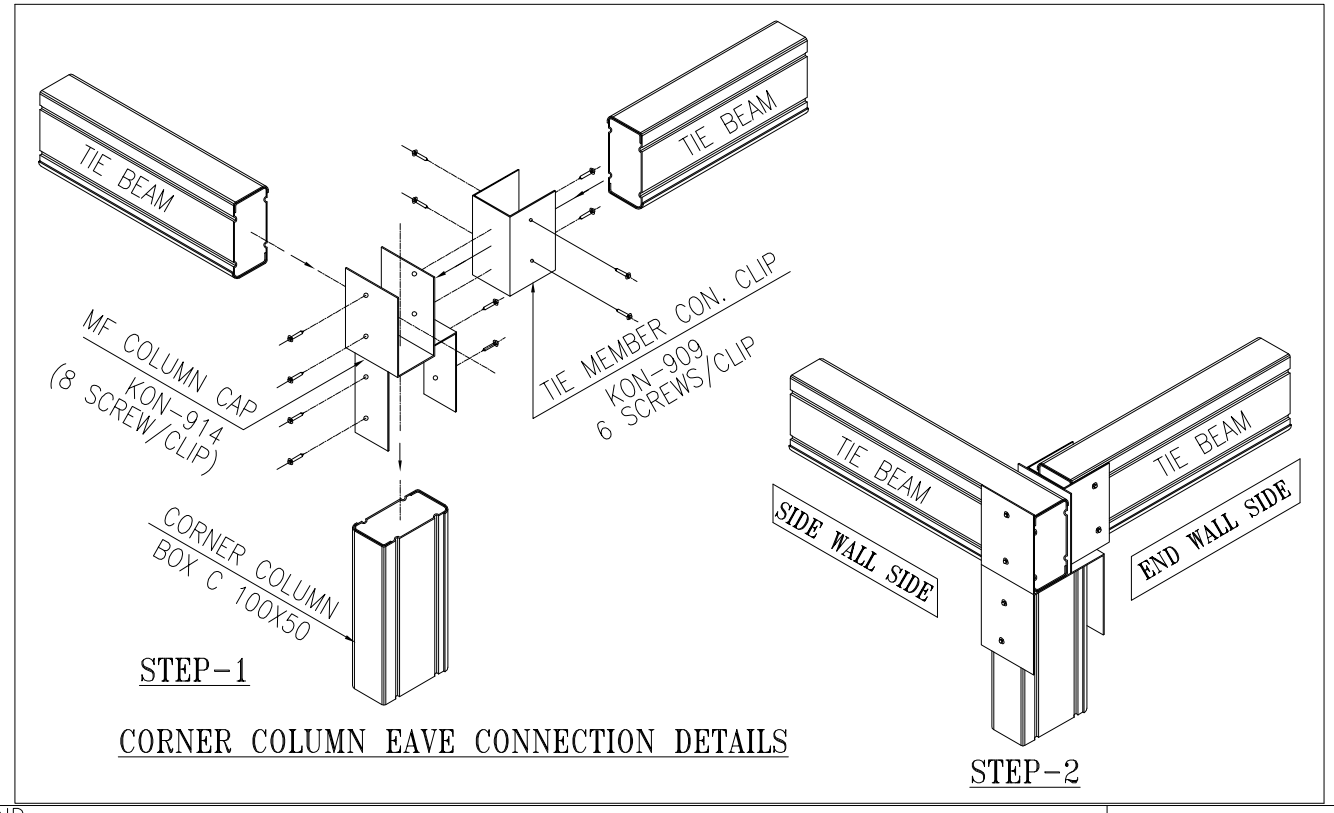
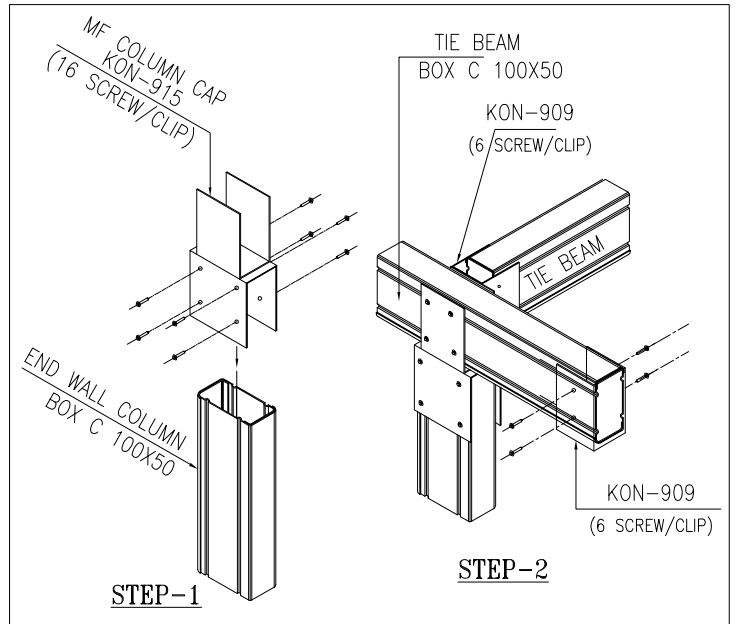


COLUMN TO TIE BEAM CONNECTION



CORNER COLUMN EAVE CONNECTION DETAILS



COLUMN TO TIE BEAM CONNECTION

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TBSL/BPD–ENGG/FORM/007(R1)

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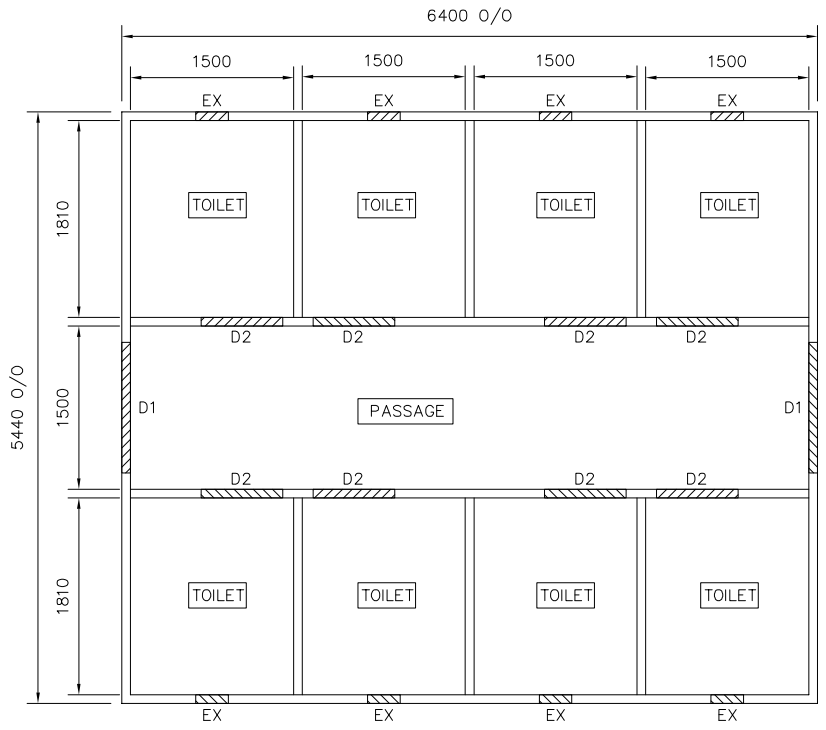
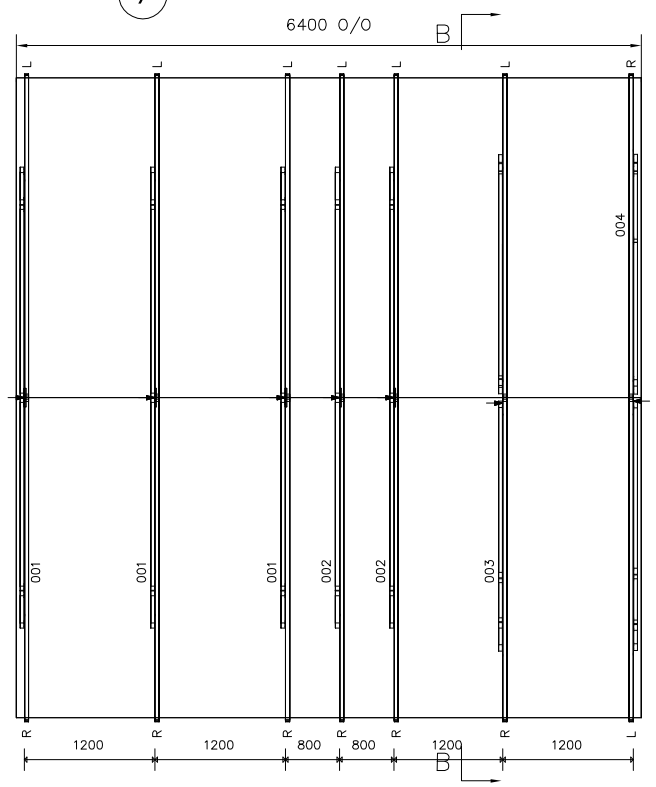
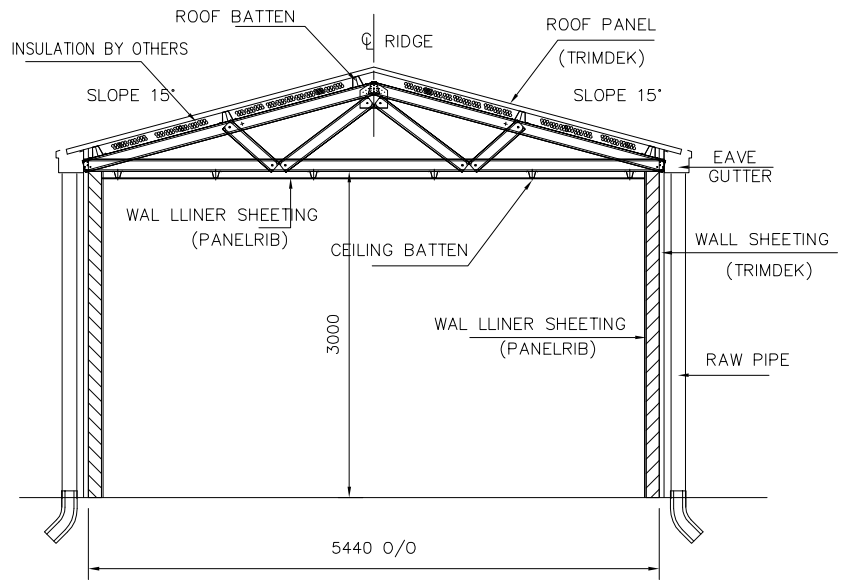


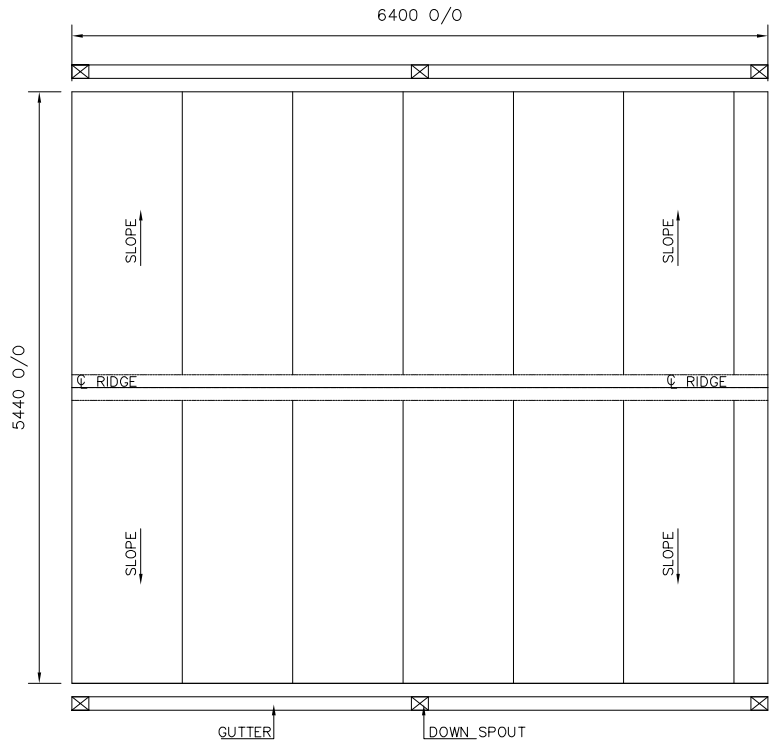
7 WALL FRAME LAYOUT



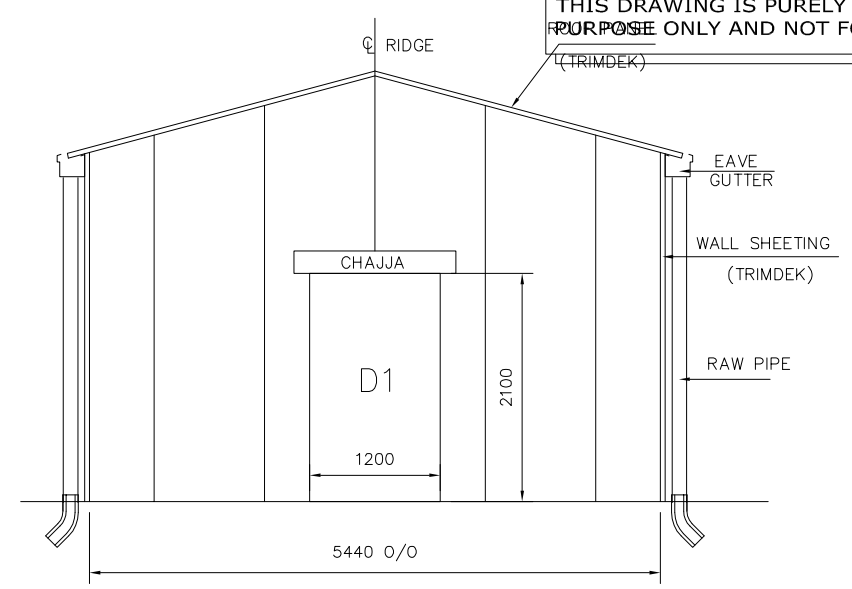
8 ROOF FRAMING LAYOUT



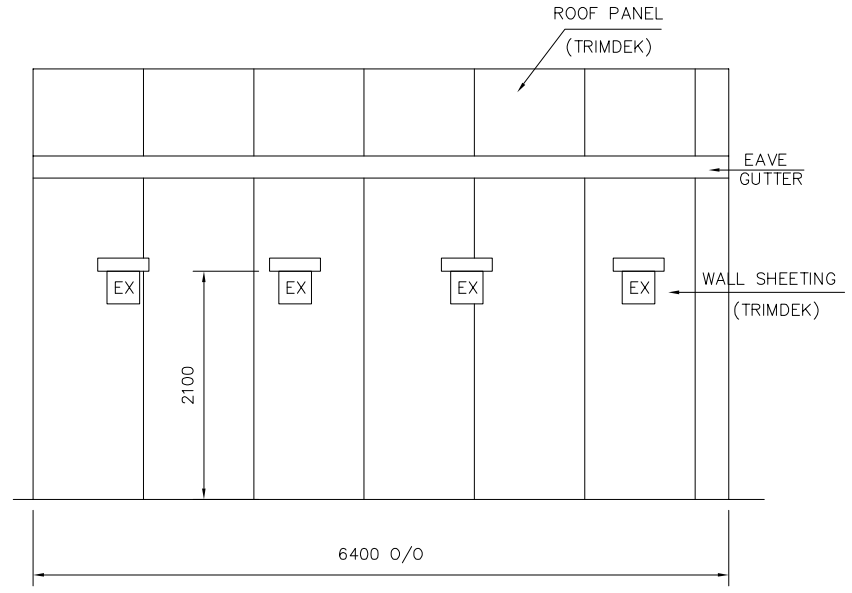
9 TYPICAL CROSS SECTION-B-B



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

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	:	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)

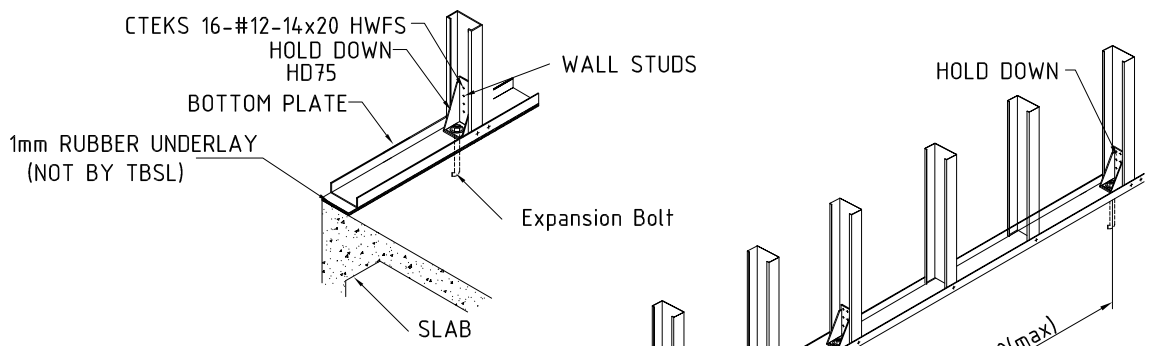
PROJECT NAME:
Toilet Block for Labours-BHEL

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)

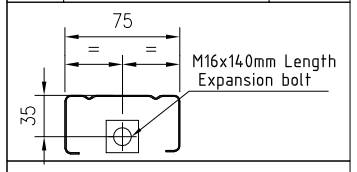
THIS DRAWING IS PURELY FOR APPROVAL PURPOSE ONLY AND NOT FOR CONSTRUCTION



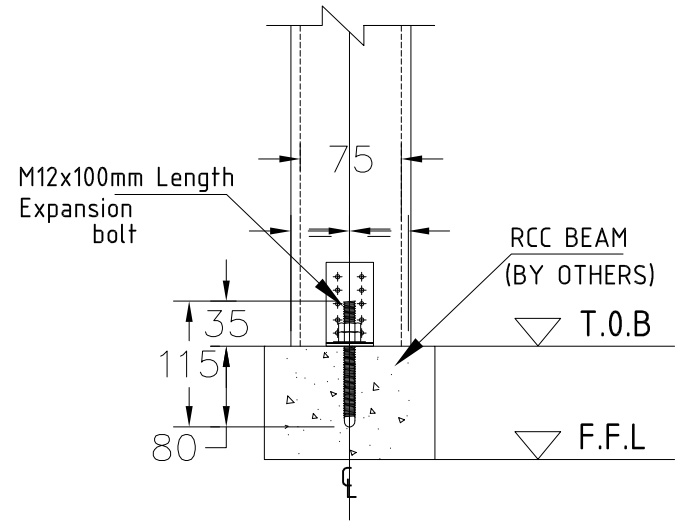
EXPANSION BOLT DETAIL

EXPANSION PLAN SKETCH

QTY.	DESCRIPTION	LENGTH
100	M16x140mm Length Expansion BOLT	140

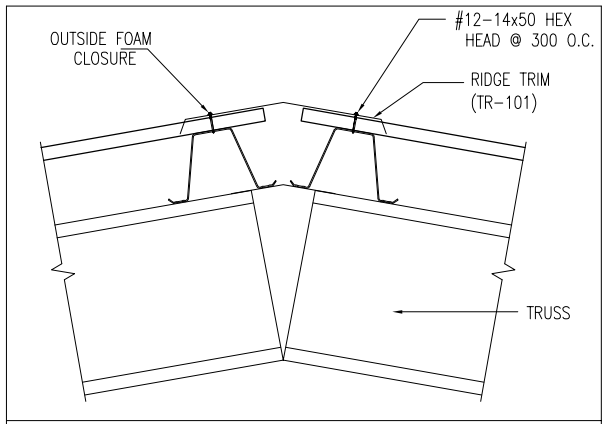


SECTION A-A

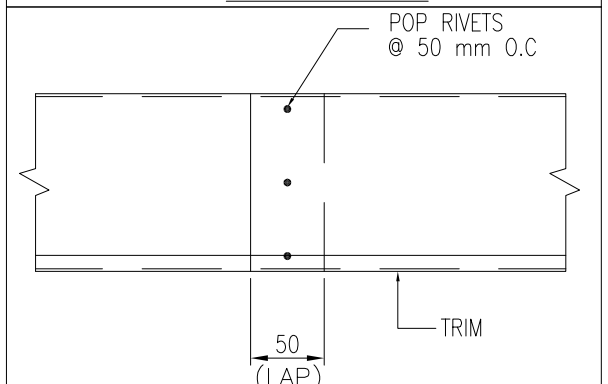


TO DESIGN RCC BEAM CONSIDERED 500 KG/M UDL

TYPICAL EXPANSION BOLT FIXING DETAILS

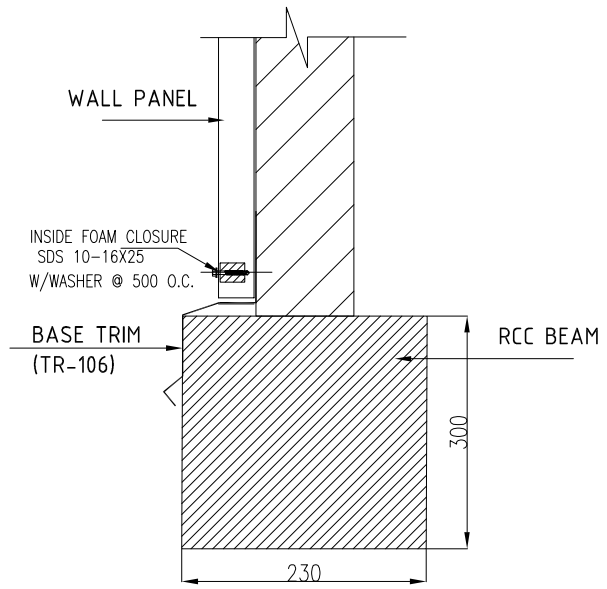


RIDGE DETAIL

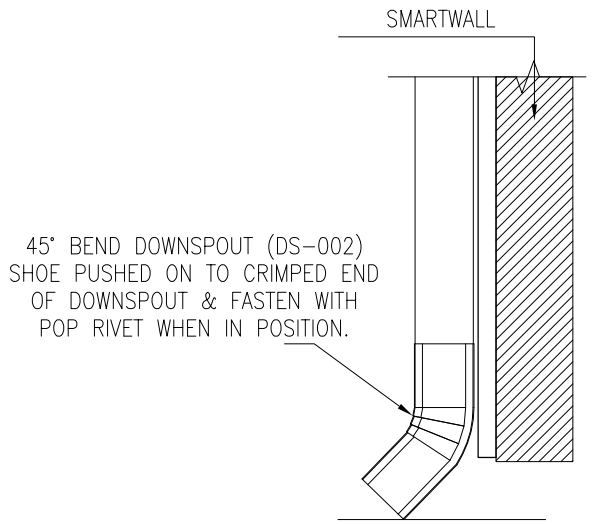


STANDARD LAP FOR TRIMS

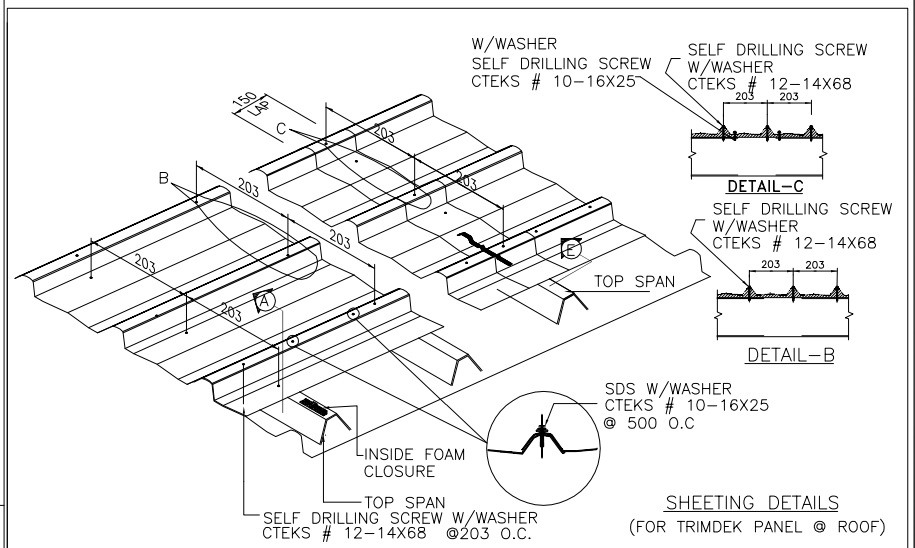
DETAIL-C (EAVE DETAIL)



BASE TRIM DETAIL-D



(D/S BOTTOM DETAIL)



SHEETING DETAILS @ ROOF (TRIMDEK)

NOTE :
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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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)	

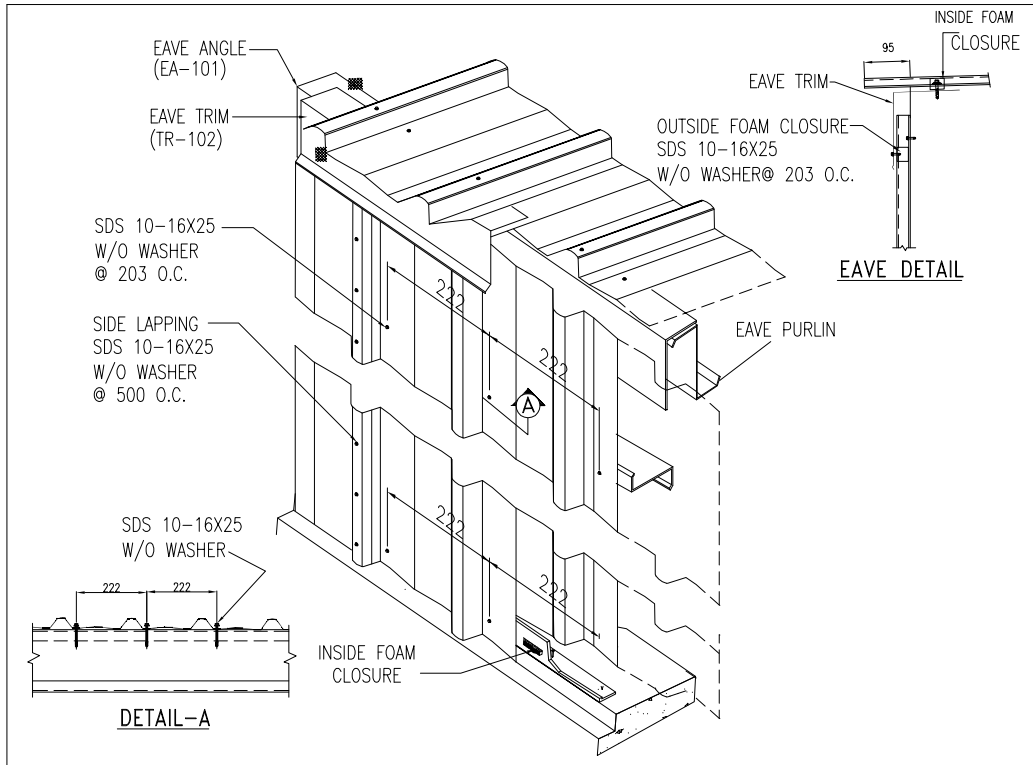
PROJECT NAME:
Toilet Block for Labours-BHEL

DRAWING TITLE:
PROPOSAL DRAWING

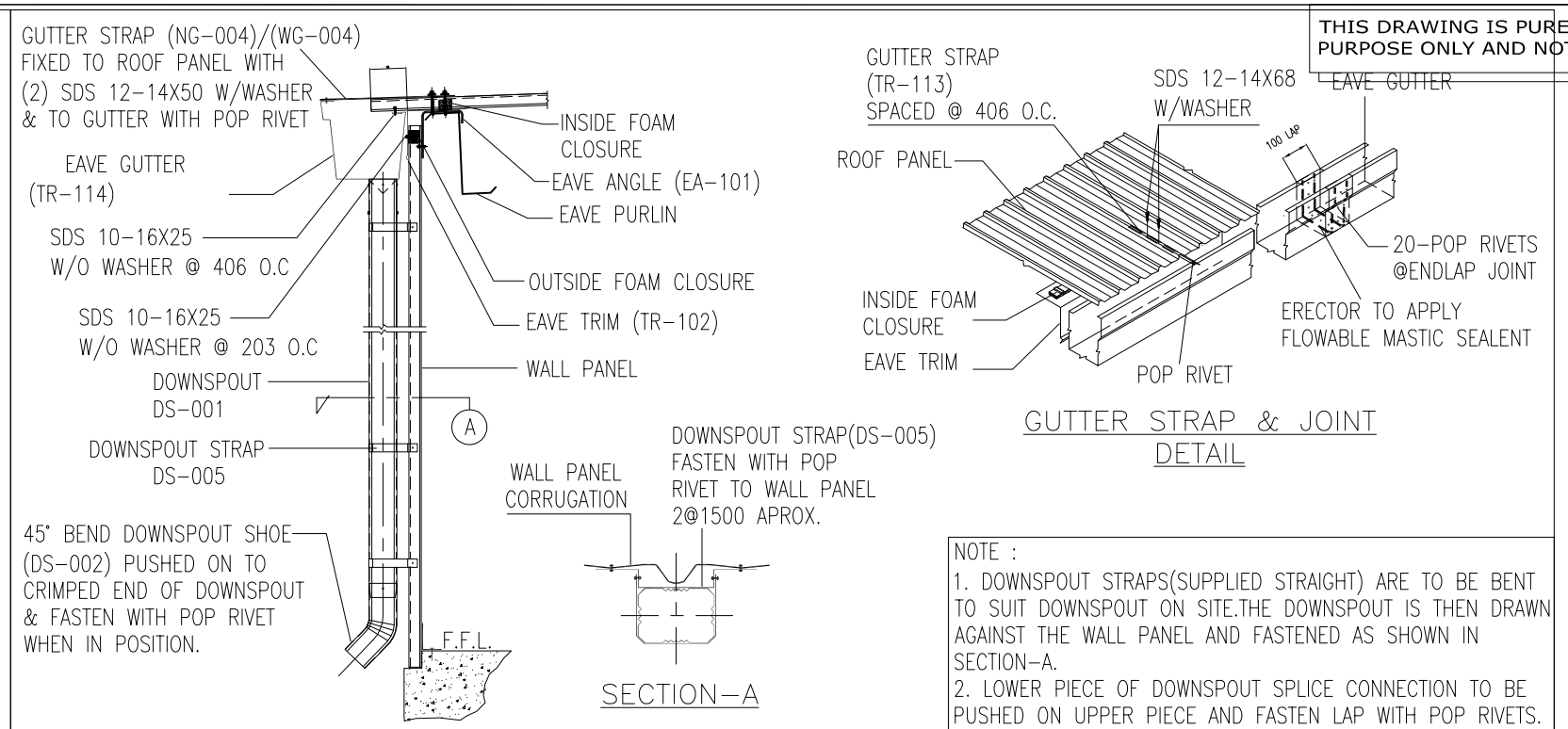
JOB SITE LOCATION : ENQ/WB/1735B		
QUOTE NO : Kolkata		REV: 0
DRG NO : E5	SCALE : NTS	
DRN : NMT	DATE : 26.04.17	
CHK : NMT	REV DATE : 00.00.00	
DSN : WAQ	SENT ON : 26.04.17	A3

TBSL/BPD-ENGG/FORM/007(R1)

THIS DRAWING IS PURELY FOR APPROVAL PURPOSE ONLY AND NOT FOR CONSTRUCTION

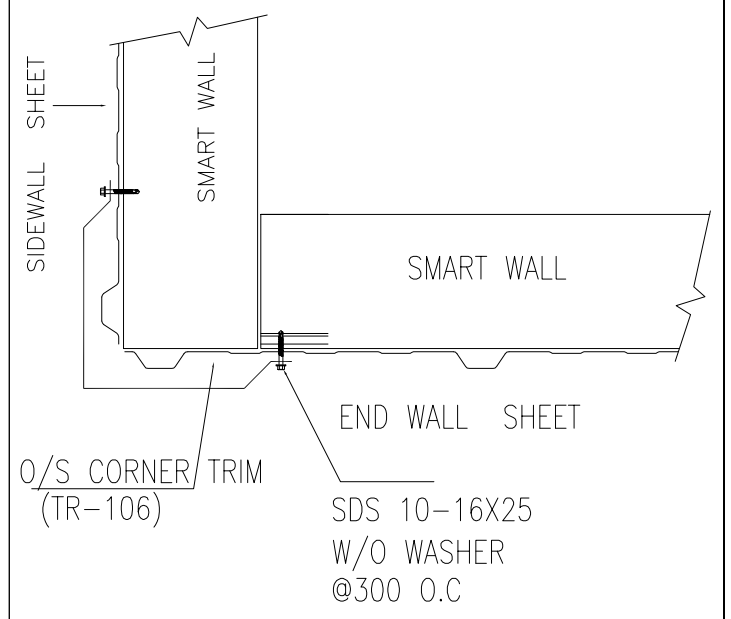


SHEETING DETAIL AT WALL

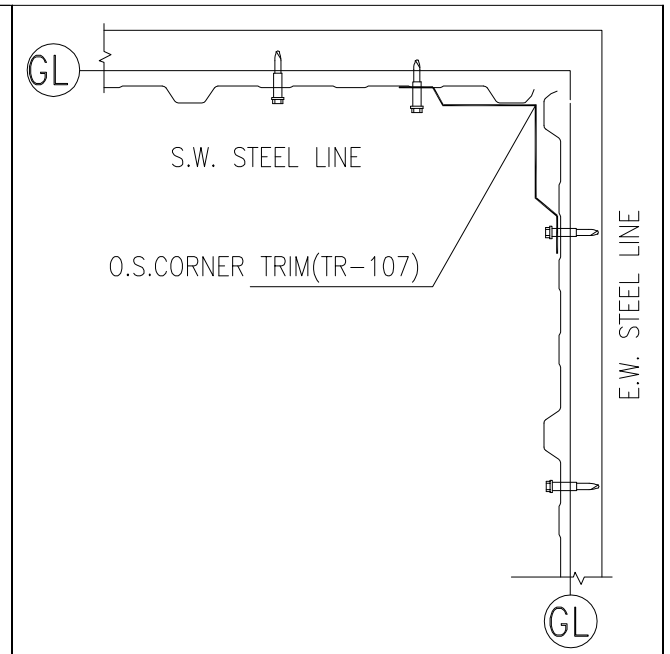


NOTE :
1. DOWNSPOUT STRAPS(SUPPLIED STRAIGHT) ARE TO BE BENT TO SUIT DOWNSPOUT ON SITE.THE DOWNSPOUT IS THEN DRAWN AGAINST THE WALL PANEL AND FASTENED AS SHOWN IN SECTION-A.
2. LOWER PIECE OF DOWNSPOUT SPLICE CONNECTION TO BE PUSHED ON UPPER PIECE AND FASTEN LAP WITH POP RIVETS.

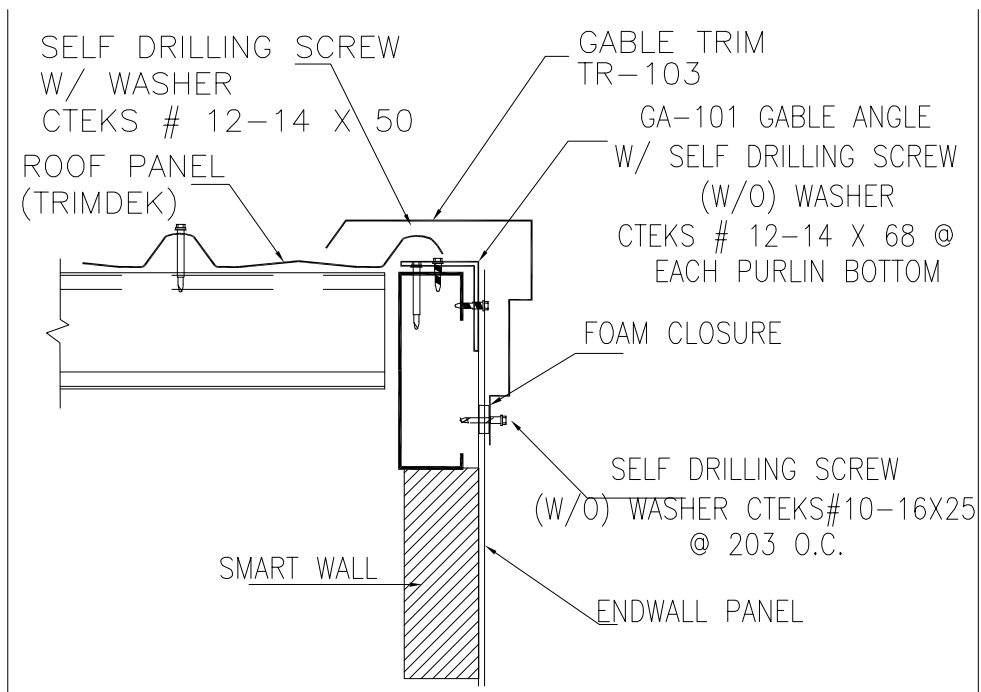
GUTTER & DOWNSPOUT INSTALLATION AT FULLY SHEETED SIDEWALL



O/S CORNER TRIM DETAIL



I.S.CORNER DETAIL



GABLE DETAIL

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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 : 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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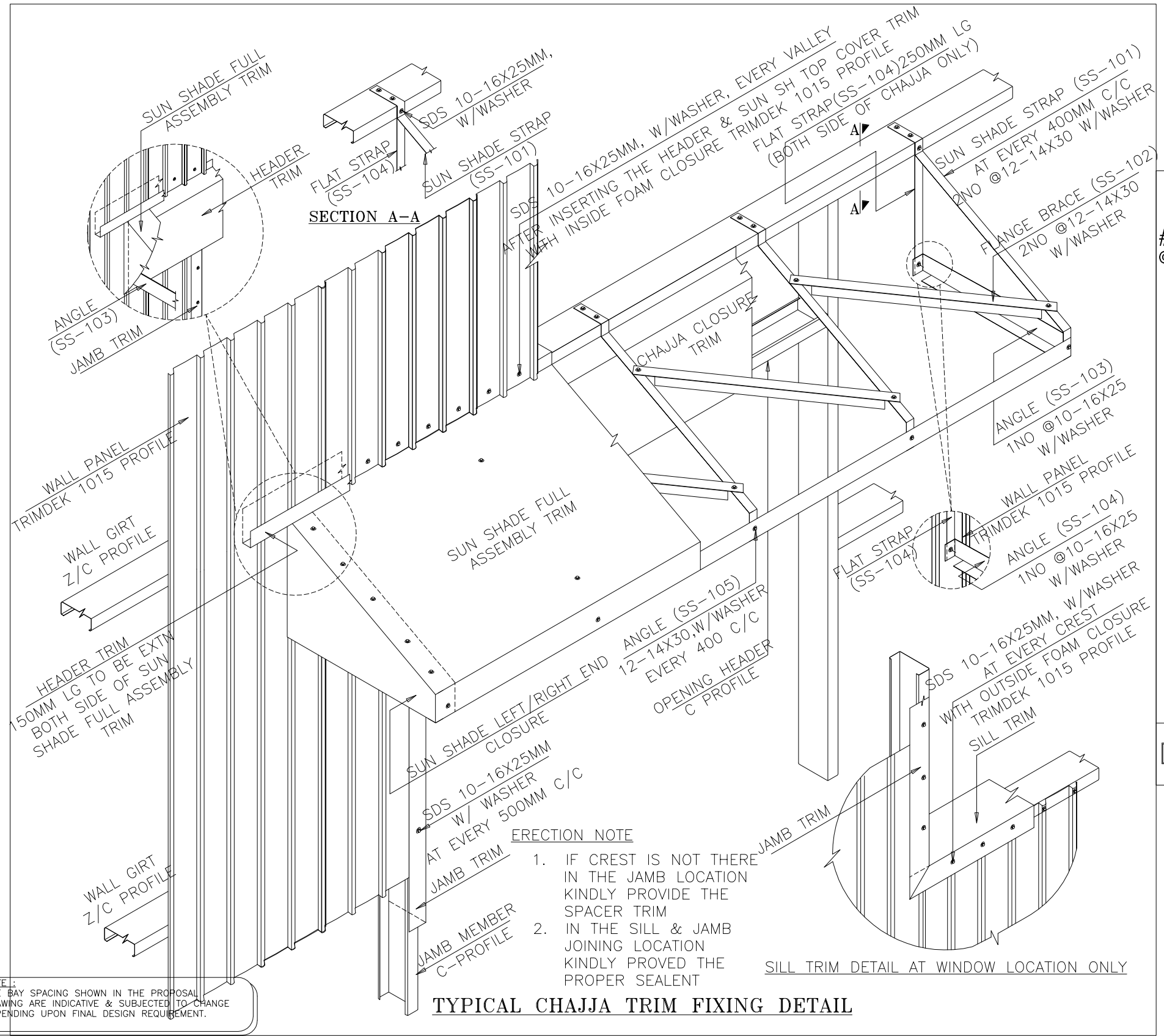

ERECTION NOTE

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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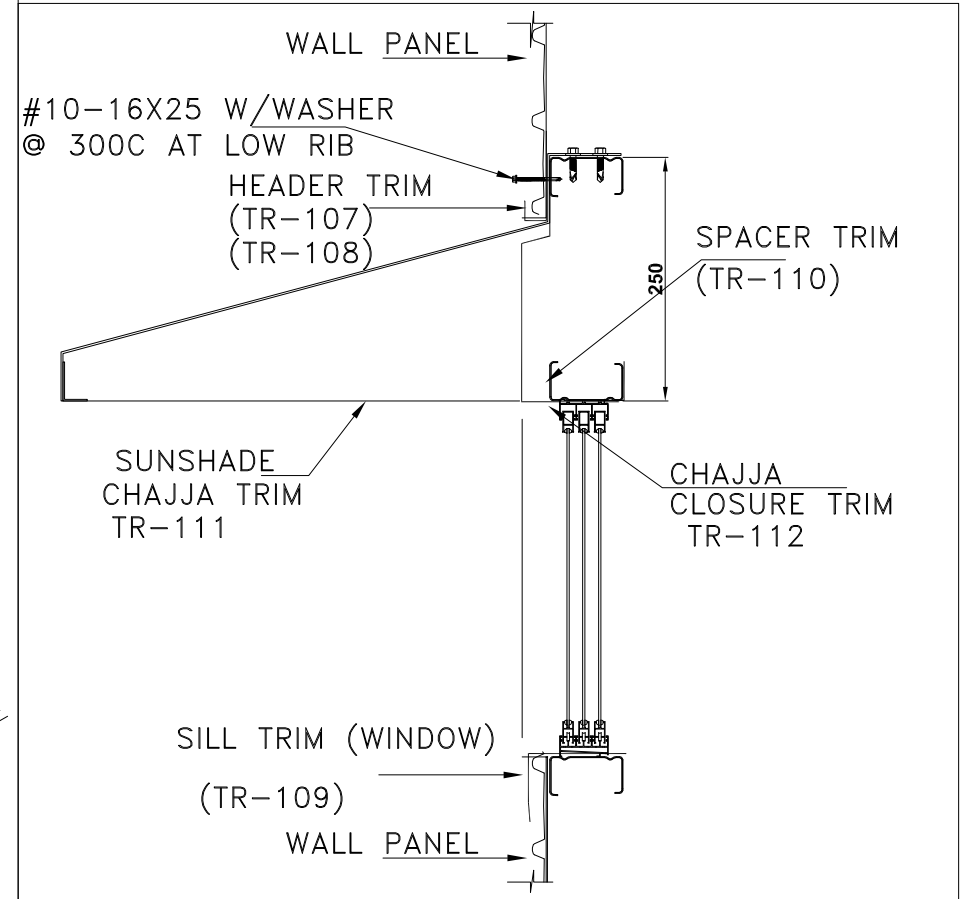

DOOR/WINDOW/LUV. CHAJJA DETAIL (TYP.)

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WFO –	WINDOW FRAMED OPENING
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 : 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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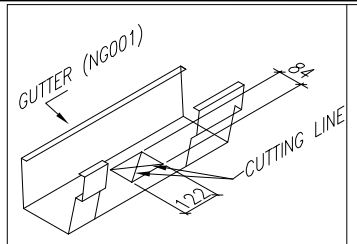
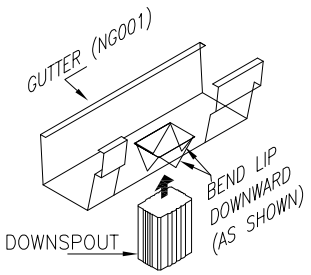
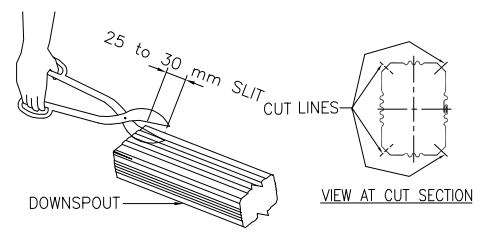


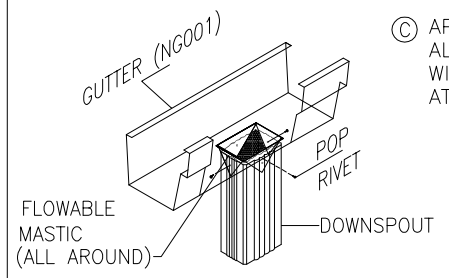
Ⓐ CUT EAVE GUTTER AS SHOWN.



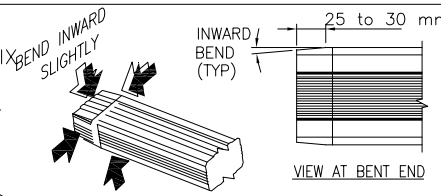
Ⓑ INSERT THE DOWNSPOUT TO THE GUTTER.



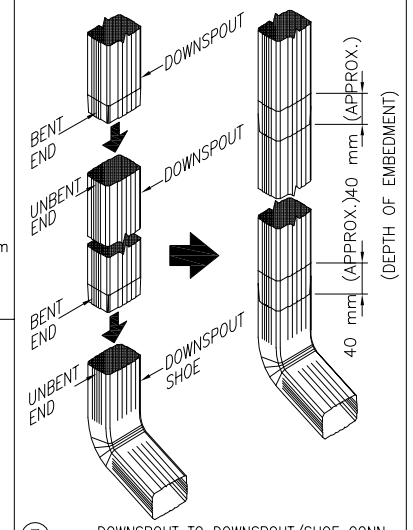
① SLIT AT FOUR CORNERS OF THE DOWNSPOUT UP TO 30mm AS SHOWN ABOVE.



Ⓒ APPLY FLOWABLE MASTIC ALL AROUND AND ALSO FIX WITH ONE POP RIVET AT EACH SIDE AS SHOWN.

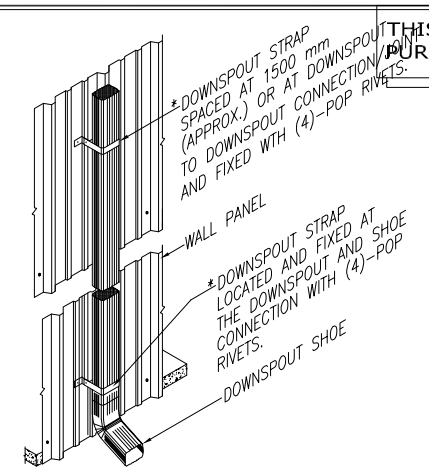


② SLIGHTLY BEND INWARD ALL FOUR SIDES OF THE SLITTED END AT AN APPROPRIATE ANGLE JUST ENOUGH FOR THE DOWNSPOUT TO SLIDE INTO ANOTHER DOWNSPOUT OR DOWNSPOUT SHOE AS SHOWN IN FIGURE 3.



③ DOWNSPOUT TO DOWNSPOUT/SHOE CONN.

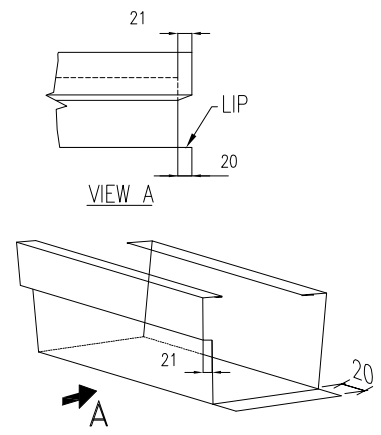
INSERT THE DOWNSPOUT INTO THE DOWNSPOUT AND/OR DOWNSPOUT SHOE.



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.

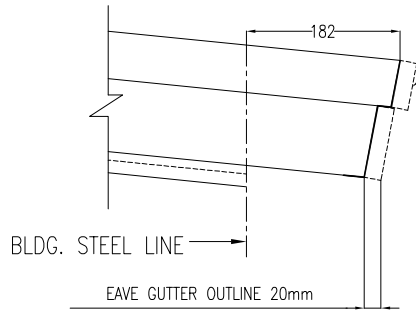
GUTTER AND DOWNSPOUT CONNECTION DETAIL



① CUT EAVE GUTTER AS SHOWN.

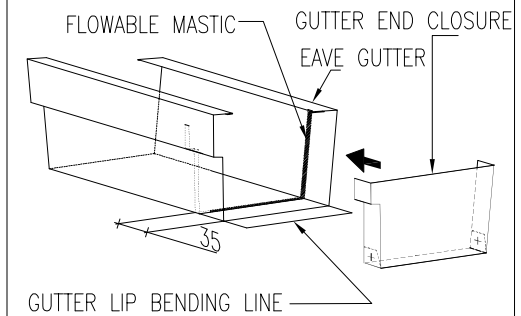
NOTES:

–DIMENSION SHOWN IS FOR 1:10 SLOPE & FOR NARROW GUTTER FOR OTHER SLOPES,–DIMENSION TO BE ADJUSTED.

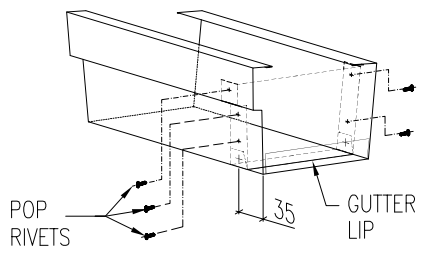


GABLE TRIM TOP TWO VERTICAL LEGS NEED TO BE EXTENDED TO COVER EAVE GUTTER AND 20MM LIP (EXTRA LENGTH) TO BE PROVIDED TO FOLD AND RIVET WITH EAVE GUTTER WALL.

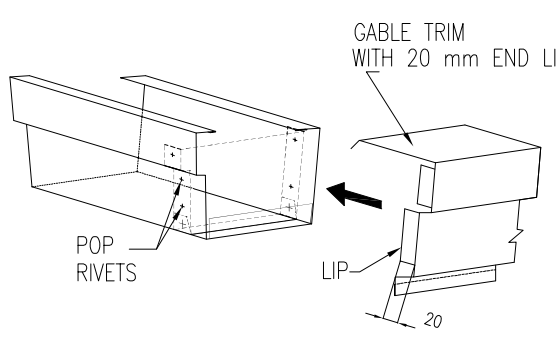
② CUT GABLE TRIM AS SHOWN.& EAVE GUTTER OUTLINE



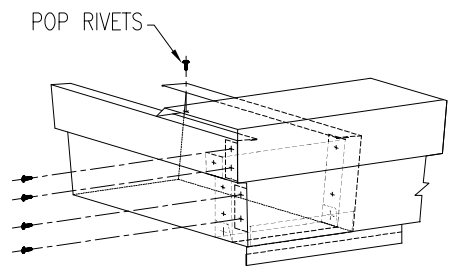
③ APPLY FLOWABLE MASTIC INSIDE EAVE GUTTER AND INSERT END CLOSURE.



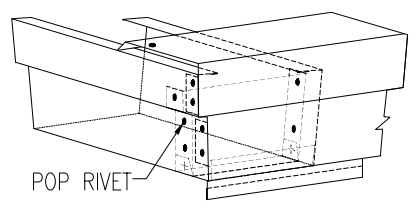
④ FIX END CLOSURE TO EAVE GUTTER BY POP RIVETS AND BEND GUTTER LIP.



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

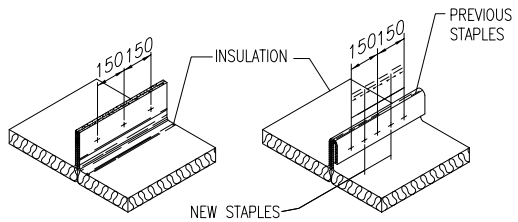


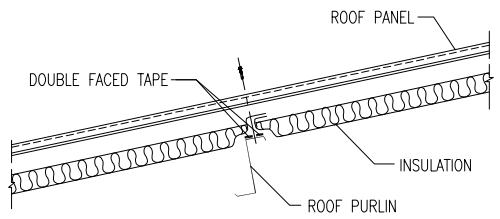
FIG. 1 FIG. 2

STAPLE PIN & STAPLER NOT BY TBSL

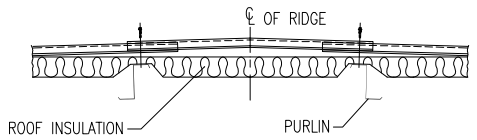
NOTE:

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

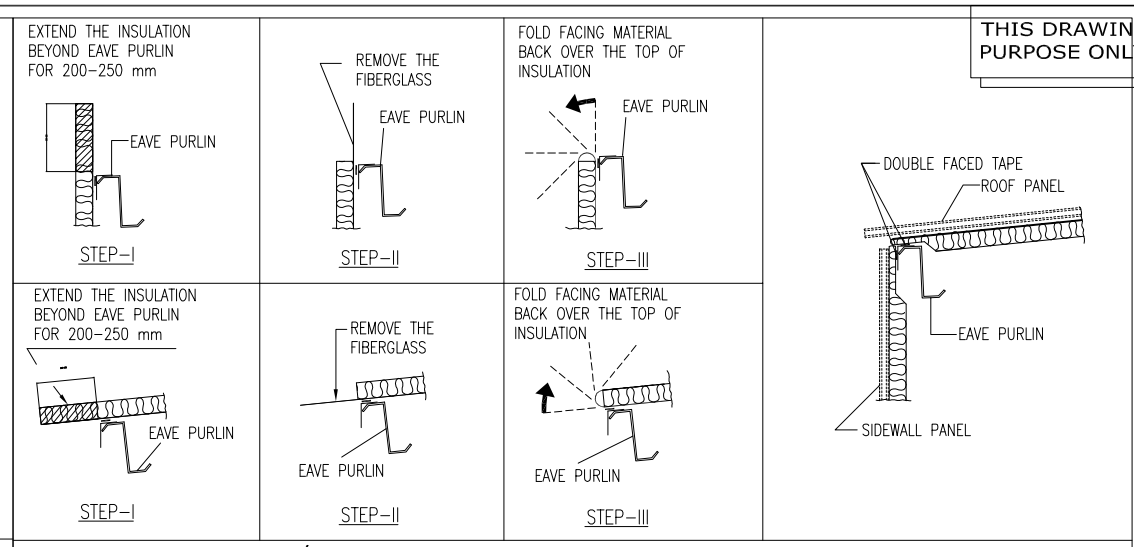


INSULATION END LAP

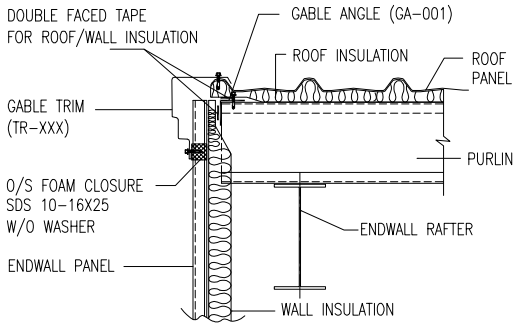


INSULATION AT RIDGE

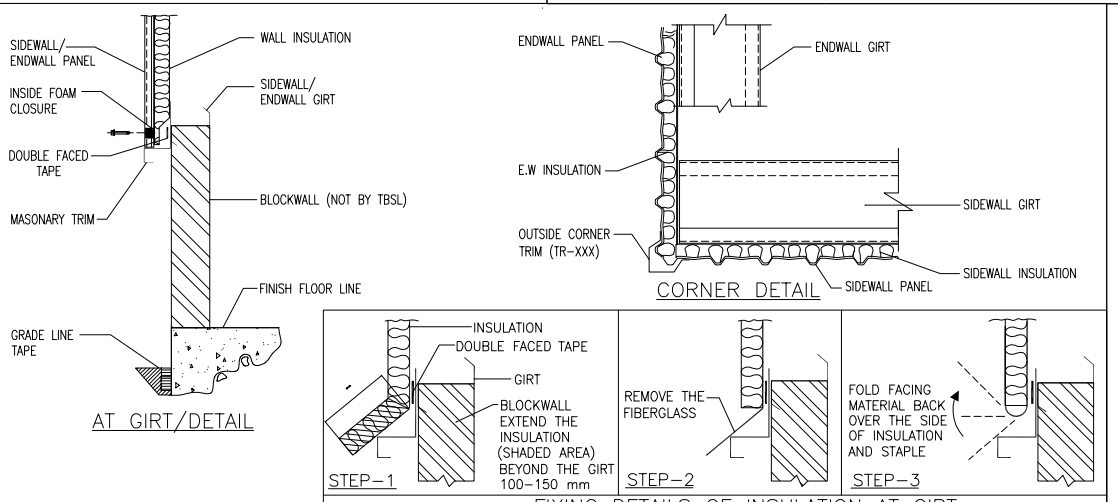
INSULATION DETAIL AT END LAPPING



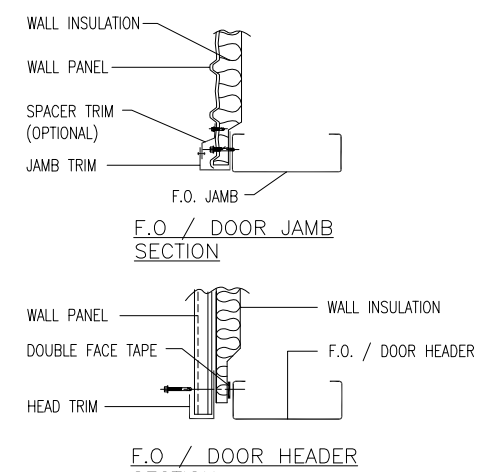
WALL/ROOF INSULATION DETAIL AT EAVE PURLIN



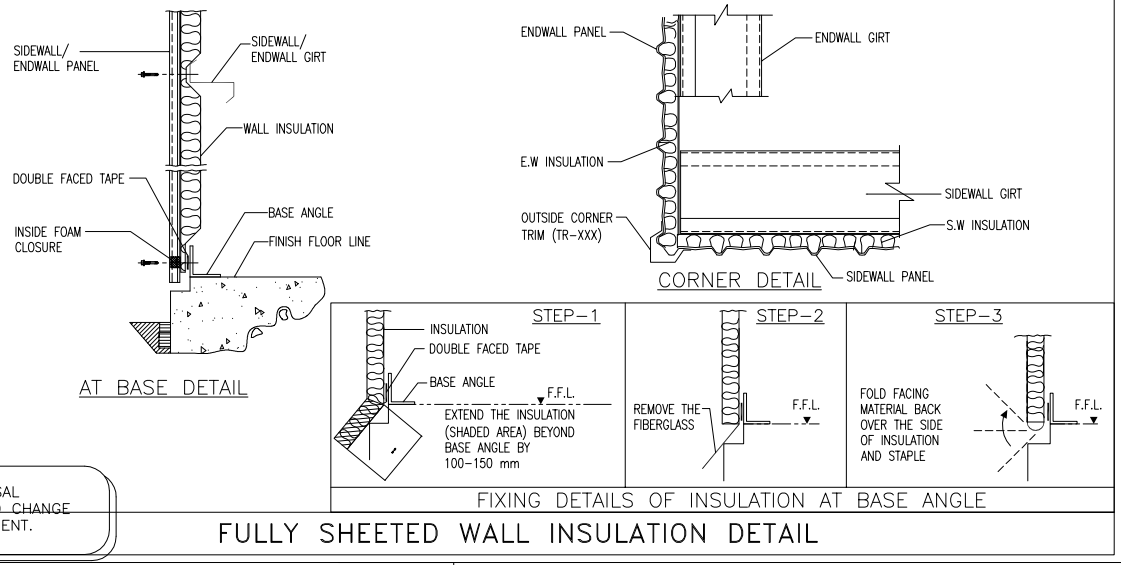
GABLE DETAIL W/ INSULATION



PARTIALLY SHEETED WALL INSULATION DETAIL



F.O. DETAIL W/ INSULATION



FULLY SHEETED WALL INSULATION DETAIL

NOTE :
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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LEGEND:

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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	
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)

FIELD QUALITY PLAN
FOR
DEMINERALISED WATER STORAGE TANKS
(SITE FABRICATED)

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

FOR TENDER PURPOSE ONLY

BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED

OWNER'S CONSULTANT

FICHTNER

Fichtner GmbH & Co. KG, Germany

BIFPCL DOC. NO. : MAITREE-00-GCL-QA-300065-PSE, REV. NO. : 1

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-BP-21
REV No.: 1

FIELD QUALITY PLAN
FOR
DEMINERALISED WATER STORAGE TANKS
(SITE FABRICATED)

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-GCL-QA-300065-PSE, REV. NO. : 1

PREPARED BY	DE/QLY, BHEL-PSER	APPROVED BY	HEAD / QLY, BHEL-PSER
FQP NO.		**QPE-MTE-660-BP-21**	
ORIGINAL DATE OF ISSUE		28/03/2018	
REVISION NO. & DATE		1, Dt. 26/04/2018	
COPY NO.		01	
ISSUED TO		BIFPCL / FICHTNER	
DATE OF ISSUE		26/04/2018	
PURPOSE :		FOR REVIEW & COMMENTS / APPROVAL	
ISSUED BY (SIGNATURE & DESIGNATION)		Digitally signed by Arup Ratan Paul DN: cn=Arup Ratan Paul, o=BHEL, ou=PSER/QLY, email=arpaul@bhel.in, c=IN Location: BHEL, PSER, Kolkata Date: 2018.04.26 14:17:49 +05'30' DE/QLY, BHEL- PSER	

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

PSER	FIELD QUALITY PLAN FOR DEMINERALISED WATER STORAGE TANKS	FQP NO: MAITREE-00-GCL-QA-300065-PSE BHEL Doc. No. : QPE-MTE-660-BP-21
		Rev. No. : 1
		SHEET 1 / 1 SHEET

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2.0	Status of Revisions	01
3.0	Authorization for checks and nonconformity disposition	01
4.0	Statement of Checks	05
5.0	Annex-I	01
6.0	Log Sheets	02

FOR TENDER PURPOSE ONLY

PSER	FIELD QUALITY PLAN FOR DEMINERALISED WATER STORAGE TANKS	FQP NO: MAITREE-00-GCL-QA-300065-PSE BHEL Doc. No. : QPE-MTE-660-BP-21
		Rev. No. : 1
		SHEET 1 / 1 SHEET

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	All	0, Dtd.: 27.03.18	The document is similar to NTPC approved FQP No. 4410-001-131-FQ-QVM-002, Rev-01 for North Karanpura STPP (3x660MW) with additional checks for storage, welding & NDT.
01	All	1, Dtd.: 26.04.18	The document is revised as per comments dated 10.04.2018 from BIFPCL/OE. Checks in this FQP are similar to NTPC approved FQP No. 4410-001-131-FQ-QVM-002, Rev-01 for North Karanpura STPP (3x660MW) with additional checks for storage, welding & NDT.

FOR TENDER PURPOSE ONLY

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

FOR TENDER PURPOSE ONLY

PSER	FIELD QUALITY PLAN FOR DEMINERALISED WATER STORAGE TANKS	FQP NO: MAITREE-00-GCL-QA-300065-PSE BHEL Doc. No. : QPE-MTE-660-BP-21
		Rev. No. : 1
		SHEET 01 / 05 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	DEMINERALISED WATER STORAGE TANKS
Sub-system :	DEMINERALISED WATER STORAGE TANKS
Area :	RECEIPT, STORAGE & 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.

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **DEMINERALISED WATER STORAGE TANKS** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-GCL-QA-300065-PSE** BHEL Doc. No. : QPE-MTE-660-BP-21 REV.NO.: 1 SHEET 02 OF 05
SYSTEM: DM WATER STORAGE TANKS	SUB-SYSTEM: DM WATER STORAGE TANKS	AREA: ERECTION

FOR TENDER PURPOSE ONLY

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 Technical Specifications & 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 / erection 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**								
B.01	Verification of documents : (i) shipping list/ packing list/ loading advice/ delivery challan (ii) Despatch clearance/ MDCC	R	Records	B	100%	Packing slip / Delivery challan / MDCC & Approved BBU	Compliance w.r.t. column 7	Stock Register	
B.02	INSPECTION OF MS PLATES								
B.02A	Mechanical & Chemical properties	R / T	MTC	B	1 sample per heat	App Drg/ Data Sheet	Relevant Material Specifications / Standards	MTC	- Material shall be sourced from BIFPCL/OE approved agency. - In absence of co-related MTC, material sample shall be tested at BIFPCL/OE approved third-party lab.
B.02B	Surface Defects	V	-	B	100%	No Pitting/ Corrosion	Damaged plates not to be used	SR	
B.02C	Thickness	M	Measuring tape, Vernier calipers	B	100%	Approved drawing	Approved drawing	SR	

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **DEMINERALISED WATER STORAGE TANKS** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-GCL-QA-300065-PSE** BHEL Doc. No. : QPE-MTE-660-BP-21 REV.NO.: 1 SHEET 03 OF 05
SYSTEM: DM WATER STORAGE TANKS	SUB-SYSTEM: DM WATER STORAGE TANKS	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.03	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	B	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 STORAGE**								
C.01	Steel plate/ pipes/ structural steel (angle/ beams/ channels/ flats etc)	V	-	B	Once every three months	Annex-I	Compliance to storage level - A as per Annex-I	Stock Register	
C.02	Fabricated items	V	-	B	Once every three months	Annex-I	Compliance to storage level - B as per Annex-I	Stock Register	
C.03	valves. strainers, hoses (oil & water), pressure regulating station etc, as applicable	V	-	B	Once every three months	Annex-I	Compliance to storage level - C as per Annex-I	Stock Register	
C.04	instruments viz. level switch, flow switch, flow meters, level indicator gauge, etc	V	-	B	Once every three months	Annex-I	Compliance to storage level - D as per Annex-I	Stock Register	
D	**WELDING & NON DESTRUCTIVE EXAMINATIONS**								
D.01	Ensure availability of applicable WPS and PQR	R	-	A	100%	Drawing / EWS	Clause no. 9.2 of API Standard 650 & ASME BPVC SEC - IX	-	
D.02	Review of MTC of welding electrodes & other consumables	R	-	A	100%	Relevant AWS specifications as per applicable WPS	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 & 'Clause no. 9.3 of API Standard 650	ASME BPVC Sec.- IX	WQR	
D.04	Adoption of correct procedure, approved electrodes and methods.	V	-	A	100%	Drawing / EWS & WPS	Drawing / EWS & WPS	SR	

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **DEMINERALISED WATER STORAGE TANKS** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-GCL-QA-300065-PSE** BHEL Doc. No. : QPE-MTE-660-BP-21 REV.NO.: 1 SHEET 04 OF 05

SYSTEM: DM WATER STORAGE TANKS | SUB-SYSTEM: DM WATER STORAGE TANKS | 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.05	Checking drying / baking of electrodes (where ever applicable)	V & R	-	B	Random in each shift	WPS	Recommendation of electrode manufacturer	SR	
D.06	Pre heating of weld joints, as applicable.	V & M	Non-contact type Thermometer	A	As per WPS	WPS	Table 7.1a of API Standard 650	SR	
D.07	Ensure proper sequence of welding, as applicable	V	-	C	100%	Drawings & WPS	Drawings & WPS	SR	
D.08	PWHT of weld joints, as applicable.	V/M	Time-Temp. Recorder	A	As per WPS	WPS	API Standard 650	SR	
D.09	Review of qualification of NDT inspectors	R	-	A	Once before engagement of each inspector	Section - 8 of API Standard 650	Clause no. 8.1.3.2, 8.4.3 & 8.5.1 of API Standard 650	NDT Inspector Register	
D.10	Visual Inspection of All weldments	V & M	As required	B	100%	Drawing	Caluse no. 8.5 of API Standard 650	SR	
D.11	DPT on butt welds after back gauging	T	DPT Kit	A	100%	ASME BPVC Section V & API Standard 650	ASME BPVC Sec VIII, division - I, Appendix - 8	site log book	
D.12	RT of butt welds joints (covering 100% of 't' joints) of tank	T	RT Kit	A	As per Section - 8 of API Standard 650	ASME BPVC Section V & API Standard 650	ASME BPVC Sec VIII Division - I, UW51/52	RT report & film	
D.13	DPT nozzle welds & all finished welds	T	DPT Kit	A	As per requirement of API 650	ASME BPVC Section V & API Standard 650	ASME BPVC Sec VIII, division - I, Appendix - 8	site log book	
D.14	Preservation of welded area	V	As required	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & Owner's FTS	SR	
E	**TANK : FABRICATION & ERECTION**								
E.01	Disposition of Tank foundation	M	Measuring tape, spirit Level & Auto Level	B	100%	Approved drawing	Approved drawing & Clause no. 7.5.5 of API Std 650	site log book	
E.02	Cutting of steel plates	V & M	Measuring tape	C	100%	Approved drawing	Section - 6 of API Standard 650	site log book	

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **DEMINERALISED WATER STORAGE TANKS** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-GCL-QA-300065-PSE** BHEL Doc. No. : QPE-MTE-660-BP-21 REV.NO.: 1 SHEET 05 OF 05
SYSTEM: DM WATER STORAGE TANKS	SUB-SYSTEM: DM WATER STORAGE TANKS	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.03	Joint fit up / edge preparation	V & M	Measuring tape	B	100%	Approved drawing & WPS	Section - 6 of API Standard 650	site log book	
E.04	fabrication of annular plate/ bottom plate/ shell/ roof and erection : a. alignment b. circularity c. verticality d. nozzle orientation & dimension (for both shell and roof)	M	Measuring tape & plumb	B	100%	Approved drawing	Section -6 & 7 of API Standard 650	site log book	
E.05	Welding & NDT	As per Sl. No. 'D'							
E.06	complete visual examination of welds of shell to bottom (inside weld)	V	visual	A	100%	approved drawing	Clause no. 7.3.3; 7.3.4 & 8.5 of API Standard 650	site log book	
E.07	final dimensional check including Verticality, Ovality	M	Measuring tape & plumb	B	100%	approved drawing	Clause no. 7.5 of API Standard 650	site log book	
E.08	bottom plate seam testing & annular plate - vacuum box test	T	Vacuum gauge	A	100%	Approved procedure	Clause no. 8.6 of API Standard 650	site log book	
E.09	hydrostatic test (water fill test)	T	pressure gauge	A	100%	Approved procedure	Clause no. 7.3.6 & 7.3.7 of API Standard 650	site log book	
E.10	roof leakage testing - vacuum box test	T	Vacuum gauge	A	100%	Approved procedure	Clause no. 8.6 of API Standard 650	site log book	
E.11	Ensure fixing of all attachments, as applicable	V	-	B	100%	Approved drawing	Approved drawing	site log book	
F	**PAINTING & PRESERVATION**								
F.01	Surface preparation	V	-	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen	ISO 8501-1	site log book	
F.02	Painting - thickness, finish, Colour shade	V & M	DFT Gauge	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & Owner's FTS	site log book	Paint to be procured from BIFPCL approved source & shall conform to ISO 12944

FOR TENDER PURPOSE ONLY

STORAGE LEVEL

SL. NO.	STORAGE LEVEL	DESCRIPTION / REMARKS
1	Storage level ‘A’	Outside with no protective cover (Open space / yard on raised surface, properly stacked and free from water logging & loading / undue weight).
2	Storage level ‘B’	Outside with protective cover (Open space / yard on raised surface, properly stacked and free from water logging & loading / undue weight, covered with PVC / Tarpaulin).
3	Storage level ‘C’	Item stored in Pucca shed / in store
4	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).
5	Storage level ‘E’	Indoor temperature & humidity controlled – air conditioned (stored in pucca shed, in store with controlled atmosphere)

FOR TENDER PURPOSE ONLY

PSER

RECORD OF QUALITY CHECKS

FOR TENDER PURPOSE ONLY

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-BP-21
PROJECT					REV. NO. : 1
UNIT NO.					LOG SHEET NO. : L-00
RATING					SHEET / SHEET

PSER	INSTRUMENT REG. NO./TAG		
	DATE OF INSPECTION		
	DRAWING / DOCUMENT REF.		

PROTOCOL

FOR TENDER PURPOSE ONLY

			NAME	SIGNATURE & DATE	FQP NO. : QPE-MTE-660-BP-21
PROJECT		INSPECTED BY			REV. NO. : 1
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

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.

FIELD QUALITY PLAN
FOR
FEED WATER & CONDENSATE 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-L-QA-300071-PSE, REV. NO. : 1

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-ST-43C
REV. NO. : 1

FOR TENDER PURPOSE ONLY

FIELD QUALITY PLAN
FOR
FEED WATER & CONDENSATE SYSTEM

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-00-L-QA-300071-PSE, REV. NO. : 1

PREPARED BY	ENGR./QLY, BHEL-PSER	APPROVED BY	HEAD / QLY, BHEL-PSER
FQP NO.		**QPE-MTE-660-ST-43C**	
ORIGINAL DATE OF ISSUE		11/01/2019	
REVISION NO. & DATE		1, Dt. 16/02/2019	
COPY NO.		01	
ISSUED TO		BIFPCL / FICHTNER	
DATE OF ISSUE		16/02/2019	
PURPOSE :		FOR REVIEW & COMMENTS / APPROVAL	
ISSUED BY (SIGNATURE & DESIGNATION)		ENGR / QLY, BHEL, PSER	

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

PSER	FIELD QUALITY PLAN FOR FEED WATER & CONDENSATE SYSTEM	FQP NO: MAITREE-00-L-QA-300071-PSE BHEL Doc. No. : QPE-MTE-660-ST-43C
		REV. NO. : 1
		SHEET 1 / 1 SHEETS

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4.0	Statement of Checks	07
5.0	Log Sheets	02

FOR TENDER PURPOSE ONLY

PSER	FIELD QUALITY PLAN FOR FEED WATER & CONDENSATE SYSTEM	FQP NO: MAITREE-00-L-QA-300071-PSE BHEL Doc. No. : QPE-MTE-660-ST-43C
		REV. NO. : 1
		SHEET 1 / 1 SHEETS

STATUS OF REVISIONS

SL. NO.	REFERENCE OF SHEETS REVISED	REVISION NO. & DATE	REMARKS
01	-	0, Dtd.: 11/01/2019	Document prepared as per the owner's technical specifications & is similar to NTPC approved FQP No. 4410-001-110-QVM-G-602, Rev-1 for NTPC - North Karanpura STPP (3x660MW).
02	-	1, Dtd.: 16/02/2019	Document is resubmitted as noted in TCS.

FOR TENDER PURPOSE ONLY

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 / OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / OE
'B' (Formal intimation shall be forwarded by BHEL. Check shall commence at notified time whether parties show-up or not)	BHEL Engineer	OWNER / OE	BHEL ENGG Centre/ Head (Quality): BHEL PS-ER	OWNER / OE
'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 ONLY

PSER	FIELD QUALITY PLAN FOR FEED WATER & CONDENSATE SYSTEM	FQP NO: MAITREE-00-L-QA-300071-PSE BHEL Doc. No. : QPE-MTE-660-ST-43C
		REV. NO. : 1
		SHEET 01 / 07 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	FEED WATER & CONDENSATE SYSTEM
Sub-system :	FEED WATER & CONDENSATE SYSTEM
Area :	RECEIPT, STORAGE & 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. Unless noted otherwise in this 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. 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. Unless noted otherwise in this FQP, 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.

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FEED WATER & CONDENSATE SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-L-QA-300071-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43C REV.NO.: 1 SHEET 02 / 07 SHEETS
SYSTEM: FEED WATER & CONDENSATE SYSTEM	SUB-SYSTEM: DEARATOR, CEP, H.P. & L.P. HEATERS, GSC, DRAIN COOLER	AREA: ERECTION

FOR TENDER PURPOSE ONLY

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*
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 latest drawings and Field/Erection Welding Schedule (EWS), 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	Check availability of Bill of materials (BOM) / packing slip, dispatch documents.	V	-	C	100%	-	Availability of documents	-		
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	Completeness & correctness of material	Logbook		
B.03	Check components/ boxes carefully for physical condition - a) In case of external damage to boxes, remove the top cover so that contents can be seen thoroughly. If the contents are sealed / intact, cover the contents / packing with original plastic sheeting / additional tarpaulin cover. b) 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.04	V	-	C	100%	Dispatch documents/ Packing slip	No damage	Logbook		
B.04	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	BHEL Work Instructions for site operations	BHEL Work Instructions for site operations	MDR		
B.05	Control of receipt and issue of all components	V	6290465373	C	100%	BHEL Work Instructions for site operations	BHEL Work Instructions for site operations	Register		
C	**STORAGE & PRESERVATION**									
C.01	Storage & Preservation of components at site	V & P	As required	C	as per Section-IV of reference doc.	Storage & Preservation Instructions for components of Steam Turbine, Generator & Auxiliaries (MAITREE-00-M-DC-300067-PSE)		SR		

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FEED WATER & CONDENSATE SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-L-QA-300071-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43C REV.NO.: 1 SHEET 03 / 07 SHEETS
SYSTEM: FEED WATER & CONDENSATE SYSTEM	SUB-SYSTEM: DEARATOR, CEP, H.P. & L.P. HEATERS, GSC, DRAIN COOLER	AREA: ERECTION

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	**WELDING & NON DESTRUCTIVE EXAMINATIONS**									
D.01	Ensure availability of applicable WPS as per Erection Welding Schedule (EWS) / Drawing	R	-	A	100%	Drawing & EWS	Qualified WPS should be available at site.	-		
D.02	Review of Batch TC of welding electrodes & other consumables from manufacturer.	R	-	A	100%	Relevant AWS specifications as per applicable WPS	Relevant AWS specifications as per applicable WPS	SR		The copy of TCs to be reviewed & signed by BHEL and record to be maintained in Site Register. BIFPCL/OE may 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 & ASME BPVC Sec.-IX	WPS & ASME BPVC Sec.-IX	WQR	√	
D.04	Adoption of correct procedure, approved electrodes and methods.	V	-	B	100%	Drawing/ EWS & WPS	Drawing/ EWS & WPS	SR		
D.05	Daily in-Process monitoring of joint fit-ups	V & M	Taper Gauge, Hi-Lo Gauge & Measuring tape	B	100%	Drawing / EWS	Drawing / EWS	SR		
D.06	Daily in-process monitoring of Drying / baking of SMAW electrodes	V & R	-	B	Random in each shift		Recommendations of electrode manufacturer	SR		
D.07	Pre heating of weld joints, as applicable.	V & M	Thermo-chalk or Non-contact type Thermometer	A	As per WPS	Drawing & WPS	WPS	Logsheet	√	
D.08	Ensure proper sequence of welding.	V	-	C	100%	Drawing	Drawing	SR		
D.09	Visual Inspection of all weldments	V & M	As required	B	100%	Drawing	ASME BPVC Sec-V	Logsheet		
D.10	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		
D.11	NDT of welds	T	As required	A	As per EWS / Drawing	Drawing / EWS	ASME BPVC Sec-V	NDT Report	√	
D.12	Rectification of welding defect (if case of any defect)	P & R	As required	A	As per EWS & Annex-I	Annex-I	ASME BPVC Sec-V	Logsheet	√	

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FEED WATER & CONDENSATE SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-L-QA-300071-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43C REV.NO.: 1 SHEET 04 / 07 SHEETS
SYSTEM: FEED WATER & CONDENSATE SYSTEM	SUB-SYSTEM: DEARATOR, CEP, H.P. & L.P. HEATERS, GSC, DRAIN COOLER	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*	*D**	*9*
D.13	Post Weld Heat Treatment of welds, as applicable	V & R	Time-temperature recorder	A	As per EWS	Drawing / EWS	WPS	HT Chart	√	
D.14	Ensure preservation of welded joint (application of primer)	V	As required	C	100%	Approved painting schedule	Approved painting schedule	Logsheet		
E	**ERECTION OF DEARATOR & FEED STORAGE TANK**									
E.01	Check fixed/ sliding support dimensions	M	Measuring Tape	B	100%	Drawing	-	Logbook		
E.02	Fit up of weld for Storage Tank Segments and Match Marking as per Shop.	V		B	100%	Drawing	-	Protocol		
E.03	DPT after back gauging (as applicable) of Butt weld	V		B	100%	Drawing	ASME BPVC Sec-V	Protocol		
E.04	Welding of Storage Tank segments by Back Step method.	As per Checks in Sl. No. D								
E.05	NDT after Welding and Post Weld Heat Treatment (as applicable)	As per Checks in Sl. No. D								
E.06	Dimensional conformity and Horizontality of Storage Tank as per drawing.	M	Tape, Spirit level	B	100%	Drawing	Drawing	Protocol		
E.07	Location of Deaerator Header w.r.t Storage Tank	M	Plumb Bob	B	100%	Drawing	Drawing	Protocol		
E.08	Fit up & Welding of Down comers & Equalizers with Storage Tank.	As per Checks in Sl. No. D								
E.09	Hydraulic Test of Storage Tank & Deaerator - header assembly.	T	As required	A	100%	Drawing & Procedure (HY0852061)	Drawing & Procedure (HY0852061)	Protocol		
E.10	Assembly of Stand Pipe and mounting of Instruments.	V	-	B	100%	Drawing & EWS	Drawing & EWS	Protocol		Welding & NDT as per Checks in Sl. No. D
E.11	Anchoring and availability of free expansion clearances at moving supports.	V	-	B	100%	Drawing	Drawing	Protocol		
F	**ERECTION OF CONDENSATE EXTRACTION PUMP**									
F.01	Check foundation disposition & dimensions including depth of CEP pit to ensure correct dimensions.	M	Tape & Rod	B	100%	Drawing	Drawing & Erection Manual	Log book		
F.02	Assembly of foundation ring & canister and level of the assembly on foundation.	M	Blue matching & Spirit level	B	100%	Drawing & Erection Manual	Drawing & Erection Manual	Log book		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FEED WATER & CONDENSATE SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-L-QA-300071-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43C REV.NO.: 1 SHEET 05 / 07 SHEETS
SYSTEM: FEED WATER & CONDENSATE SYSTEM	SUB-SYSTEM: DEARATOR, CEP, H.P. & L.P. HEATERS, GSC, DRAIN COOLER	AREA: ERECTION

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*
F.03	Tightening of foundation bolts & grouting of foundation ring.	V	-	B	100%	Drawing & Erection Manual	Erection Manual & Grout manufacturers recommendations	Protocol		Cubes to be taken during grouting and compressive test to be done & witnessed by FQA .
F.04	Assembly of Pump inside the canister. Ensure tightness of joint between Canister and pump assembly to avoid loss of vacuum	M	Feeler Gauge	B	100%	Drawing & Erection Manual	0.05 mm feeler gauge should not go inside	Log book		
F.05	Recheck the condition of bearing.	V	-	B	100%	Drawing & Erection Manual	Drawing & Erection Manual	Log book		
F.06	Ensure proper contact between pump and Motor. Check Levelling & centering of motor stool.	V	Blue matching & Spirit level	B	100%	Erection Manual & Assembly Drawing	Erection Manual & Assembly Drawing	Log book		
F.07	Ensure that insulated bolts and washers are used for fixing of non-driving end housing with end shields in case of insulated bearing.	V	-	B	100%	Erection Manual & Assembly Drawing		Logbook		
F.08	Termination of power cables, space heater cables, RTD Cables and control cables. Check for clearance, tightness, cable size, lug size, crimping tightness etc. Check for use of proper gland size and proper mounting of it.	Refer to 1. MAITREE-00-BBS-QA-300037-PSE (FQP for Medium Voltage Cabling) & 2. MAITREE-00-BHS-QA-300038-PSE (FQP for Low Voltage Cabling)								
F.09	Ensure that stator body and base frame and terminal box are connected to earth. Check for double earthing provision with suitable earth strips and ensure tightness of it.	V	-	B	100%	Erection Manual & Assembly Drawing		Logbook		
F.10	Freeness of motor rotor by manual rotation.	V	-	B	100%	Erection Manual & Assembly Drawing		Logbook		
F.11	Check IR value and PI value of motor winding. NOTE : 1. if IR value is more than 5 Giga-ohm in 1 minute then PI value need not be checked. 2. If IR value is less than specified, follow check in Sl. No. F.13	M	1kV / 5kV Megger	B*	100%	Assembly Drawing, OEM's instruction	OEM's instruction	Logbook	√	*** Customer Hold Point**
F.12	IR value (after 60 Seconds) for the following: A. Space Heater & cable B. RTD and Cable C. NDE side bearing insulation	M	500V/ 250V Megger	B	100%	Assembly Drawing, OEM's instruction	OEM's instruction	Logbook		
F.13	Dry out motor in case IR / PI values are less than required & retest	P	-	A	100%	Assembly Drawing, OEM's instruction	OEM's instruction	Logbook		
F.14	Check for CT ratio, magnetizing current, polarity (if applicable)	V		B	100%	Assembly Drawing, OEM's instruction	OEM's instruction	Logbook		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FEED WATER & CONDENSATE SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-L-QA-300071-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43C REV.NO.: 1 SHEET 06 / 07 SHEETS
SYSTEM: FEED WATER & CONDENSATE SYSTEM	SUB-SYSTEM: DEARATOR, CEP, H.P. & L.P. HEATERS, GSC, DRAIN COOLER	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*	*D**	*9*
F.15	Check distance between coupling halves of Pump & Motor	M	Measuring tape, Feeler gauge, Micrometer	B	100%	Erection Manual & Assembly Drawing	Erection Manual & Assembly Drawing	Logbook	√	*** Customer Hold Point**
F.16	Alignment of pumps and motor. Note: Coupling to be done after Motor Trial Run.	M	Dial gauge	A	100%	Drawing & Erection Manual	within 0.05 mm	Protocol	√	
F.17	Mounting of all instrumentation on Pump	V		B	100%	Drawing & Erection Manual	Drawing & Erection Manual	Log book		
F.18	Bumping & trial run of Pump Motor. Check for direction of rotation and correctness of wire connections.	V		B	100%	Drawing & Erection Manual	Drawing & Erection Manual	Protocol		
F.19	Filling of Bearing Oil Sump. Check for leakage.	V		B	100%	Erection Manual	No Leakage	Log book		
F.20	Ensure installation of required number of pipe supports	V	-	C	100%	Erection Manual & Assembly Drawing		Log book		piping load should not pass on the pump
G	**ERECTION OF GLAND STEAM CONDENSER**									
G.01	Levelling of exhauster & motor assembly on foundation & its alignment	M & V	Tape, Dial gauge	B	100%	Drawing	Drawing	SR		
G.02	Position, alignment and levelling of GSC. NOTE Ensure that no undue cold pull is transferred on GSC after connecting pipelines.	M & V	Tape, Water level	B	100%	Drawing	Drawing	SR		Cubes to be taken during grouting and compressive test to be done & witnessed by FQA .
G.03	Welding & NDT and PWHT, as applicable	As per Checks in Sl. No. D								
G.04	Mounting of instrumentation	V	-	B	100%	Instrument Schedule	Instrument Schedule	SR		
H	**ERECTION OF H.P. & L.P. HEATERS**									
H.01	Check position, level and alignment of Heaters.	M	Measuring Tape, Spirit level/ Water level	B	100%	Drawing	Drawing	Log book		
H.02	Adequate slope of heaters in order to drain heater when not in service.	M	Spirit level/ Water level scale	B	100%	Drawing	Drawing	Log book		
H.03	Installation and welding of drain / vent /root valves and thermowells as per drgs for mounting of instruments.	As per Checks in Sl. No. D								
H.04	Anchoring & availability of free expansion of moving support.	V		B	100%	Drawing	Drawing	Log book		

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **FEED WATER & CONDENSATE SYSTEM** STATEMENT OF CHECKS	FQP NO.: **MAITREE-00-L-QA-300071-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43C REV.NO.: 1 SHEET 07 / 07 SHEETS
SYSTEM: FEED WATER & CONDENSATE SYSTEM	SUB-SYSTEM: DEARATOR, CEP, H.P. & L.P. HEATERS, GSC, DRAIN COOLER	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*	*D**	*9*
H.05	Fit up, Welding, PWHT & NDT of pipelines (as applicable)	As per Checks in Sl. No. D								
I	**ERECTION OF DRAIN COOLER**									
I.01	Check foundation disposition & dimensions	M	Tape	B	100%	Drawing	Drawing	SR		
I.02	Check position, alignment and levelling of Drain Cooler	M & V	Tape, Water level	B	100%	Drawing	Drawing	SR		
I.03	Check all openings in Drain Cooler for any foreign material	V	-	B	100%	-	No foreign material	SR		
I.04	Completion of Piping connections : Welding & NDT (Ensure that no strain is caused on Cooler due to Piping)	As per Checks in Sl. No. D								
I.05	Provision of Vents & Installation of Drain Valves on Tube & Shell side	V	-	C	100%	Drawing	Drawing	SR		
J	**TG INTEGRAL PIPING**									
J.01	Checks shall be done as per FQP No. MAITREE-00-L-QA-300023-PSE (FQP for Power Cycle Piping)									
K	**INSULATION & PAINTING (UN-INSULATED PARTS)**									
K.01	Completion of Insulation & cladding, as applicable	V	-	B	100%	Drawing & Insulation Schedule	Drawing & Insulation Schedule	Logbook	√	
K.02	Touch-up of paint in damaged portions of equipment, if required (Batch TC from manufacturer to be reviewed & invoice to be co-related for each lot of supply, by FQA)	V & R	-	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & MAITREE-00-BFA-FF-100001-GEN		JOINT PROTOCOL	√	- Primer / paints to be procured from BIFPCL/OE approved source
K.03	Final Painting inspection for pipe / pipe-support - check DFT, finish, Colour shade	M & V	Digital DFT Gauge	B	100%			JOINT PROTOCOL	√	
K.04	Check marking & labelling of pipes & equipment	V	-	B	100%	Approved Painting Schedule : MAITREE-00-BFA-FF-100000-Gen & MAITREE-00-BFA-FF-100001-GEN		JOINT PROTOCOL	√	
L	**ERECTION COMPLETION CHECKS**									
L.01	Erection Completion Check for each equipment / system, Handing over for commissioning & Handing over of erection inspection records, Logsheets & protocols as per the Contract.	V & R	-	A	100%	Drawings	Drawings	JOINT PROTOCOL	√	Review of all Inspection records, Log Sheets, protocols for completeness and disposition status of NCRs (if any)

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RECORD OF QUALITY CHECKS

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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-ST-43C
PROJECT					REV. NO.: 1
UNIT NO.					LOG SHEET NO. : L-00
RATING					PAGE 1 OF 1

PSER	INSTRUMENT REG. NO./TAG NO.	
	DATE OF INSPECTION	
	DRAWING / DOCUMENT REF.	

PROTOCOL

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			NAME	SIGNATURE & DATE	FQP NO.: QPE-MTE-660-ST-43C
PROJECT		INSPECTED BY			REV. NO.: 1
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

MAITREE STPP : STEAM TURBINE UNIT#1

Siemens AG

Field Quality Plan (Montageprüffolgeplan) 1916

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Gadarwara	IN1061	10MA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

Erection Company:

Appendices:

ECCN: EAR99 AL: N

Preparation of Field Quality Plan (Erstellung des Montageprüffolgeplans)

	Prepared (erstellt) **Contractor (delivery)** (Hersteller)	**Checked** (geprüft): **Contractor (delivery)** (Hersteller)	**Checked** (geprüft): **Siemens PM**	**Checked** (geprüft): **Siemens QMiP**	**Released** (freigegeben): **Siemens GPM**
Company (Firma):					
Name / Dept. (Name/Abt.):					
Date (Datum):					
Signature (Unterschrift):					

Rev.	**Date** (Datum)	**Description of revision** (Änderungsbeschreibung)	**Prepared** (erstellt):	**Checked** (geprüft):	**Released** (freigegeben): .....
C					
B					
A	2015-07-27	First Edition			

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Gadarwara	IN1061	10MA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

*) Erklärung der Abkürzungen am Ende der Tabelle/Legend of abbreviations at the end of the table

Phase	No.	Description of inspection / activity (Beschreibung der Inspektion / Aktivität)	Doc.Code (Art der Dok.)	Date (Datum)	Category of Participation by (Prüfdurchführung und Teilnahme von) Signature (Kurzzeichen)					Remarks/ References/ Verifying Doc. Identification (Anmerkung/ Referenzdokumente/ Art der Ergebnisprotokolle)
					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
1	1	Einrichten der Baustelle, Einräumen der Baustellenmagazine SET UP EQUIPMENT ON SITE, SET UP SITE STORES	P		+					1.7-0001-0054 1.7-0005-0001 1.7-0004-0001 1.7-0010-0010
1	1.1	Materiallieferung auf Vollständigkeit und Unversehrtheit prüfen Check delivery of material for completeness and damages	S		+					
2	2	Transport und Aufstellen der Aggregate TRANSPORT AND INSTALLATION OF THE AUXILIARY UNITS	P		+					KUN 675.05 TLV 0800 1.7-7100-0001
2	3	Zubehör für diverse Systeme ACCESSORIES FOR MISC. SYSTEMS	P		+					KUN 675.05 TLV 0800 1.7-7100-0001
2	4	Turbinen- und Generatorfundament säubern, Fundament nach Vermessungsunterlagen prüfen CLEAN TURBINE AND GENERATOR FOUNDATIONS CHECK FOUNDATIONS AGAINST SURVEYING DOCUMENTS	S		+					
2	5	Einrüsten des Fundamentes zum Verlegen der Lagergehäuse ERECT FOUNDATION FORMWORK FOR LAYING	S		+					

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MAITREE STPP : STEAM TURBINE UNIT#1

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Gadarwara	IN1061	2DMA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

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1.2-T001-A-000565 to 1.2-T173-A-000565

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		BEARING CASING								
2	6	Bezugspunkte für Maschinenflurhöhe, Längs- und Querachse festlegen, Fixpunkte kontrollieren MARK OUT REFERENCE POINTS FOR TURBINE FLOOR ELEVATION, LONGITUDINAL AND TRANSVERSE AXES, CHECK ANCHOR POINTS	S		+					
2	7	Ankerschrauben für das hintere N2-Lagergehäuse einbauen INSERT ANCHOR BOLTS FOR REAR LP2-BEARING PEDESTAL	S		+					
2	8	Hinteres N2-Lagergehäuse säubern, montagefertig vorbereiten und auf Stellschrauben ablegen CLEAN REAR LP2-BEARING PEDESTAL, PREPARE FOR ASSEMBLY AND SET DOWN ON ADJUSTING SCREWS	S		+					
2	9	Thermoelemente in das hintere N2-Lagergehäuse einbauen INSTALL THERMO COUPLES IN REAR LP2-BEARING PEDESTAL	P		+	W	W			1.7-1018-0005
2	10	Ankerschrauben für das hintere N1-Lagergehäuse einbauen INSERT ANCHOR BOLTS FOR REAR LP1-BEARING PEDESTAL	S		+					

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MAITREE STPP : STEAM TURBINE UNIT#1

unit II

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Gadarwara	IN1061	20MA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

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Phase	No.	Description of inspection / activity (Beschreibung der Inspektion / Aktivität)	Doc.Code (Art der Dok.)	Date (Datum)	Category of Participation by (Prüfdurchführung und Teilnahme von) Signature (Kurzzeichen)					Remarks/ References/ Verifying Doc. Identification (Anmerkung/ Referenzdokumente/ Art der Ergebnisprotokolle)
					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	11	Hinteres N1-Lagergehäuse säubern, montagefertig vorbereiten und auf Stellschrauben ablegen CLEAN REAR LP1-BEARING PEDESTAL, PREPARE FOR ASSEMBLY AND SET DOWN ON ADJUSTING SCREWS	S		+					
2	12	Thermoelemente in das hintere N1-Lagergehäuse einbauen INSTALL THERMO COUPLES IN REAR LP1-BEARING PEDESTAL	P		+	W	W			1.7-1018-0005
2	13	Ankerschrauben für das hintere M-Lagergehäuse einbauen INSERT ANCHOR BOLTS FOR REAR IP-BEARING PEDESTAL	S		+					
2	14	Hinteres M-Lagergehäuse säubern, montagefertig vorbereiten und auf Stellschrauben ablegen CLEAN REAR IP-BEARING PEDESTAL, PREPARE FOR ASSEMBLY AND SET DOWN ON ADJUSTING SCREWS	S		+					
2	15	Thermoelemente in das hintere MD-Lagergehäuse einbauen INSTALL THERMO COUPLES IN REAR IP-BEARING PEDESTAL	P		+	W	W			1.7-1018-0005
2	16	Ankerschrauben für das hintere H-Lagergehäuse einbauen	S		+					

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MAITREE STPP : STEAM TURBINE UNIT#1 Unit II

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Field Quality Plan (Montageprüffolgeplan) 1916

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Gadarwara	IN1061	10MA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		INSERT ANCHOR BOLTS FOR REAR HP-BEARING PEDESTAL								
2	17	Hinteres H-Lagergehäuse säubern, montagefertig vorbereiten und auf Stellschrauben ablegen CLEAN REAR HP-BEARING PEDESTAL, PREPARE FOR ASSEMBLY AND SET DOWN ON ADJUSTING SCREWS	S		+					
2	18	Thermoelemente in das hintere H-Lagergehäuse einbauen INSTALL THERMO COUPLES IN REAR HP-BEARING PEDESTAL	P		+	W	W			1.7-1018-0005
2	19	Ankerschrauben für das vordere H-Lagergehäuse einbauen INSTALL ANCHOR BOLTS FOR FRONT HP-BEARING PEDESTAL	S		+					
2	20	Vorderes H-Lagergehäuse säubern, montagefertig vorbereiten und auf Stellschrauben ablegen CLEAN FRONT HP-BEARING PEDESTAL, PREPARE FOR ASSEMBLY AND SET DOWN ON ADJUSTING SCREWS	S		+					
2	21	Thermoelemente in das vordere H-Lagergehäuse einbauen INSTALL THERMO COUPLES IN FRONT HP-BEARING PEDESTAL	P		+	W	W			1.7-1018-0005

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MAITREE STPP : STEAM TURBINE UNIT#1

Unit II

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	22	Hinteres N2-Lagergehäuse nach Zeichnung und Biegelinie ausrichten ALIGN REAR LP2-BEARING PEDESTAL TO DRAWING AND DEFLECTION CURVE	P		+		H			1.7-1040-0027 1.7-1042-0040 1.7-1044-0040 1.7-1052-0010
2	23	Hinteres N1-Lagergehäuse nach Zeichnung und Biegelinie ausrichten ALIGN REAR LP1-BEARING PEDESTAL TO DRAWING AND DEFLECTION CURVE	P		+		H			1.7-1040-0027 1.7-1042-0040 1.7-1044-0040 1.7-1052-0010
2	24	Hinteres M-Lagergehäuse nach Zeichnung und Biegelinie ausrichten ALIGN REAR IP-BEARING PEDESTAL TO DRAWING AND DEFLECTION CURVE	P		+		H			1.7-1040-0027 1.7-1042-0040 1.7-1044-0040 1.7-1052-0010
2	25	Vorderes und hinteres H-Lagergehäuse nach Zeichnung und Biegelinie ausrichten ALIGN FRONT AND REAR HP-BEARING PEDESTALS TO DRAWING AND DEFLECTION CURVE	P		+		H			1.7-1040-0027 1.7-1042-0040 1.7-1044-0040 1.7-1052-0010
2	26	Verschalung zum Untergießen des hinteren N2-Lagergehäuses anbringen SET UP FORMWORK FOR GROUTING REAR LP2-BEARING PEDESTAL	S		+					
2	27	Verschalung zum Untergießen des hinteren N1-Lagergehäuses anbringen	S		+					

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MAITREE STPP : STEAM TURBINE UNIT#1 Unit II

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Gadarwara	IN1061	20MA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

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Phase	No.	Description of inspection / activity (Beschreibung der Inspektion / Aktivität)	Doc.Code (Art der Dok.)	Date (Datum)	Category of Participation by (Prüfdurchführung und Teilnahme von) Signature (Kurzzeichen)					Remarks/ References/ Verifying Doc. Identification (Anmerkung/ Referenzdokumente/ Art der Ergebnisprotokolle)
					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		SET UP FORMWORK FOR GROUTING REAR LP1-BEARING PEDESTAL								
2	28	Verschalung zum Untergießen des hinteren M-Lagergehäuses anbringen SET UP FORMWORK FOR GROUTING REAR IP-BEARING PEDESTAL	S		+					
2	29	Verschalung zum Untergießen der vorderen und hinteren H-Lagergehäuse anbringen SET UP FORMWORK FOR GROUTING FRONT AND REAR HP-BEARING PEDESTALS	S		+					
2	30	Ausrichtkontrolle der Lagergehäuse und Grundplatten vor dem vergiessen ALIGNMENT CHECK OF BEARING CASINGS AND BASEPLATES BEFORE GROUTING	P		+	H ✓	H mandatory			1.7-1040-0027 1.7-1042-0040 1.7-1044-0040 1.7-1052-0010
2	31	Hinteres N2-Lagergehäuse nach Vorschrift mit Vergussmörtel untergießen GROUT REAR LP2-BEARING PEDESTAL WITH GROUTING COMPOUND AS SPECIFIED	P		+		H			TLV 2051 1.7-1040-0027
2	32	Hinteres N1-Lagergehäuse nach Vorschrift mit Vergussmörtel untergießen GROUT REAR LP1-BEARING PEDESTAL WITH GROUTING COMPOUND AS SPECIFIED	P		+		H			TLV 2051 1.7-1040-0027

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr /Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	33	Hinteres M-Lagergehäuse nach Vorschrift mit Vergussmörtel untergießen GROUT REAR IP-BEARING PEDESTAL WITH GROUTING COMPOUND AS SPECIFIED	P		+		H			TLV 2051 1.7-1040-0027
2	34	Vorderes und hinteres H-Lagergehäuse nach Vorschrift mit Vergussmörtel untergießen GROUT FRONT AND REAR HP-BEARING PEDESTALS WITH GROUTING COMPOUND AS SPECIFIED	P		+		H			TLV 2051 1.7-1040-0027
2	35	Ausrichtkontrolle der Lagergehäuse und Grundplatten nach dem vergiessen ALIGNMENT CHECK OF BEARING CASINGS AND BASEPLATES AFTER GROUTING	P		+		H			1.7-1043-0040 1.7-1045-0040 1.7-1052-0010
2	36	Rundstähle zu den N2-Gehäuse-Mittenführungen in die Fundamentriegel einbauen, vorrichten und Schweißen INSTALL, PREALIGN AND WELD STEEL BARS FOR LP2-CASING CENTERING GUIDERS IN FOUNDATION	P		+		H			WPS (the document has to be provided by the responsible erection company) 1.7-1042-0040
2	36.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	37	Rundstähle zu den N-Gehäuse-Mittenführungen in die Fundamentriegel einbauen, vorrichten und Schweißen	P		+		H			WPS (the document has to be provided by the responsible erection company)

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MAITREE STPP : STEAM TURBINE UNIT#1 (Unit II)

Siemens AG

Field Quality Plan (Montageprüffolgeplan) **1916**

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Gadarwara	IN1061	30MA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

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*) Erklärung der Abkürzungen am Ende der Tabelle/Legend of abbreviations at the end of the table

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		INSTALL, PREALIGN AND WELD STEEL BARS FOR LP1-CASING CENTERING GUIDERS IN FOUNDATION								1.7-1042-0040
2	37.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	38	Hohlräume der Gehäuse Mittenführungen in den Fundamentriegeln mit Vergussmörtel füllen FILL IN VOIDS IN CASING CENTERING GUIDES IN THE FOUNDATION BEAMS WITH GROUTING COMPOUND	P		+		H			TLV 2051 1.7-1043-0040
2	39	N1-Längs- und Stirnwände säubern und montagefertig vorbereiten CLEAN LP1-SIDE AND END WALLS AND PREPARE FOR ASSEMBLY	S		+					
2	40	N1-Stirnwände einfädeln, ausrichten und fixieren SET DOWN LP1-END WALLS ON SUPPORTING ARMS, ALIGN AND SECURE	P		+					WPS (the document has to be provided by the responsible erection company)
2	40.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	41	Einbaumaße der N1-Längswände kontrollieren und herstellen CHECK AND ESTABLISH THE AS-ASSEMBLED DIMENSIONS OF THE LP1-SIDE WALLS	S		+					
2	42	N1-Längswände ausrichten, einpassen und abheften ALIGN, FIT AND TACK-WELD THE LP1-SIDE WALLS	P		+					WPS (the document has to be provided by the responsible erection company)
2	42.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	43	Versteifungsrohre des N1-Außengehäuses einpassen und verschweißen FIT AND WELD BRACING PIPES FOR LP1-OUTER CASING	P		+					WPS (the document has to be provided by the responsible erection company)
2	43.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	44	N1-Kreisbogenträger aufbauen, ausrichten und verschrauben ALIGN, MOUNT AND BOLT DOWN THE LP1-CIRCULAR ARC SUPPORTS	P		+					WPS (the document has to be provided by the responsible erection company)

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	**44.1**	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	**45**	N1-Außengehäuse-Unterteil komplett verschweißen WELD THE ENTIRE LP1-BOTTOM HALF OUTER CASING	P		+					WPS (the document has to be provided by the responsible erection company)
2	**45.1**	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	**46**	N1-Außengehäuse-Oberteil aufdecken und säubern, Verbindungsstellen an den Teilfugen schweißen und bearbeiten REMOVE LP1-TOP-HALF OUTER CASING AND CLEAN, WELD AND FINISH JOINTS ON JOINT PLANE	P		+					WPS (the document has to be provided by the responsible erection company)
2	**46.1**	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	**47**	N1-Außengehäuse-Unterteil nach Längs- und Querachse und in der Höhe nach Biegelinie ausrichten ALIGN LP1-BOTTOM-HALF OUTER CASING TO LONGITUDINAL AND TRANSVERSE AXES AND	P		+		H			1.7-1379-0001

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Gadarwara	IN1061	30MA	&MDC080			
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID	

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		VERTICALLY WITH DEFLECTION CURVE								
2	48	Passbleche des N1-Außengehäuse-Unterteiles anpassen und verschweißen FIT AND WELD THE SHIM PLATES OF THE LP1-BOTTOM HALF OUTER CASING	P		+					WPS (the document has to be provided by the responsible erection company)
2	48.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	49	N1-Tragarm- und Mittenführungs-Kompensatoren anbauen, anpassen und schweißen PROVISIONALLY MOUNT THE EXPANSION JOINT FOR THE LP1-SUPPORTING ARM AND CENTERING GUIDE	P		+					WPS (the document has to be provided by the responsible erection company) 1.7-1036-0001
2	49.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	50	N1-Innengehäuse-Unterteil in N1-Außengehäuse-Unterteil ablegen SET DOWN LP1-BOTTOM HALF INNER CASING IN LP1 BOTTOM HALF OUTER CASING	S		+					
2	51	N1-Innengehäuse-Unterteil auf Höhe und nach Achse ausrichten	S		+					

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Gadarwara	IN1061	20MA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	Unit

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		ALIGN ELEVATION AND CENTERLINE OF LP1-BOTTOM HALF INNER CASING								
2	52	N1-Innengehäuse radial und axial fixieren, Schubstangenkontrolle FIX THE LP1-INNER CASING RADIALLY AND AXIALLY IN POSITION, CHECK THE GUIDE RODS	S		+					
2	53	N1-Wellendichtungsgehäuse-Unterteile säubern und an Lagergehäuse anbauen CLEAN LP1-BOTTOM HALF SHAFT SEAL CASING AND ATTACH TO BEARING PEDESTAL	P		+					WPS (the document has to be provided by the responsible erection company)
2	53.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	54	N1-Turbinenwelle säubern und montagefertig vorbereiten CLEAN LP1-SHAFT AND PREPARE FOR ASSEMBLY	P		+					1.7-1250-0035 1.7-1350-0035
2	55	N1-Betriebs- und Hilfslager säubern, montagefertig vorbereiten und einbauen CLEAN MAIN AND AUXILIARY LP1-BEARINGS, PREPARE FOR ASSEMBLY AND INSTALL	P		+					1.7-1018-0005
2	56	Kompensatoren zur Wellendichtung auf N1-Turbinenwelle einfädeln	S		+					

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Siemens AG

Field Quality Plan (Montageprüffolgeplan) **1916**

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

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SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		SLIDE BELLOWS-TYPE EXPANSION JOINTS AT SHAFT SEALS ONTO LP1-SHAFT								
2	57	N1-Turbinenwelle in Betriebs- und Hilfslager einbauen und ausrichten INSTALL LP1-TURBINE SHAFT IN MAIN AND AUXILIARY BEARINGS AND ALIGN	P		+	H	H mandatory			1.7-1016-0001 1.7-1267-0035
2	58	Radiale und axiale Wellenstichmaße in den Lagergehäusen festlegen TAKE ACTUAL RADIAL AND AXIAL SHAFT DIMENSIONS IN THE BEARING PEDESTALS	P		+					1.7-1262-0001 1.7-1362-0001
2	59	N1-Wellendichtungsgehäuse-Unterteile nach N1-Turbinenwelle vorrichten PROVISIONALLY ALIGN LOWER SECTION OF LP1-SHAFT SEAL CASING TO LP1-SHAFT	P		+					1.7-1341-0005 1.7-1340-0005
2	60	N1-Innengehäuse-Unterteil radial und axial nach N1-Turbinenwelle ausrichten RADIALLY AND AXIALLY ALIGN LP1-BOTTOM-HALF INNER CASING TO LP1-TURBINE SHAFT	S		+					
2	61	Radiale und axiale Schaufelspielkontrolle der N1-Turbinenwelle durchführen PERFORM RADIAL AND AXIAL BLADING CLEARANCE CHECK ON LP1-TURBINE	P		+	H	H mandatory			1.7-1332-0060 1.7-1335-0055 1.7-1322-0025 1.7-1336-0055
2	62	N1-Leitschaufelträger- und Leitschaufelkranz-Oberteil auflegen, Teilflächenschrauben anziehen	P		+		H			1.7-1323-0002 1.7-1323-0010

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Unit II

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System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		INSTALL LP1 GUIDE BLADE CARRIER AND STATIONARY BLADE RING UPPER PART, TIGHTEN JOINT BOLTS								1.7-1016-0002
2	63	Äußeres N1-Innengehäuse-Oberteil betriebsfertig auflegen, Teilflächenschrauben anziehen MOUNT THE OUTER SHELL OF LP1-INNER CASING READY FOR OPERATION TIGHTEN CASING JOINT BOLTS	P		+		H			1.7-1323-0052 1.7-1320-0058 1.7-1036-0001 1.7-1016-0002
2	64	Axiale Vergangkontrolle der N1-Innengehäuse durchführen CHECK THE AXIAL DISPLACMENT OF THE LP1-INNER CASING	P		+	H	H			1.7-1351-0006 1.7-1332-0060
2	65	Gehäuse-Deckel aufbauen und verschrauben MOUNT LP1 TOP HALVES COVERS AND TIGHTEN THE JOINT BOLTS	P		+					WPS (the document has to be provided by the responsible erection company)
2	65.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	66	Bohrungen für Passbolzen in Teilfläche N1-Außengehäuse bohren und aufreiben DRILL AND REAM HOLES FOR FITTING BOLTS IN JOINT PLANE OF LP1-OUTER CASING	S		+					

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Unit II

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	67	Reißmembrane montieren INSTALL ATMOSPHERIC RELIEF DIAPHRAGM	P		+	W	W			1.7-1036-0001
2	68	N1-Gehäuse-Deckel aufdecken und säubern REMOVE LP1 TOP-HALVES COVERS PARTS AND CLEAN	S		+					
2	69	N1-Außengehäuse-Oberteil betriebsfertig auflegen, Teilflächenschrauben anziehen MOUNT LP1-TOP-HALF OUTER CASING READY FOR OPERATION, TIGHTEN CASING JOINT BOLTS	P		+		H			1.7-1380-0001 1.7-1036-0001 1.7-1381-0002
2	70	N2-Längs- und Stirnwände säubern und montagefertig vorbereiten CLEAN LP2-SIDE AND END WALLS AND PREPARE FOR ASSEMBLY	S		+					
2	71	N2-Stirnwände auf Tragarme Einfädeln, ausrichten und fixieren SET DOWN LP2-END WALLS ON SUPPORTING ARMS, ALIGN AND SECURE	P		+					WPS (the document has to be provided by the responsible erection company)
2	71.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	72	Einbaumaße der N2-Längswände kontrollieren und herstellen CHECK AND ESTABLISH THE AS-ASSEMBLED DIMENSIONS OF THE LP2-SIDE WALLS	S		+					
2	73	N2-Längswände ausrichten, einpassen und abheften ALIGN, FIT AND TACK-WELD THE LP2-SIDE WALLS	P		+					WPS (the document has to be provided by the responsible erection company)
2	73.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	74	Versteifungsrohre des N2-Außengehäuses einpassen und verschweißen FIT AND WELD BRACING PIPES FOR LP2-OUTER CASING	P		+					WPS (the document has to be provided by the responsible erection company)
2	74.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	75	N2-Kreisbogenträger ausrichten, aufbauen und verschrauben ALIGN, MOUNT AND BOLT DOWN THE LP2-CIRCULAR SUPPORTS	P		+					WPS (the document has to be provided by the responsible erection company)

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1.2-T001-A-000565 to 1.2-T173-A-000565

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Phase	No.	Description of inspection / activity (Beschreibung der Inspektion / Aktivität)	Doc.Code (Art der Dok.)	Date (Datum)	Category of Participation by (Prüfdurchführung und Teilnahme von) Signature (Kurzzeichen)					Remarks/ References/ Verifying Doc. Identification (Anmerkung/ Referenzdokumente/ Art der Ergebnisprotokolle)
					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	**75.1**	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	**76**	N2-Außengehäuse-Unterteil komplett verschweißen WELD THE ENTIRE LP2-BOTTOM HALF OUTER CASING	P		+					WPS (the document has to be provided by the responsible erection company)
2	**76.1**	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	**77**	N2-Außengehäuse-Oberteil aufdecken und säubern, Verbindungsstellen an den Teilfugen schweißen und bearbeiten REMOVE LP2-TOP-HALF OUTER CASING AND CLEAN, WELD AND FINISH JOINTS ON JOINT PLANE	P		+					WPS (the document has to be provided by the responsible erection company)
2	**77.1**	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	**78**	N2-Außengehäuse-Unterteil nach Längs- und Querachse und in der Höhe nach Biegelinie ausrichten ALIGN LP2-BOTTOM-HALF OUTER CASING TO LONGITUDINAL AND TRANSVERSE AXES AND	P		+		H			1.7-1479-0001

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Req. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		VERTICALLY WITH DEFLECTION CURVE								
2	79	Passbleche des N2-Außengehäuse-Unterteiles anpassen und verschweißen FIT AND WELD THE SHIM PLATES OF THE LP2-BOTTOM HALF OUTER CASING	P		+					WPS (the document has to be provided by the responsible erection company)
2	79.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	80	N2-Tragarm- und Mittenführungs-Kompensatoren anbauen, anpassen und verschweißen PROVISIONALLY MOUNT THE EXPANSION JOINT FOR THE LP2-SUPPORTING ARM AND CENTERING GUIDE	P		+					WPS (the document has to be provided by the responsible erection company) 1.7-1036-0001
2	80.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	81	N2-Innengehäuse-Unterteil in N2-Außengehäuse-Unterteil ablegen SET DOWN LP2-BOTTOM HALF INNER CASING IN LP2BOTTOM HALF OUTER CASING	S		+					
2	82	N2-Innengehäuse-Unterteil auf Höhe und nach Achse ausrichten	S		+					

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Gadarwara	IN1061	10MA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		ALIGN ELEVATION AND CENTERLINE OF LP2-BOTTOM HALF INNER CASING								
2	83	N2-Innengehäuse radial und axial fixieren, Schubstangenkontrolle FIX THE LP2-INNER CASING RADIALLY AND AXIALLY IN POSITION, CHECK THE GUIDE RODS	P		+					WPS (the document has to be provided by the responsible erection company) 1.7-1075-0001
2	83.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	84	N2-Wellendichtungsgehäuse-Unterteile säubern und an Lagergehäuse anbauen CLEAN LP2-BOTTOM HALF SHAFT SEAL CASING AND ATTACH TO BEARING PEDESTAL	P		+					WPS (the document has to be provided by the responsible erection company)
2	84.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	85	N2-Turbinenwelle säubern und montagefertig vorbereiten CLEAN LP2-SHAFT AND PREPARE FOR ASSEMBLY	P		+					1.7-1450-0040 1.7-1350-0035
2	86	N2-Betriebs- und Hilfslager säubern, montagefertig vorbereiten und einbauen CLEAN MAIN AND AUXILIARY LP2-BEARINGS,	P		+					1.7-1018-0005

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

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1.2-T001-A-000565 to 1.2-T173-A-000565

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		PREPARE FOR ASSEMBLY AND INSTALL								
2	87	Kompensatoren zur Wellendichtung auf N2-Turbinenwelle einfädeln SLIDE BELLOWS-TYPE EXPANSION JOINTS AT SHAFT SEALS ONTO LP2-SHAFT	S		+					
2	88	N2-Turbinenwelle in Betriebs- und Hilfslager einbauen und ausrichten INSTALL LP2-TURBIBE SHAFT IN MAIN AND AUXILIARY BEARINGS AND ALIGN	P		+	H	H			1.7-1016-0002 1.7-1467-0035
2	89	Radiale und axiale Wellenstichmaße in den Lagergehäusen festlegen TAKE ACTUAL RADIAL AND AXIAL SHAFT DIMENSIONS IN THE BEARING PEDESTALS	P		+					1.7-1362-0001 1.7-1462-0001
2	90	N2-Wellendichtungsgehäuse-Unterteile nach N2-Turbinenwelle vorrichten PROVISIONALLY ALIGN LOWER SECTION OF LP2-SHAFT SEAL CASING TO LP2-SHAFT	P		+					1.7-1440-0005 1.7-1441-0005
2	91	N2-Innengehäuse-Unterteil radial und axial nach N2-Turbinenwelle ausrichten RADIALLY AND AXIALLY ALIGN LP2-BOTTOM-HALF INNER CASING TO LP2-TURBINE SHAFT	S		+					
2	92	Radiale und axiale Schaufelspielkontrolle der N2-Turbinenwelle durchführen	P		+	H	H			1.7-1422-0025 1.7-1432-0060

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Unit II

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Gadarwara	IN1061	2 0MA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		PERFORM RADIAL AND AXIAL BLADING CLEARANCE CHECK ON LP2-TURBINE					manufactory			1.7-1435-0055 1.7-1436-0055
2	93	N2-Leitschaufelträger- und Leitschaufelkranz-Oberteil auflegen, Teilflächenschrauben anziehen INSTALL LP2 GUIDE BLADE CARRIER AND STATIONARY BLADE RING UPPER PART, TIGHTEN JOINT BOLTS	P		+		H			1.7-1016-0002 1.7-1423-0002 1.7-1423-0010
2	94	Äußeres N2-Innengehäuse-Oberteil betriebsfertig auflegen, Teilflächenschrauben anziehen MOUNT THE OUTER SHELL OF LP2-INNER CASING READY FOR OPERATION TIGHTEN CASING JOINT BOLTS	P		+		H			1.7-1036-0001 1.7-1016-0002 1.7-1420-0058 1.7-1423-0052
2	95	Axiale Vergangkontrolle der N2-Innengehäuse durchführen CHECK THE AXIAL DISPLACMENT OF THE LP2-INNER CASING	P		+	H	H manufactory			1.7-1451-0006 1.7-1432-0060
2	96	Gehäuse-Deckel aufbauen und verschrauben MOUNT LP2 TOP HALVES COVERS AND TIGHTEN THE JOINT BOLTS	P		+					WPS (the document has to be provided by the responsible erection company)
2	96.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1

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Unit II

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	97	Bohrungen für Passbolzen in Teilfläche N2-Außengehäuse bohren und aufreiben DRILL AND REAM HOLES FOR FITTING BOLTS IN JOINT PLANE OF LP2-OUTER CASING	S		+					
2	98	Reißmembran in N2-Außengehäuse-Oberteil montieren INSTALL ATMOSPHERIC RELIEF DIAPHRAGM INTO LP2-TOP-HALF OUTER CASING	P		+	W	W			1.7-1036-0001
2	99	N2-Gehäuse-Deckel aufdecken und säubern REMOVE LP2 TOP-HALVES COVERS PARTS AND CLEAN	S		+					
2	100	N2-Außengehäuse-Oberteil betriebsfertig auflegen, Teilflächenschrauben anziehen MOUNT LP2-TOP-HALF OUTER CASING READY FOR OPERATION, TIGHTEN CASING JOINT BOLTS	P		+		H			1.7-1480-0001 1.7-1036-0001 1.7-1481-0002
2	101	H-Teilturbine säubern und montagefertig vorbereiten CLEAN HP-TURBINE AND PREPARE FOR ASSEMBLY	P		+	W	W			1.7-1150-0035 1.7-1016-0002 1.7-1018-0005
2	102	H-Teilturbine auf Lagergehäuse stellen und vorrichten SET DOWN HP-TURBINE ON BEARING PEDESTALS AND PROVISIONALLY ALIGN	S		+					

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MAITREE STPP : STEAM TURBINE UNIT#1 (Unit II)

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Gadarwara	IN1061	10MA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	103	Radiale und axiale Wellenstichmaße in den Lagergehäusen festlegen ESTABLISH THE RADIAL AND AXIAL CHECK DIMENSIONS FOR THE SHAFT IN THE BEARING PEDESTALS	S		+					
2	104	H-Betriebs- und Hilfslager säubern, montagefertig vorbereiten und einbauen CLEAN MAIN AND AUXILIARY HP-BEARINGS, PREPARE FOR ASSEMBLY AND INSTALL	P		+					1.7-1018-0005
2	105	H-Turbinenwelle einlagern und ausrichten SET DOWN HP-SHAFT IN BEARINGS AND ALIGN SHAFT	P		+	H ✓	H mandatory			1.7-1166-0005 1.7-1167-0035
2	106	H-Turbinengehäuse nach H-Turbinenwelle radial und axial ausrichten ALIGN HP-TURBINE CASING RADIALLY AND AXIALLY TO HP-TURBINE SHAFT	P		+	W	W			1.7-1151-0005 1.7-1170-0001
2	107	Radiale und axiale Vergangkontrolle der H-Teilturbine PERFORM RADIAL AND AXIAL CLEARANCE CHECK ON HP-TURBINE	P		+	H ✓	H mandatory			1.7-1151-0005
2	108	M-Teilturbine säubern und montagefertig vorbereiten CLEAN IP-TURBINE AND PREPARE FOR ASSEMBLY	P		+	W	W			1.7-1215-0002 1.7-1036-0001 1.7-1250-0035 1.7-1016-0002

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MAITREE STPP : STEAM TURBINE UNIT#1

Unit II

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
										1.7-1018-0005
2	109	M-Teilturbine auf Lagergehäuse stellen und vorrichten SET DOWN IP TURBINE ON BEARING PEDESTALS AND PROVISIONALLY ALIGN	S		+					
2	110	Radiale und axiale Wellenstichmaße in den Lagergehäusen festlegen ESTABLISH THE RADIAL AND AXIAL CHECK DIMENSIONS FOR THE SHAFT IN THE BEARING PEDESTALS	S		+					
2	111	M-Betriebs- und Hilfslager säubern, montagefertig vorbereiten und einbauen CLEAN MAIN AND AUXILIARY IP-BEARINGS, PREPARE FOR ASSEMBLY AND INSTALL	P		+					1.7-1018-0005
2	112	M-Turbinenwelle einlagern und ausrichten SET DOWN IP-SHAFT IN BEARINGS AND ALIGN SHAFT	P		+	H ✓	H mandatory			1.7-1267-0035
2	113	M-Turbinengehäuse nach M-Turbinenwelle radial und axial ausrichten ALIGN IP-TURBINE CASING RADIALLY AND AXIALLY TO IP-TURBINE SHAFT	P		+	W	W			1.7-1251-0006 1.7-1270-0001
2	114	Radiale und axiale Vergangkontrolle der M-Teilturbine PERFORM RADIAL AND AXIAL CLEARANCE	P		+	H ✓	H mandatory			1.7-1251-0006

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Unit II

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr /Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		CHECK ON IP-TURBINE								
2	115	Montage der Ventilunterstützungen für Frischdampf-Schnellschluss-Stellventile ATTACH SUPPORTS FOR MAIN STOP AND CONTROL VALVES	P		+					WPS (the document has to be provided by the responsible erection company) 1.7-1036-0001
2	115.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	116	Montage und Ausrichten der Frischdampf-Schnellschluss-Stellventile INSTALL AND ALIGN MAIN STOP AND CONTROL VALVES	P		+	H	H			1.7-2305-0002 1.7-1115-0009 1.7-1016-0002
2	117	Montage der Ventilunterstützungen für Abfang-Schnellschluss-Stellventile ATTACH SUPPORTS FOR REHEAT STOP AND CONTROL VALVES	P		+					WPS (the document has to be provided by the responsible erection company) 1.7-1036-0001
2	117.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	118	Montage und Ausrichten der Abfang-Schnellschluss-Stellventile INSTALL AND ALIGN REHEAT STOP AND	P		+		H			1.7-1215-0008 1.7-2305-0002 1.7-1225-0001

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MAITREE STPP : STEAM TURBINE UNIT#1 Unit 2

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		CONTROL VALVES								1.7-2312-0010 1.7-1215-0010 1.7-2312-0011 1.7-1225-0002 1.7-1016-0002
2	**119**	Montage der Ventilunterstützungen für Überlastventil ATTACH SUPPORTS FOR OVERLOAD VALVE	P		+					WPS (the document has to be provided by the responsible erection company)
2	**119.1**	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	**120**	Montage und Ausrichten der Überlastventile und Rohrleitungen INSTALL AND ALIGN OVERLOAD VALVES AND PIPING	S		+		H			
2	**121**	Anbau aller Schalt- und Stellantriebe für FV, AV und UV INSTALL ALL VALVE ACTUATORS FOR MAIN STEAM, REHEAT STOP AND CONTROL VALVES	P		+	W	W			1.7-2301-0016 1.7-2302-0016 1.7-2301-0017 1.7-2302-0017 1.7-1036-0001 1.7-2301-0022

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MAITREE STPP : STEAM TURBINE UNIT#1

Unit #1

Siemens AG

Field Quality Plan (Montageprüffolgeplan) 1916

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Gadarwara	IN1061	10MA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	Unit

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	122	Thermoelemente und WT-Fühler einbauen INSTALL THERMO-COUPLES AND TSE SENSORS	S		+	W	W			
2	123	Anpassen, Montieren und Schweißen der Überströmleitung FIT, WELD AND INSTALL CROSS OVER PIPE	P		+	W	W			WPS (the document has to be provided by the responsible erection company) 1.7-1092-0002 1.7-1376-0002 1.7-1090-0005 1.7-1091-0005 1.7-1476-0002
2	123.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	124	Betriebsfertige Montage der Überströmleitung ASSEMBLE CROSS OVER PIPE READY FOR OPERATION	P		+		H			1.7-1036-0001 1.7-1376-0002 1.7-1016-0002 1.7-1090-0005 1.7-1476-0002
2	125	Endausrichtung des Wellenstranges im Betriebszustand PERFORM FINAL ALIGNMENT OF SHAFT ASSEMBLY IN OPERATING CONDITION	P		+		H			1.7-1050-0007 1.7-1249-0002 1.7-1150-0035 1.7-1250-0035 1.7-1349-0002

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr /Reg. No	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
										1.7-1149-0001 1.7-1449-0003 1.7-1052-0010 1.7-1450-0040 1.7-1350-0035
2	**126**	H-M-Kupplung zusammenziehen, Kupplungsbohrungen aufreiben und honen, Kupplungsbolzen einpassen DRAW TOGETHER HP/IP COUPLING, REAM AND HONE COUPLING HOLES, FINISH-GRIND COUPLING BOLTS	P		+		H			1.7-1149-0020
2	**127**	M-N1-Kupplung zusammenziehen, Kupplungsbohrungen aufreiben und honen, Kupplungsbolzen einpassen DRAW TOGETHER IP/LP1 COUPLING, REAM AND HONE COUPLING HOLES, FINISH-GRIND COUPLING BOLTS	P		+		H			1.7-1249-0020
2	**128**	N1-N2-Kupplung Zusammenziehen, Kupplungsbohrungen aufreiben und honen, Kupplungsbolzen einpassen DRAW TOGETHER LP1/LP2 COUPLING, REAM AND HONE COUPLING HOLES, FINISH-GRIND COUPLING BOLTS	P		+		H			1.7-1349-0020
2	**129**	N2-Generator-Kupplung zusammenziehen, Kupplungsbohrungen Aufreiben und honen,	P		+		H			1.7-1449-0025

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		Kupplungsbolzen einpassen DRAW TOGETHER LP2-GENERATOR COUPLING, REAM AND HONE COUPLING HOLES, FINISH-GRIND COUPLING BOLTS								
2	130	H-M Turbinenwellen kuppeln unter Rundlaufkontrolle der Kupplungsflansche COUPLE HP- AND IP-SHAFTS, CHECKING RADIAL RUN-OUT OF COUPLING FLANGES	P		+	H	H mandatory			1.7-1150-0003 1.7-1150-0035 1.7-1149-0001
2	131	M-N1 Turbinenwelle kuppeln unter Rundlaufkontrolle der Kupplungsflansche COUPLE IP- AND LP1-SHAFTS, CHECKING RADIAL RUN-OUT OF COUPLING FLANGES	P		+	H	H	"		1.7-1249-0002 1.7-1250-0035 1.7-1250-0020
2	132	N1-N2 Turbinenwelle kuppeln unter Rundlaufkontrolle der Kupplungsflansche COUPLE LP1- AND LP2-SHAFTS, CHECKING RADIAL RUN-OUT OF COUPLING FLANGES	P		+	H	H	"		1.7-1350-0002 1.7-1349-0002 1.7-1350-0035
2	133	N2-Turbinenwelle mit Generatorläufer kuppeln unter Rundlaufkontrolle der Kupplungsflansche COUPLE LP2-SHAFT AND GENERATOR ROTOR, CHECKING RADIAL RUN-OUT OF COUPLING FLANGES	P		+	H	H	"		1.7-1449-0003 1.7-1450-0021 1.7-1450-0040
2	134	Radiale Vergangkontrolle der N1-Innengehäuse mit Hilfe der Stellschrauben durchführen CHECK THE RADIAL CLEARANCE OF THE LP1-	P		+	H	H	"		1.7-1351-0006

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		INNER CASING BY MEANS OF THE ADJUSTING SCREWS								
2	135	Rundlaufkontrolle an der Endstufe des äußeren N1-Innengehäuses CHECK RADIAL RUN-OUT OF FINAL STAGE OF OUTER SHELL OF LP1-INNER CASING	P		+	H ✓	H mandatory			1.7-1351-0006 1.7-1322-0025
2	136	N1-Innengehäuse eventuell nachrichten, Passfedern der Gehäuseauflagen und Mittenführung einbauen CORRECT THE ALIGNMENT OF LP1-INNER CASING IF NECESSARY, AND MOUNT THE FITTED KEYS FOR CASING SUPPORTS AND CENTERING GUIDE	P		+	W	W			1.7-1320-0062 1.7-1320-0063 1.7-1351-0001 1.7-1332-0060
2	137	N1-Wellendichtungsgehäuse-Unterteile nach dem gekuppelten Wellenstrang ausrichten ALIGN LP1-BOTTOM HALF SHAFT SEAL CASING TO COUPLED SHAFT ASSEMBLY	P		+	W	W			1.7-1343-0005 1.7-1052-0010
2	138	Radialspiele der N1-Wellendichtung kontrollieren CHECK RADIAL CLEARANCES OF LP1-SHAFT SEAL	P		+	H ✓	H mandatory			1.7-1341-0005 1.7-1340-0005
2	139	N1-Wellendichtungsgehäuse betriebsfertig zudecken, Passfedern einpassen und einbauen PLACE COVER ON LP1-SHAFT SEAL CASING READY FOR OPERATION FABRICATE TO SIZE AND INSERT FITTED KEYS	P		+	W	W			WPS (the document has to be provided by the responsible erection company) 1.7-1343-0005 1.7-1016-0001 1.7-1036-0001 1.7-1381-0001

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System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	139.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	140	Radiale Vergangkontrolle der N2-Innengehäuse mit Hilfe der Stellschrauben durchführen CHECK THE RADIAL CLEARANCE OF THE LP2-INNER CASING BY MEANS OF THE ADJUSTING SCREWS	P		+	H ✓	H mandatory			1.7-1451-0006
2	141	Rundlaufkontrolle an der Endstufe des äußeren N2-Innengehäuses CHECK RADIAL RUN-OUT OF FINAL STAGE OF OUTER SHELL OF LP2-INNER CASING	P		+	H ✓	H mandatory			1.7-1451-0006 1.7-1422-0025
2	142	N2-Innengehäuse eventuell nachrichten, Passfedern der Gehäuseauflagen und Mittenführung einbauen CORRECT THE ALIGNMENT OF THE LP2-INNER CASING IF NECESSARY, AND MOUNT THE FITTED KEYS FOR CASING SUPPORTS AND CENTERING GUIDE	P		+	W	W			1.7-1451-0001 1.7-1420-0063 1.7-1420-0062 1.7-1432-0060
2	143	N2-Wellendichtungsgehäuse-Unterteile nach dem gekuppelten Wellenstrang ausrichten ALIGN LP2-BOTTOM HALF SHAFT SEAL CASING TO COUPLED SHAFT ASSEMBLY	P		+	W	W			1.7-1443-0005 1.7-1052-0010

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	144	Radialspiele der N2-Wellendichtung kontrollieren CHECK RADIAL CLEARANCES OF LP2-SHAFT SEAL	P		+	H	H under Hong			1.7-1440-0005 1.7-1441-0005
2	145	N2-Wellendichtungsgehäuse betriebsfertig zudecken, Passfedern einpassen und einbauen PLACE COVER ON LP2-SHAFT SEAL CASING READY FOR OPERATION FABRICATE TO SIZE AND INSERT FITTED KEYS	P		+	W	W			WPS (the document has to be provided by the responsible erection company) 1.7-1443-0005 1.7-1036-0001 1.7-1016-0002 1.7-1481-0002
2	145.1	Zerstörungsfreie Prüfung der Schweißnähte Nondestructive test of weld seams	P		+	I	W			WPS (the document has to be provided by the responsible erection company) PV 0026.0-00000-1
2	146	M-Gehäuse nach dem gekuppelten Wellenstrang eventuell nachrichten, Auswiegen der Pratzenauflagen IF NECESSARY, REALIGN IP-CASING TO COUPLED SHAFT ASSEMBLY, LEVEL OFF BRACKET SUPPORTS	P		+		H			1.7-1262-0001 1.7-1162-0002 1.7-1251-0002 1.7-1251-0006 1.7-1270-0001
2	147	Passfedern der M-Gehäuseführung einpassen und einbauen MACHINE TO SIZE AND INSTALL FITTED KEYS OF IP-CASING GUIDE	P		+					1.7-1270-0001 1.7-1071-0003 1.7-1072-0003

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System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	148	Passstücke der M-Turbinen-Pratzenauflage einpassen und einbauen MACHINE TO SIZE AND INSTALL SHIM PLATES FOR IP-TURBINE BRACKET SUPPORT	P		+					1.7-1270-0001 1.7-1071-0003 1.7-1072-0003
2	149	Herstellen der Spiele an den Distanzplatten des M-Gehäuses ESTABLISH CLEARANCES AT IP-CASING SPACER PLATES	P		+					1.7-1270-0001
2	150	H-Gehäuse nach dem gekuppelten Wellenstrang eventuell nachrichten, Auswiegen der Pratzenauflagen IF NECESSARY, REALIGN HP-CASING TO COUPLED SHAFT ASSEMBLY, LEVEL OFF BRACKET SUPPORTS	P		+		H			1.7-1161-0002 1.7-1162-0002 1.7-1151-0001 1.7-1151-0005 1.7-1170-0001
2	151	Hydrostatische Wellendreheinrichtung montieren und ausrichten INSTALL AND ALIGN THE HYDROSTATIC SHAFT TURNING GEAR	P		+	H	H mandatory instead of 150			1.7-1050-0007 1.7-1610-0010
2	152	Passfedern der H-Gehäuseführung einpassen und einbauen MACHINE TO SIZE AND INSTALL FITTED KEYS OF HP-CASING GUIDE	P		+					1.7-1170-0001 1.7-1070-0008 1.7-1071-0008
2	153	Passstücke der H-Turbinen-Pratzenauflage einpassen und einbauen	P		+					1.7-1170-0001 1.7-1070-0008 1.7-1071-0008

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Unit II

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No	Unit

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		MACHINE TO SIZE AND INSTALL SHIM PLATES FOR HP-TURBINE BRACKET SUPPORT								
2	**154**	Herstellen der Spiele an den Distanzplatten des H-Gehäuses ESTABLISH CLEARANCES AT HP-CASING SPACER PLATES	P		+					1.7-1170-0001
	155	Schwingungsmessgeber in das vordere H-Lagergehäuse einbauen INSTALL VIBRATION SENSORS IN FRONT HP-BEARING PEDESTAL	P		+					1.7-1018-0005
	156	Schwingungsmessgeber in das hintere H-Lagergehäuse einbauen INSTALL VIBRATION SENSORS IN REAR HP-BEARING PEDESTAL	P		+					1.7-1018-0005
2	**157**	Schwingungsmessgeber in das hintere M-Lagergehäuse einbauen INSTALL VIBRATION SENSORS IN REAR IP-BEARING PEDESTAL	P		+					1.7-1018-0005
2	**158**	Schwingungsmessgeber in das hintere N1-Lagergehäuse einbauen INSTALL VIBRATION SENSORS IN REAR LP1-BEARING PEDESTAL	P		+					1.7-1018-0005
2	**159**	Schwingungsmessgeber in das hintere N2-Lagergehäuse einbauen	P		+					1.7-1018-0005

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

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					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		INSTALL VIBRATION SENSORS IN REAR LP2-BEARING PEDESTAL								
2	160	Dichtring in das vordere H-Lagergehäuse einpassen und einbauen FIT SEALING RINGS IN FRONT HP-BEARING PEDESTAL AND INSTALL	P		+					1.7-1161-0002 1.7-1151-0005 1.7-1036-0001 1.7-1151-0002
2	161	Dichtringe in das hintere H-Lagergehäuse einpassen und einbauen FIT SEALING RINGS IN REAR HP-BEARING PEDESTAL AND INSTALL	P		+					1.7-1162-0002 1.7-1151-0005 1.7-1036-0001 1.7-1151-0002
2	162	Dichtringe in das hintere M-Lagergehäuse einpassen und einbauen FIT SEALING RINGS IN REAR IP-BEARING PEDESTAL AND INSTALL	P		+					1.7-1262-0001 1.7-1251-0002 1.7-1251-0006 1.7-1036-0001
2	163	Dichtringe in das hintere N1-Lagergehäuse einpassen und einbauen FIT SEALING RINGS IN REAR LP1-BEARING PEDESTAL AND INSTALL	P		+					1.7-1362-0001 1.7-1351-0006 1.7-1036-0001
2	164	Dichtringe in das hintere N2-Lagergehäuse einpassen und einbauen FIT SEALING RINGS IN REAR LP2-BEARING PEDESTAL AND INSTALL	P		+					1.7-1451-0006 1.7-1462-0001 1.7-1036-0001

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Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	U...D

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

*) Erklärung der Abkürzungen am Ende der Tabelle/Legend of abbreviations at the end of the table

Phase	No.	Description of inspection / activity (Beschreibung der Inspektion / Aktivität)	Doc.Code (Art der Dok.)	Date (Datum)	Category of Participation by (Prüfdurchführung und Teilnahme von) Signature (Kurzzeichen)					Remarks/ References/ Verifying Doc. Identification (Anmerkung/ Referenzdokumente/ Art der Ergebnisprotokolle)
					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	165	Vorderes H-Lagergehäuse fertig stellen zum Spülbetrieb PREPARE FRONT HP-BEARING PEDESTAL FOR FLUSHING	P		+	W	W			1.7-1161-0002 1.7-1167-0035 1.7-1015-0007 1.7-1067-0015
2	166	Hinteres H-Lagergehäuse fertig stellen zum Spülbetrieb PREPARE REAR HP-BEARING PEDESTAL FOR FLUSHING	P		+	W	W			1.7-1162-0002 1.7-1166-0005 1.7-1067-0002 1.7-1015-0007
2	167	Hinteres M-Lagergehäuse fertig stellen zum Spülbetrieb PREPARE REAR IP-BEARING PEDESTAL FOR FLUSHING	P		+	W	W			1.7-1262-0001 1.7-1267-0035 1.7-1015-0007 1.7-1067-0015
2	168	Hinteres N1-Lagergehäuse fertig stellen zum Spülbetrieb PREPARE REAR LP1-BEARING PEDESTAL FOR FLUSHING	P		+	W	W			1.7-1362-0001 1.7-1367-0035 1.7-1015-0007 1.7-1067-0015
2	169	Hinteres N2-Lagergehäuse fertig stellen zum Spülbetrieb PREPARE REAR LP2-BEARING PEDESTAL FOR FLUSHING	P		+	W	W			1.7-1462-0001 1.7-1015-0007 1.7-1067-0015 1.7-1467-0035

FOR TENDER PURPOSE ONLY

MAITREE STPP : STEAM TURBINE UNIT#1 (Unit II)

Siemens AG

Field Quality Plan (Montageprüffolgeplan) 1916

Handling: Handhabung:

For internal use only Nur für internen Gebrauch

Gadarwara	IN1061	10MA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNIT

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

*) Erklärung der Abkürzungen am Ende der Tabelle/Legend of abbreviations at the end of the table

Phase	No.	Description of inspection / activity (Beschreibung der Inspektion / Aktivität)	Doc.Code (Art der Dok.)	Date (Datum)	Category of Participation by (Prüfdurchführung und Teilnahme von) Signature (Kurzzeichen)					Remarks/ References/ Verifying Doc. Identification (Anmerkung/ Referenzdokumente/ Art der Ergebnisprotokolle)
					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
2	170	Montageende, Beginn Spülen des Schmierölsystems END OF ASSEMBLY PROCEDURE, BEGIN FLUSHING LUBRICATING OIL SYSTEM	P		+					1.7-1020-0001 1.7-1031-0300 1.7-1022-0020
2	171	Lagergehäuse betriebsfertig verschließen CLOSING BEARING PEDESTALS READY FOR OPERATION	P		+	W	W			1.7-1262-0001 1.7-1362-0001 1.7-1161-0002 1.7-1162-0002 1.7-1462-0001 1.7-1036-0001 1.7-1015-0007 1.7-1018-0005 1.7-1040-0027
2	172	Montage der Turbinenisolation INSTALL TURBINE INSULATION	S		+					TLV 1001
3	173	Übergabe der Protokolle und QST durch die Montagefirma HANDOVER OF RECORDS AND FQP BY ASSEMBLY COMPANY	P		+		H			1.7-1031-0200 1.7-1034-0001 ECC
3	173.1	Kontrolle der Protokolle auf Vollständigkeit (Felder ausgefüllt, Unterschriften) Checking the records for completeness (form fields	S		+		H			

FOR TENDER PURPOSE ONLY

MAITREE STPP : STEAM TURBINE UNIT#1 Unit II

Siemens AG

Field Quality Plan (Montageprüffolgeplan) 1916

Handling: Handhabung:

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Gadarwara	IN1061	10MA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNIU

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

*) Erklärung der Abkürzungen am Ende der Tabelle/Legend of abbreviations at the end of the table

Phase	No.	Description of inspection / activity (Beschreibung der Inspektion / Aktivität)	Doc.Code (Art der Dok.)	Date (Datum)	Category of Participation by (Prüfdurchführung und Teilnahme von) Signature (Kurzzeichen)					Remarks/ References/ Verifying Doc. Identification (Anmerkung/ Referenzdokumente/ Art der Ergebnisprotokolle)
					CON	SC	SM	AL/ NoBo *)	O *)	*) if applicable
		filled, signature)								

Bemerkungen/Remarks:
Durchführung und Dokumentation der Arbeitsschritte entsprechend Montagehandbuch.
EXECUTION AND DOCUMENTATION OF WORKING STEPS ACCORDING TO ASSEMBLY MANUAL.

FOR TENDER PURPOSE ONLY

MAITREE STPP : STEAM TURBINE UNIT#1

Unit II

Siemens AG

Field Quality Plan (Montageprüffolgeplan) 1916

Handling: Handhabung:

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Gadarwara	IN1061	10MA	&MDC080		
Kraftwerk/Power Plant	Project Code	Object Code (Unit + System KKS)	DCC	Zähl-Nr./Reg. No.	UNID

System / Component (KKS):
SST5-6000:H70-123-V4-M3-50HZ; I60-V2-M2A-50HZ; L4x8-1-V2-M3-50HZ

Belonging to Assembly Instruction (gehört zu Montageanweisung)
1.2-T001-A-000565 to 1.2-T173-A-000565

FOR TENDER PURPOSE ONLY

Legend:

Documentation code (Doc. Code)

P = Documentation of test or inspection step by record necessary.
S = Stamp / short sign in FQP. **No** additional formal approval required.

T = Test certificate/stamp issued by authorized inspector necessary (e.g. notified body)

Involved parties

AI/NoBo = Authorized inspector (third party organization / notified body, etc.)
CON = Contractor (erection)
O = Owner (client / customer or its representative)
SC = Subcontractor or Contractor's (delivery) advisor / supervisor
SM = Technician representative of Site Management having contracted the Contractor (erection)

Inspections codes

H = Hold point. Formal notification is mandatory. Attendance & signatures of participating representatives are mandatory. Inspection to be carried out before proceeding with next step.
D = Document review: check of documentation or final data package
I = Information point. Parties have to be notified prior to check. The erection continues whether the parties are there or not.

W = Witness point. Formal notification is mandatory. Tests to be executed 100% at arranged time, whether the invited representatives show up or not.

Wx = [x =percentage of inspection scope] spot witness point. To be handled like a witness point with following deviation. Formal invitation only for the first of repeated activities or on demand by deficiencies. Wx serves the purpose to check the correctness of the working procedure.

\+ = Carrying out the test step and signature /stamp.

Legende:

Dokumentationscodes

P = Dokumentation des Test- oder Prüfschrittes durch ein Protokoll erforderlich.
S = Stempel / Kurzzeichen im FQP. **Keine** zusätzlichen formalen Genehmigungen erforderlich.
T = Testzertifikat/Stempel durch einen unabhängigen Prüfer (z. B. benannte Stelle).

Beteiligte

AI/NoBo = Unabhängiger Prüfer (Prüforganisation / benannte Stelle etc.)
CON = Montagefirma
O = Kunde (Betreiber oder dessen Vertreter)
SC = Auftragnehmer oder Advisor / Supervisor des Herstellers
SM = Technischer Vertreter der Baustellenleitung, die die Montagefirma beauftragt hat

Inspektionscodes

H = Haltepunkt. Formale Anmeldung sowie die Teilnahme & Unterschrift durch die Beteiligten sind zwingend erforderlich. Prüfschritt muss abgeschlossen sein, bevor der nächste Schritt durchgeführt werden darf.
D = Dokumentprüfung: Prüfung der Dokumentation oder endgültiger Daten.
I = Informationspunkt. Die Beteiligten sind vor dem Prüfschritt zu informieren. Die Montage wird fortgesetzt, unabhängig davon, ob die Beteiligten während des Prüfschrittes anwesend waren oder nicht.
W = Meldepunkt. Formale Anmeldung ist zwingend erforderlich. Prüfschritt wird komplett zum vereinbarten Zeitpunkt durchgeführt, unabhängig davon, ob die Beteiligten während des Prüfschrittes anwesend waren oder nicht.
Wx = [x =Prozentsatz des Prüfumfangs] Stichprobe. Wird analog zu Meldepunkt durchgeführt, jedoch mit folgender Änderung: Formale Anmeldung nur für den ersten von immer wieder kehrenden Prüfschritten oder auf Verlangen bei Mängeln. Wx dient dem Zweck die Richtigkeit der Arbeitsanweisung zu überprüfen.
\+ = Durchführen des Prüfschrittes, unterschreiben/abstempeln.

FIELD QUALITY PLAN
FOR
STEAM TURBINE - UNIT # 2

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-02-MA-QA-300070-PSE, REV. NO. : 2

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

BHEL DOC. NO. : QPE-MTE-660-ST-43B
REV No.: 2

FOR TENDER PURPOSE ONLY

FIELD QUALITY PLAN
FOR
STEAM TURBINE - UNIT # 2

2X660 MW MAITREE SUPER THERMAL POWER PROJECT

BIFPCL DOC. NO. : MAITREE-02-MA-QA-300070-PSE, REV. NO. : 2

PREPARED BY	ENGR./QLY, BHEL-PSER	APPROVED BY	HEAD / QLY, BHEL-PSER
FQP NO.		**QPE-MTE-660-ST-43B**	
ORIGINAL DATE OF ISSUE		14/02/2018	
REVISION NO. & DATE		2, Dt. 14/08/2018	
COPY NO.		01	
ISSUED TO		BIFPCL / FICHTNER	
DATE OF ISSUE			
PURPOSE :		FOR REVIEW & APPROVAL	
ISSUED BY (SIGNATURE & DESIGNATION)		ENGR./QLY, BHEL- PSER	

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - EASTERN REGION
KOLKATA – 700091

PSER	FIELD QUALITY PLAN FOR STEAM TURBINE - UNIT # 2	FQP NO: MAITREE-02-MA-QA-300070-PSE BHEL Doc. No. : QPE-MTE-660-ST-43B
		REV. NO. : 2
		SHEET 1 / 1 SHEETS

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FOR TENDER PURPOSE ONLY

PSER	FIELD QUALITY PLAN FOR STEAM TURBINE - UNIT # 2	FQP NO: MAITREE-02-MA-QA-300070-PSE BHEL Doc. No. : QPE-MTE-660-ST-43B
		REV. NO. : 2
		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 owners technical specifications
02	-	1, Dtd.: 25.04.18	Document re-submitted for review & approval of BIFPCL/ OE
03	All	2, Dtd.: 14.08.18	Document revised as per comments from BIFPCL/ OE and duly marked. Checks in this document are similar to FQP for Unit#2 Steam Turbine for NTPC-Gadarwara STPP.

FOR TENDER PURPOSE ONLY

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 turbine assembly area

FOR TENDER PURPOSE ONLY

PSER	FIELD QUALITY PLAN FOR STEAM TURBINE - UNIT # 2	FQP NO: MAITREE-02-MA-QA-300070-PSE BHEL Doc. No. : QPE-MTE-660-ST-43B
		REV. NO. : 2
		SHEET 01 / 14 SHEETS

STATEMENT OF CHECKS

Capacity / Type :	660MW
System :	STEAM TURBINE & AUXILIARIES
Sub-system :	STEAM TURBINE – UNIT # 2
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. Checks for Steam Turbine of Unit # 1 is covered under document number MAITREE-01-MA-QA-300069-PSE
3. Checks for condenser is covered under document number MAITREE-00-MAG-QA-300024-PSE
4. Abbreviations used:
   R – Record Verification
   V – Visual Check
   P – Physical Check
   M – Measurement
   T – Test
   MTC – Manufacturers Test Certificate
   SR – Site Register
5. Latest revision of Standards & Specification shall apply.
6. Materials shall be procured in compliance to Functional Technical Specifications & BIFPCL / OE approval.
7. Inspection and Tests shall be in compliance with Approved Document/ Quality Control Procedure for the Product.
8. Welding shall be carried out by Qualified Welders, with traceable WPQR, in line with approved WPS and Qualified PQR, as per ASME Section IX
9. Only approved welding consumables shall be used, as per Approved Welding Consumable list.
10. Procedure shall be established and followed, for Procurement, Storage, Issue and Control of Welding Consumables.
11. NDT shall be carried out by Qualified Personnel with compliance to Approved NDT procedures and Acceptance Norms, as per ASME Section V.
12. The Agency carrying out RT shall be approved by Local Authorities.
13. Field Radiography shall be carried out in compliance with Local Statutory requirements and safety precautions by Approved Agency.
14. Radiography Source handling and control procedure shall be established as per Local Statutory requirements and complied.
15. Preheating and Post Weld Heat treatment shall be in compliance with Approved Procedures.
16. Cleaning, preservation and Painting of products shall be carried out as per Approved Painting Schedule.
17. (2) Record identified with “tick” (√) mark in column no. ‘D*’ shall be essentially included in QA documentation.

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **STEAM TURBINE - UNIT # 2** STATEMENT OF CHECKS	FQP NO.: **MAITREE-02-MA-QA-300070-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43B REV.NO.: 2 SHEET 02 / 14 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: STEAM TURBINE - UNIT # 2	AREA: ERECTION

SL NO.	CHARACTERISTICS / ITEM	TYPE OF CHECK	INSTRUMENT	CLASS OF CHECK	QUANTUM/ FREQUENCY OF CHECK	REFERENCE DOCUMENT & ACCEPTANCE STANDARD	FORMAT OF RECORD (2)		REMARKS
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*D**	*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 structure before start of activity	List of Latest Revision of Approved Drawings and Owner's Technical Specifications	SR		
B	**MATERIAL RECEIPT**								
B.01	Check availability of Bill of materials (BOM) / packing slip, dispatch documents.	V	-	C	100%	-	-		
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	Logbook		
B.03	Check components/ boxes carefully for physical condition - a) In case of external damage to boxes, remove the top cover so that contents can be seen thoroughly. If the contents are sealed / intact, cover the contents / packing with original plastic sheeting / additional tarpaulin cover. b) 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.04	V	-	C	100%	Dispatch documents/ Packing slip	Logbook		
B.04	Ensure that nonconforming / rejected components are identified, stored separately and reported to supplier for rectification / replenishment.	V	-	C	100%	Work instructions for site Operations	MDR		
B.05	Control of receipt and issue of all components	V	-	C	100%	Work instructions for site Operations	Register		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **STEAM TURBINE - UNIT # 2** STATEMENT OF CHECKS	FQP NO.: **MAITREE-02-MA-QA-300070-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43B REV.NO.: 2 SHEET 03 / 14 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: STEAM TURBINE - UNIT # 2	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*	*D**	*9*
C	**STORAGE & PRESERVATION**								
C.01	Storage & Preservation of components at site	V & P	As required	C	as per Section-IV of reference doc.	MAITREE-00-M-DC-300067-PSE	SR		
D	**CHECKS ON FOUNDATION**								
D.01	Ensure availability of identified & protected permanent benchmark at convenient location	V	-	A	100%	GA Drawing & Foundation Plan Drawings	JOINT PROTOCOL	√	
D.02	Elevation of top of foundation pedestals with reference to permanent benchmark.	M	Dumpy level, Water level & Measuring Tape	B △2	100%	Foundation Plan Drawings	JOINT PROTOCOL	√	
D.03	Disposition of foundation pedestals, bolt pockets & openings with reference to longitudinal axis of turbine and reference axis.	M	Measuring Tape, Total station	A	100%	Foundation Plan Drawings	JOINT PROTOCOL	√	
D.04	Mark out reference points for Turbine floor elevation longitudinal and transverse axes, check anchor points	M	Optical or water level	A	100%	Foundation Plan Drawings	JOINT PROTOCOL	√	
E	**WELDING & NON DESTRUCTIVE EXAMINATIONS**								
E.01	Ensure availability of applicable WPS & Erection Welding Schedule (EWS)	R	-	A	100%	Drawing & EWS	-		WPS, duly qualified, should be available at site. △2
E.02	Review of Batch TC of welding electrodes & other consumables from manufacturer.	R	-	A	100%	Relevant AWS specifications as per applicable WPS	SR		The copy of TCs to be reviewed & signed by BHEL and record to be maintained in Site Register. BIFPCL/OE may conduct spot checks of review conducted by BHEL.
E.03	Welders' performance qualification, preparation of Welder Qualification Record (WQR) and Identity card.	V & T	-	A	100%	WPS & ASME BPVC Sec.-IX	WQR	√	
E.04	Codification of weld joints for maintenance of records indicating number of weld joint, heat treatment carried out, NDE results, acceptance and rejection / repair details.	V & R	-	A	100%	Drawing & EWS	L-44	√	
E.05	Adoption of correct procedure, approved electrodes and methods.	V	-	B	100%	Drawing & EWS & WPS	L-45		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **STEAM TURBINE - UNIT # 2** STATEMENT OF CHECKS	FQP NO.: **MAITREE-02-MA-QA-300070-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43B REV.NO.: 2 SHEET 04 / 14 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: STEAM TURBINE - UNIT # 2	AREA: ERECTION

FOR TENDER PURPOSE ONLY

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*	*D**	*9*
E.06	Daily in-Process monitoring of joint fit-ups	V & M	Taper Gauge, Hi-Lo Gauge & Measuring tape	B	100%	Drawing & EWS	L-44		
E.08	Daily in-process monitoring of Drying / baking of SMAW electrodes	V & R	-	B	Random in each shift	Recommendations of electrode manufacturer	SR		
E.09	Pre heating of weld joints, as applicable.	V & M	Thermo-chalk or Non-contact type Thermometer	A	As per EWS / WPS	Drawing / EWS & WPS	L-44 & L-45	√	
E.10	Ensure proper sequence of welding.	V	-	C	100%	Construction drawings	SR		
E.11	Visual Inspection of all weldments	V & M	As required	B	100%	Drawing & ASME BPVC Sec-V	Logsheet		
E.12	Positive Material Identification (PMI) of welds on alloy steel	V	Handheld XRF PMI guns	B	10% of the weld made by each welder per day	EWS & procedure recommended by the PMI equipment manufacturer	L-44	√	
E.13	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		
E.14	NDT of welds	T	As required	A	As per EWS	Drawing & EWS, WPS & ASME BPVC Sec-V	NDT Report, L-44 & L-45	√	
E.15	Rectification of welding defect (if case of any defect)	P & R	As required	A	As per EWS & Annex-I	Annex-I & ASME BPVC Sec-V	L-44	√	
E.16	Post Weld Heat Treatment of welds	V & R	Time-temperature recorder	A	As per EWS	WPS & EWS	HT Chart , L-44 & L-45	√	
E.17	Hardness testing of HAZ & weldment for alloy steel pipe joints, as applicable.	T	UCI machine	A	As per EWS	WPS & EWS	L-45	√	
E.18	Ensure preservation of welded joint (application of primer)	V	As required	C	100%	Drawing & Approved painting schedule	L-44		
F	**INSTALLATION OF BEARING PEDESTAL AND BEARINGS**								
F.01	Clean all Bearing pedestals prepare for assembly and set down on adjusting screws.	V	Tape	C	100%	Assembly drawing & Erection Manual	SR		

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **STEAM TURBINE - UNIT # 2** STATEMENT OF CHECKS	FQP NO.: **MAITREE-02-MA-QA-300070-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43B REV.NO.: 2 SHEET 05 / 14 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: STEAM TURBINE - UNIT # 2	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*	*D**	*9*
F.02	Insert Anchor Bolts in to all Bearing Pedestal	V		C	100%	Assembly drawing & Erection Manual	-		
F.03	Alignment check of Bearing Pedestals to Drawing and Catenary, tightening of super bolts– Before Grouting *	M	Tape and Pot level, Torque wrench	A	100%	Assembly drawing & Erection Manual	L01 & L02		* QSTM Surveylance check
F.04	Set up shuttering work for Grouting of Bearing Pedestal	V	-	B	100%	Erection Manual	-		
F.05A	Verification of batch TC of grouting compound & cube testing of same batch to verify 3 days compressive strength of grout before grouting of bearing pedestal.	R & T	Compressin Testing Machine	A	100% for each batch of groutting compound	Assembly Drawing & Grout Manufacturer's Recommendations	PROTOCOL		
F.05B	Grout Bearing Pedestals with Grouting Compound as Specified & curing as per manufacturer's recommendations	P & T	-	A	100%	Assembly drawing & Erection Manual	PROTOCOL		Cubes to be taken during grouting and compressive test to be done & witnessed by FQA Engr.
F.06	Alignment check of Bearing Pedestals to Drawing and Deflection Curve after grouting	M	Tape and Pot level	A	100%	Assembly drawing & Erection Manual	L01 & L02		
F.07	Super bolt tightening after Grouting	M		B	100%	Assembly drawing & Erection Manual	L-02		
F.08	Pedestal Parting plane gap	M	Feeler Gauge	B	100%	Assembly drawing & Erection Manual	PROTOCOL		
F.09	Fill in voids in Casing Centering Guides in the Foundation Beams with Grouting Compound	V	-	B	100%	Assembly drawing & Erection Manual	-		
F.10	Check bearing dia	M	Micrometer	B	100%	Assembly drawing & Erection Manual	SR		
F.11	Check blue contact between bearing support and pedestal	V		B	100%	Assembly drawing & Erection Manual	SR		
F.12	Check blue contact and Gap between torus and bearing support	V		A	100%	Assembly drawing & Erection Manual	SR		
F.13	Boroscopic examination of oil lines inside pedestals	V	Boroscope	B	100%	Write-up of boroscopic inspection system & user manual (MAITREE-00-MA-DA-130104-HWR)	PROTOCOL		
F.14	Welding & Non-destructive Test of Weld Seams of Guide pins	refer Sl. No. E for checks							
G	**LP TURBINE ASSEMBLY**								
G.01	Clean LP1-Side and End Walls and prepare for Assembly	V	-	C	100%	Assembly drawing & Erection Manual	SR		
G.02	Set Down LP1-End Walls on Supporting Arms, Align and Secure	M,V	Tape	C	100%	Assembly drawing & Erection Manual	PROTOCOL		

FOR TENDER PURPOSE ONLY

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **STEAM TURBINE - UNIT # 2** STATEMENT OF CHECKS	FQP NO.: **MAITREE-02-MA-QA-300070-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43B REV.NO.: 2 SHEET 06 / 14 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: STEAM TURBINE - UNIT # 2	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*	*D**	*9*
G.03	Check and Establish the as Assembled Dimensions the LP1-Side Walls.	M	Tape	B	100%	Assembly drawing & Erection Manual	PROTOCOL		
G.04	Align, Fit and Tack-Weld the LP1-Side walls	M,V	Tape	B	100%	Assembly drawing & Erection Manual	PROTOCOL		Refer Sl. No. E for welding
G.05	Non-destructive Test of Weld Seams	refer Sl. No. E13 & E14 for checks							
G.06	Fit and Weld Bracing Pipes for LP1-Outer Casing	M	Tape	B	100%	Assembly drawing & Erection Manual	PROTOCOL		Refer Sl. No. E for welding
G.07	Non-destructive Test of Weld Seams	refer Sl. No. E13 & E14 for checks							
G.08	Align LP1- Bottom-Half Outer Casing To longitudinal and Transverse Axes and Vertically with Deflection Curve.	M	Tape, Micrometer	A	100%	Assembly drawing & Erection Manual	L-03	√	Refer Sl. No. E for welding
G.09	Non-destructive Test of Weld Seams	refer Sl. No. E13 & E14 for checks							
G.10	Weld the Entire LP1-Bottom Half Outer Casing	T	-	C	100%	Assembly drawing & Erection Manual	SR		Refer Sl. No. E for welding
G.11	Non-destructive Test of Weld Seams	refer Sl. No. E13 & E14 for checks							
G.12	Provisionally Mount the Expansion Joint for the LPI-Supporting ARM and Centering Guide	V & M	Tape	B	100%	Assembly drawing & Erection Manual	SR		Refer Sl. No. E for welding
G.13	Non-destructive Test of Weld Seams	refer Sl. No. E13 & E14 for checks							
G.14	Set Down LPI-Bottom Half Inner Casing in LP1 Bottom Half Outer Casing	M,V	Tape, Micrometer	C	100%	Assembly drawing & Erection Manual	PROTOCOL		
G.15	Align Elevation and Centerline of LP1 Bottom Half Inner Casing	M	Water level, Micrometer, Tape	A	100%	Assembly drawing & Erection Manual	PROTOCOL		
G.16	Fix the LPI-Inner Casing Radially and Axially in Position, Check the Guide Rods	M	Water level, Micrometer, Tape	B	100%	Assembly drawing & Erection Manual	PROTOCOL		
G.17	Clean LP1-Bottom Half Shaft Seal Casing and attach to Bearing Pedestal	V	-	C	100%	Assembly drawing & Erection Manual	SR		

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **STEAM TURBINE - UNIT # 2** STATEMENT OF CHECKS	FQP NO.: **MAITREE-02-MA-QA-300070-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43B REV.NO.: 2 SHEET 07 / 14 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: STEAM TURBINE - UNIT # 2	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*	*D**	*9*
G.18	Clean LP1- Shaft, measure shaft dia, spigot dia, recess dia, recess depth, spigot height, face concavity and Prepare for Assembly	M	Depth Micrometer, Straight Edge, Slip Gauge	B	100%	Assembly drawing & Erection Manual	L-36		
G.19	Clean Main and Auxiliary LP1-Bearings, Prepare for Assembly and Install	V	-	C	100%	Assembly drawing & Erection Manual	SR		
G.20	Slide Bellows – Type Expansion Joints at Shaft Seals onto LP1-Shaft	V	-	C	100%	Assembly drawing & Erection Manual	SR		
G.21	Install LP1-Turbine Shaft in Main and Auxiliary Bearings and Align*	M	Tape, Micrometer	B	100%	Assembly drawing & Erection Manual	PROTOCOL		* QSTM Surveylance check
G.22	Take Actual Radial and Axial Shaft Reference Dimensions in the Bearing Pedestals. Check face and radial run out of LP Rotor	M	Micrometer, slip gauge	B	100%	Assembly drawing & Erection Manual	L-47		
G.23	Provisionally Align Lower Section of LP1-Shaft Seal Casing to LP1-Shaft	M,V	Slip Gauge,, Micrometer	B	100%	Assembly drawing & Erection Manual	PROTOCOL		
G.24	Radially and Axially Align LP1-Bottom-Half Inner Casing to LP1-Turbine Shaft. Check centering at diffusor (Note: Lower half casing sag to be removed by jacking from bottom)	M	Slip Gauge, feeler gauge, Dial gauge. micrometer	B	100%	Assembly drawing & Erection Manual	PROTOCOL		
G.25	Perform Initial Radial and Axial Blading Clearance Check on LP1-Turbine (Including Top with Lead Wire) *	M	Feeler Gauge, Micrometer	B	100%	Assembly drawing & Erection Manual	L-10, L-11 & L-12	√	* QSTM Surveylance check
G.26	Mount top half casing and perform prelim centering and roll and bump check (Note: Dial to be fixed near centralizing pin location for checking top bottom readings), Carry out Horn Drop check	M	Dial gauge	B	100%	Assembly drawing & Erection Manual	L-21/L-09		
G.27	Final blade clearance check after removal of top half casing and GBC	M	Feeler Gauge, Slip Gauge, Micrometer	A	100%	Assembly drawing & Erection Manual	L-10, L-11 & L-12	√	
G.28	Installing the top sections of the Guide Blade Rings and heat tighten	M	Depth Vernier	A	100%	Assembly drawing & Erection Manual	L-15	√	
G.29	Mount the Outer Shell of LP1-Inner Casing Ready for Operation Tighten Casing Joint Bolts	M	Depth Vernier	A	100%	Assembly drawing & Erection Manual	L-5 & L-16	√	

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **STEAM TURBINE - UNIT # 2** STATEMENT OF CHECKS	FQP NO.: **MAITREE-02-MA-QA-300070-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43B REV.NO.: 2 SHEET 08 / 14 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: STEAM TURBINE - UNIT # 2	AREA: ERECTION

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*
G.30	Bump Check ,centering and Roll Check of the LP1-Inner casing by Means of the Adjusting Screws LIFTING JACK (Note: Dial to be fixed near centralizing pin location for checking top bottom readings) *	M	Dial gauge, Slip gauge	A	100%	Assembly drawing & Erection Manual	L-21 & L- 09	√	* QSTM Surveylance check
G.31	Record reference dimensions after final roll check and bump check	M	Micrometer, slip gauge	B	100%	Assembly drawing & Erection Manual	L-07, L-08 & L-14		
G.32	Set Down LP1-Cover on LP1-Bottom-Half Outer Casing, Align, Tack and Weld	M	Tape	B	100%	Assembly drawing & Erection Manual	PROTOCOL		Refer Sl. No. E for welding
G.33	Non-destructive Test of Weld Seams	refer Sl. No. E13 & E14 for checks							
G.34	Drill and Ream Holes for Fitting Bolts in Joint Plane of LP1-Outer Casing	P	-	B	100%	Assembly Drawing	PROTOCOL		
G.35	Fix Atmospheric relief Diaphragm	P	-	B	100%	Assembly Drawing	SR		
G.36	Fit and Weld LP1-Steam Inlet Lines	V & P	-	B	100%	Assembly Drawing	SR		Refer Sl. No. E for welding
G.37	Non-destructive Test of Weld Seams	refer Sl. No. E13 & E14 for checks							
G.38	Remove LP1-Top-Half Outer Casing and clean, weld and finish joints on joint plane.	V	-	B	As per EWS	As per applicable WPS & EWS	SR		Refer Sl. No. E for welding
G.39	Non-destructive Test of Weld Seams	refer Sl. No. E13 & E14 for checks							
G.40	Mount LP1 – Top- Half Outer Casing Ready for Operation Tighten Casing Joint Bolts & check parting plane for gap	P & M	Torque Wrench	B	100%	Drg as applicable & Erection Manual	L-04		
G.41	Checks (including QSTM surveylance checks) from G.01 to G.40 for LP1 shall be repeated for LP2 also								
H	**HP TURBINE INSTALLATION**								
H.01	Clean HP-Turbine. Measure shaft dia, spigot dia, recess dia, recess depth, spigot height, face concavity and Prepare for Assembly	M	Micrometer, Depth Micrometer, straight edge, slip gauge	B	100%	Assembly Drawing	L-36		

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **STEAM TURBINE - UNIT # 2** STATEMENT OF CHECKS	FQP NO.: **MAITREE-02-MA-QA-300070-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43B REV.NO.: 2 SHEET 09 / 14 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: STEAM TURBINE - UNIT # 2	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*	*D**	*9*
H.02	Set down HP-Turbine on Bearing Pedestals and Provisionally Align	M	Micrometer	B	100%	Assembly Drawing	PROTOCOL		
H.03	Clean Main and Auxiliary HP-Bearings, Prepare for Assembly and install	V		B	100%	Assembly Drawing	SR		
H.04	Set down HP-Turbine on Bearing and Align Shaft. *	V,M	Dial gauge	B	100%	Assembly Drawing	PROTOCOL	√	* QSTM Surveylance check
H.05	Centering of HP-Turbine casing Radially and Axially with HP-Turbine Shaft. Perform Roll and Bump Check on HP-Turbine.	M	Dial gauge	A	100%	Assembly Drawing	L-30	√	
H.06	Check face and radial run out of HP Rotor *	M	Dial Gauge	B	100%	Assembly Drawing	L-47	√	* QSTM Surveylance check
H.07	Carry out initial Horn Drop check (Note: To be repeated after fixing of valves and finally after welding of piping, insulation and fixing of keys and packers)	M	Dial Gauge	B	100%	Assembly Drawing	L-06		Refer Sl. No. E for welding
H.08	Establish the Radial and Axial reference Dimensions for the Shaft in the Bearing Pedestals.	M	Dial gauge, Micrometer	A	100%	Shop protocols	L-20	√	
I	**IP TURBINE ASSEMBLY**								
I.01	Check for existence of all holes for wall stress, instrument stubs, drain, etc..	V	-	B	100%	Assembly Drawing	SR		
I.02	Check clearance between shaft seal casing and shat seal ring	M	Feeler gauge	B	100%	Assembly Drawing & 0.03 mm feeler should not go	SR		
I.03	Check clearance on the lock washer in the shaft seal casing joint	M	Feeler gauge	B	100%	Assembly Drawing & 0.03 mm feeler should not go	SR		
I.04	Clean, place and provisionally center IP outer casing bottom half & Ensure parting plane gap between lower and upper half	M	Tape, Feeler Gauge	B	100%	Assembly Drawing & 0.03 mm feeler should not go	PROTOCOL & L-22		
I.05	Check fitting of Angle rings of IP inlet and IP extractions	M	Dial Gauge , Micrometer	B	100%	Assembly Drawing	L-33		
I.06	Place inner casing bottom half along with keys	V & M	Feeler Gauge	B	100%	Assembly Drawing & 0.03 mm feeler should not go	L-22		

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **STEAM TURBINE - UNIT # 2** STATEMENT OF CHECKS	FQP NO.: **MAITREE-02-MA-QA-300070-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43B REV.NO.: 2 SHEET 10 / 14 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: STEAM TURBINE - UNIT # 2	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*	*D**	*9*
I.07	Clean IP Shaft, Measure shaft dia, spigot dia, recess dia, recess depth, spigot height, face concavity and prepare for assembly	M	Micrometer, Depth Micrometer, Straight Edge, Slip Gauge	B	100%	Assembly Drawing	L-36		
I.08	Clean Main and Auxiliary IP-Bearings and Install.	V		B	100%	Assembly Drawing	SR		
I.09	Install IP-Turbine shaft and Align Shaft *	M	Dial gauge	B	100%	Assembly drawing & Erection Manual	PROTOCOL	√	* QSTM Surveylance check
I.10	Check face and radial run out of IP Rotor	M	Dial Gauge	B	100%	Assembly drawing & Erection Manual	L-47		
I.11	Check blade clearances. Place top half inner casing (Check top cl. With lead). Check IP Turbine Assembly clearances *	M	Feeler Gauge	A	100%	Assembly drawing & Erection Manual	L-23, L-24, L-25, L-26,L-27	√	* QSTM Surveylance check
I.12	Place top half outer casing, Align IP-Turbine Casing Radially and Axially to IP-Turbine Shaft. Roll check and bump check	M	Dial gauge	B	100%	Assembly drawing & Erection Manual	PROTOCOL		
I.13	Heat tighten inner and outer casing bolts.	M	Depth Vernier	B	100%	Assembly drawing & Erection Manual	L-28, L-29		
I.14	Repeat centering, Roll check, Bump Check	M	Dial Gauge	A	100%	Assembly drawing & Erection Manual	L-31	√	
I.15	Carry out initial Horn Drop check (Note: To be repeated after fixing of valves and finally after welding of piping, insulation and fixing of keys and packers)	M	Dial Gauge	B	100%	Assembly drawing & Erection Manual	L-06		Refer Sl. No. E for welding
I.16	Install IP arms for push rods followed by tightening	M	TAPE	B	100%	Assembly drawing & Erection Manual	L-35		
I.17	Establish the Radial and Axial Check Dimensions for the shaft in the Bearing Pedestals	M	Dial Gauge, Micrometer	A	100%	Assembly drawing & Erection Manual	L-31	√	
J	**VALVES**								
J.01	Attach Spring Supports for Main Stop and Control Valves	R,M	Tape	B	100%	Assembly drawing & Erection Manual			
J.02	Install and Align Main Stop and Control Valves. *	M	Slip Gauge, Micrometer	B	100%	Assembly drawing & Erection Manual	L-19	√	* QSTM Surveylance check
J.03	Check blue contact b/w U seal ring and HP inlet assembly and compression value	V, M	Micrometer	B	100%	Assembly drawing & Erection Manual	L-19		

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **STEAM TURBINE - UNIT # 2** STATEMENT OF CHECKS	FQP NO.: **MAITREE-02-MA-QA-300070-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43B REV.NO.: 2 SHEET 11 / 14 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: STEAM TURBINE - UNIT # 2	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*	*D**	*9*
J.04	Attach Spring Supports for Reheat Stop and Control Valves	R,M	Tape	B	100%	Assembly drawing & Erection Manual			
J.05	Install and Align Reheat Stop and Control Valves	M	Tape	B	100%	Assembly drawing & Erection Manual	L-33 & L-34		
J.06	Check blue contact b/w U seal ring and IP inlet assembly and compression value		Micrometer	B	100%	Assembly drawing & Erection Manual	L-33		
J.07	Install Bypass Valves and its supports	M	Tape	B	100%	Assembly drawing & Erection Manual			
J.08	Install all Valve Actuators for main Steam. Reheat stop and Control Valves. (Note: Ensure zero position matching of actuator)	P,V	-	B	100%	Assembly drawing & Erection Manual			
K	**FINAL ALIGNMENT**								
K.01	Install Thermo-Couples and TSE Sensors	P	-	B	100%	Assembly drawing & Erection Manual	SR		
K.02	Fit, weld & Install Cross-over pipe	P	-	B	100%	Assembly drawing & Erection Manual	SR		refer Sl. No. E for welding checks
K.03	NDT of welds	refer Sl. No. E for checks							
K.04	Assemble cross-over pipe ready for operation	P	-	B	100%	Assembly drawing & Erection Manual	SR		
K.05	Perform Final Alignment of Shaft Assembly in Operating Condition. (Note 1: Generator to be air pressurized to the rated pressure Note 2: Water to be charged on CW side of condenser or equivalent load to be added in steam space)	M	Dial Gauge, Micrometer	A	100%	Assembly drawing & Erection Manual	L-36	√	
K.06	Install and Align the Hydrostatic Shaft Turning Gear *	M	Micrometer	A	100%	Assembly drawing & Erection Manual	L-41	√	*** QSTM Surveylance check**
K.07	Draw together HP/IP, IP/LP1, LP1/LP2 and LP2/Gen Couplings, Ream and Hone Coupling Holes, Finish – Grind Coupling Bolts.	M	Dial Gauge, Slip gauge	B	100%	Assembly drawing & Erection Manual	L-38		
K.08	Ensure that all finished coupling bolts and nuts are within ±5 grams	M	Weighing machine	B	100%	Assembly drawing & Erection Manual	L-38		
K.09	DPT of Finished Coupling Bolts & Nuts as per Technical instructions from BHEL- HEEP, Hardwar.	V	-	B	100%	Technical instructions from BHEL- HEEP, Hardwar	PROTOCOL		

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BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **STEAM TURBINE - UNIT # 2** STATEMENT OF CHECKS	FQP NO.: **MAITREE-02-MA-QA-300070-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43B REV.NO.: 2 SHEET 12 / 14 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: STEAM TURBINE - UNIT # 2	AREA: ERECTION

FOR TENDER PURPOSE ONLY

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*	*D**	*9*
K.10	Proper caulking to be ensured for coupling covers	V	-	C	100%	Assembly drawing & Erection Manual	PROTOCOL		
K.11	Couple HP/ IP, IP/LP1, LP1/LP2 and LP2/Gen Shafts, Checking Radial Run-Out of Coupling Flanges *	M	Dial gauge	A	100%	Assembly drawing & Erection Manual	L-37	√	* QSTM Surveylance check
K.12	Check swing check at HP End	M	Dial Gauge	B	100%	Assembly drawing & Erection Manual	L-48		
K.13	Recenter HP Casing to Coupled Shaft Assembly	M	Dial Gauge Slip gauge	A	100%	Assembly drawing & Erection Manual	L-30	√	
K.14	Machine to size and Install Fitted Keys of HP- Casing Guide	M	Dial Gauge, Micrometer	B	100%	Assembly drawing & Erection Manual	L-32		
K.15	Machine to Size and Install Shim Plates for HP-Turbine Bracket support	M	Dial Gauge, Micrometer	B	100%	Assembly drawing & Erection Manual	L-32		
K.16	Recenter IP Casing to Coupled Shaft Assembly If	M	Dial Gauge	A	100%	Assembly drawing & Erection Manual	L-31	√	
K.17	Machine to Size and Install Fitted Keys of IP – Casing Guide	M	Dial Gauge, Micrometer	B	100%	Assembly drawing & Erection Manual	L-22		
K.18	Machine to Size and Install Shim Plates for IP-Turbine Bracket Support	M	Dial Gauge, Micrometer	B	100%	Assembly drawing & Erection Manual	L-22		
K.19	Establish Clearances at LP-Casing Spacer Plates	M	Dial Gauge, Micrometer	B	100%	Assembly drawing & Erection Manual	L-05		
K.20	Correct the centering of LP1- Inner casing and perform roll check. Mount the Fitted Keys for Casing Supports and Centering Guide and LP reference dimension *	M	Dial Gauge, Micrometer	A	100%	Assembly drawing & Erection Manual	L-7,L-8, L-9	√	* QSTM Surveylance check
K.21	Align LP1-Bottom Half Shaft seal casing to coupled shaft Assembly.	M	Slip Gauge, Micrometer	B	100%	Assembly drawing & Erection Manual	L-13		
K.22	Check Radial Clearance of LP1-Shaft Seal. *	M	Feeler Gauge, Micrometer	A	100%	Assembly drawing & Erection Manual	L-12	√	* QSTM Surveylance check
K.23	Place Cover on LP1-Shaft Seal Casing ready for Operation Fabricate to Size and Insert Fitted Keys.	M	Micrometer	B	100%	Assembly drawing & Erection Manual	L-13		

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **STEAM TURBINE - UNIT # 2** STATEMENT OF CHECKS	FQP NO.: **MAITREE-02-MA-QA-300070-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43B REV.NO.: 2 SHEET 13 / 14 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: STEAM TURBINE - UNIT # 2	AREA: ERECTION

FOR TENDER PURPOSE ONLY

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*
K.24	Check lifting of casings	M	Micrometer, Dial Gauge	B	100%	Assembly drawing & Erection Manual	L-46		
K.25	Install Monitoring Instruments in Bearing Pedestals	P	-	C	100%	Assembly drawing & Erection Manual	SR		
K.26	Install oil catchers in Bearing Pedestals	M	Feeler, micrometer	B	100%	Assembly drawing & Erection Manual	L-42		
K.27	Prepare Bearing Pedestals for Flushing	V	-	A	100%	Assembly drawing & Erection Manual	SR		
K.28	Completion of Turbine Insulation & Painting	R & V	-	B	100%	Erection Manual, Procedure for turbine insulation (MAITREE-00-MA-DA-130104-HWR) & Approved painting schedule	SR		- Paints to be procured from BIFPCL/OE approved source - Batch TC from manufacturer to be reviewed & invoice to be co-related for each lot of supply.
K.29	Install LP push rod assembly reference dimension	M	Tape	B	100%	Assembly drawing & Erection Manual	L-17		
K.30	Check Bearing alignment & clearance dimension for brg 1,2,3,4,5	M	Micrometer, Feeler gauge	A	100%	Assembly drawing & Erection Manual	L-39	√	
K.31	Check Bearing pedestal ref. dimension for pedestals 1,2,3,4,5	M	Tape	B	100%	Assembly drawing & Erection Manual	L-40		
L	**GLAND STEAM CONDENSER**								
L.01	Levelling of exhauster & motor assembly on foundation & its alignment	M & V	Tape, Dial gauge	B	100%	Drawing	SR		
L.02	Position, alignment and levelling of GSC.	M & V	Tape, Water level	B	100%	Drawing	SR		Ensure that no undue cold pull is transferred on GSC after connecting pipelines.
L.03	Mounting of instrumentation	V	-	B	100%	Instrument Schedule	SR		
M	**DRAIN COOLER**								
M.01	Foundation dimensions	M	Tape	B	100%	Drawing	SR		
M.02	Position, alignment and levelling of Drain Cooler	M & V	Tape, Water level	B	100%	Drawing	SR		

BHARAT HEAVY ELECTRICALS LIMITED PS:ER, KOLKATA	FIELD QUALITY PLAN FOR **STEAM TURBINE - UNIT # 2** STATEMENT OF CHECKS	FQP NO.: **MAITREE-02-MA-QA-300070-PSE** BHEL Doc. No. : QPE-MTE-660-ST-43B REV.NO.: 2 SHEET 14 / 14 SHEETS
SYSTEM: STEAM TURBINE & AUXILIARIES	SUB-SYSTEM: STEAM TURBINE - UNIT # 2	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*	*D**	*9*
M.03	Check all openings in Drain Cooler for any foreign material	V	-	B	100%	No foreign material	SR		
M.04	Provision of Vents & Installation of Drain Valves on Tube & Shell side	V & R	-	B	100%	Drawing	SR		
N	**TG INTEGRAL PIPING**								
N.01	Layout and slope of Pipelines	M & V	Tape	B	100%	Drawing	SR		
N.02	Verification of Material Colour code, system wise	V & R	Handheld XRF PMI guns	B	100%	MU Colour Code & procedure recommended by the PMI gun manufacturer	L-43		All alloy steel components are to be checked with PMI
N.03	Welding & NDE of Pipelines.	refer Sl. No. 'E' for checks							
N.04	Installation of Hangers & Supports								
□□4□	Location & Dimensions	M & V	Tape	B	100%	Drawing & Hanger schedule	SR		
□□4□	Load Setting	M	Tape	B	100%	Drawing & Hanger schedule	SR		
□□4□	Welding & NDE, as applicable	refer Sl. No. 'E' for checks							
O	**PAINTING OF LP OUTER CASING & OTHER UN-INSULATED PARTS**								
O.01	Visual inspection of surface for damage to the paint during handling	V	-	C	100%	- Approved painting schedule - No rust, oil & other foreign materials	SR		
O.02	Touch-up of primer / paint in damaged portions, if required and finish painting. (Batch TC from manufacturer to be reviewed & invoice to be co-related for each lot of supply).	V, R & P	-	B	100%	Drawing, Approved painting schedule & ISO 12944	SR		- Primer / paints to be procured from BIFPCL/OE approved source
O.03	Checking of final painting dry film thickness & acceptance	M & V	Digital DFT Gauge	B	100%	Drawing & Approved painting schedule	JOINT PROTOCOL	√	
P	**ERECTION COMPLETION CHECKS**								
P.01	Erection Completion Check, Handing over for commissioning & Handing over of erection inspection records, Logsheets & protocols as per the Contract.	V & R	-	A	100%	Assembly drawings & Erection Manual	JOINT PROTOCOL	√	Review of all Inspection records, Log Sheets, protocols for completeness and disposition status of NCRs (if any)

FOR TENDER PURPOSE ONLY

ANNEXURE - I

METHODOLOGY FOR SAMPLING FOR TESTING OF REPAIRED WELD JOINTS IN ADDITION TO THE REQUIREMENTS OF THE TECHNICAL SPECIFICATION

Wherever the quantum of check in any NDT is other than 100%, following guidelines for sampling / re-sampling procedure for NDT have been formulated by BHEL & BIFPCL jointly including following features:

1) The group of welds for sampling shall be based on welding done by a welder in specified continuous time (say work done in a shift or in a day). For further analysis, acceptance or rejection, this group shall be treated as an entity.

2) From above weld group, the selection of weld joint / weld spot shall be done by BIFPCL as per the quantum of check specified.

3) For acceptance of the weld group, all samples selected in this group should meet the acceptance norms. In case of any sample (s) found beyond acceptance norms, following actions shall be taken:

3.1) Rectification of defective welds and re-testing of the repair.

3.2) Re-sampling by BIFPCL from the same group of welds, with quantum of NDT being double of originally specified quantum (with minimum 2 welds for every defective weld).

In case of RT on T-joints, if defect found on L-seam done at manufacturing works of pipe produced as per IS-3589, pipe defects shall be rectified and no resampling is envisaged.

4) In case of any weld from the re-sample as per 3.2 above found beyond acceptable norms, following action shall be taken:

4.1) NDT of all the welds of the group which were not tested in first and second samples.

4.2) Repair and re-testing of all defective welds.

4.3) Necessary action on process control and on welder for eliminating recurrence of defectives.

5) For the purpose of sampling, the weld group shall be defined as number of welds in case of smaller diameter of tubes / pipes (or small welds on structures) while for very large diameter pipes e.g. CW piping or for vessels / long welds, the length of weld may be taken as basic unit. Sampling shall also be accordingly in terms of No. of weld joints or length of weld.

6) From the time of readiness of weld group, suitable time limits shall be prescribed for first sampling testing, re-sampling, repairing, re-testing etc. (normally not more than 1 day's backlog should be piled up at every step).

Illustration: Radiography of welds: Welding completed on day 1 should be tested by day-2 and repair and re-sampling of the group should be done by day – 3 and further testing / repair should be by day – 4.

7. Sampling and re-sampling procedure shall be applicable for all the NDT viz RT, UT, DPT, MPI.

Note: In case of RT of tube welds with double wall double image (elliptical view) number of exposure shall be as per relevant code / plant standard and will not be less than two exposures for each weld.

FOR TENDER PURPOSE ONLY

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बीएचईएल BHEL	**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-ST-43B
PROJECT					REV. NO. : 2
UNIT NO.					LOG SHEET NO. : L-00
RATING					SHEET 1 / 1 SHEETS

FOR TENDER PURPOSE ONLY

PSER	INSTRUMENT REG. NO./TAG NO.	
	DATE OF INSPECTION	
	DRAWING / DOCUMENT REF.	

PROTOCOL

FOR TENDER PURPOSE ONLY

			NAME	SIGNATURE & DATE	FQPNO.:QPE-MTE-660-ST-43B
PROJECT		INSPECTED BY			REV. NO. : 2
UNIT NO.		CLEARED BY			PROTOCOL NO.
RATING		CUSTOMER			PAGE:

2X660MW Maitree STPP						
TENDER NO – PSER:SCT:KLN-T1966:19						
FGD WEIGHT SCHEDULE (U1 & U2)						
SL. NO.	**PGMA**	**PGMA_DESC**	**SCOPE**	**LOCATION**	**Weight (KG)**	**CATEGORY**
1	FW251	EXPANSION JOINT BETWEEN BYPASS	Vendor U#1	UNIT#1	6000.00	DUCT
2	FW253	EXPANSION JOINT BETWEEN SCRUBR	Vendor U#1	UNIT#1	6000.00	DUCT
3	FW267	INSULATION MATERIALS FOR DUCT	Vendor U#1	UNIT#1	40000.00	INS
4	FW268	FIXING COMPONENTS AND CLADDING	Vendor U#1	UNIT#1	40000.00	INS
5	FW751	PROCESS WATER PIPE ACCESSORIES	Vendor U#1	COMMON	59000.00	PIPE
6	FW752	COOLING WATER PIPE ACCESSORIES	Vendor U#1	COMMON	14000.00	PIPE
7	FW753	SLURRY PIPE ACCESSORIES	Vendor U#1	COMMON	110000.00	PIPE
8	FW754	SERVICE AIR PIPE ACCESSORIES	Vendor U#1	COMMON	24000.00	PIPE
9	FW755	INSTRUMENT AIR PIPE ACCESSORIE	Vendor U#1	COMMON	24000.00	PIPE
10	FW758	VALVES AND FITTINGS COMMON	Vendor U#1	COMMON	90000.00	PIPE
11	FW213	ABSORBER SYSTEM INTERNALS	Vendor U#1	UNIT#1	25000.00	PIPE
12	FW227	EMERGENCY QUENCH SYSTEM	Vendor U#1	UNIT#1	8000.00	PIPE
13	FW229	W/D WASH SYSTEM	Vendor U#1	UNIT#1	8000.00	PIPE
14	FW244	OXIDATION AIR DISTRIBUTION SYS	Vendor U#1	UNIT#1	10000.00	PIPE
15	FW701	SLURRY PUMPS & ACCESSORIES	Vendor U#1	COMMON	56000.00	RM/EQPT
16	FW702	WATER PUMPS & ACCESSORIES	Vendor U#1	COMMON	40000.00	RM/EQPT
17	FW720	AGITATORS	Vendor U#1	COMMON	40000.00	RM/EQPT
18	FW738	GYPSUM BELT FILTER AND ACCESS	Vendor U#1	COMMON	191000.00	RM/EQPT
19	FW212	SLURRY RECIRCULATION PUMP SYST	Vendor U#1	UNIT#1	55000.00	RM/EQPT
20	FW230	AIR OXIDATION SYSTEM	Vendor U#1	UNIT#1	20000.00	RM/EQPT
21	FW610	GALLARIES&RAILINGS FOR SCRUBBE	Vendor U#1	COMMON	240000.00	STR
22	FW614	PLATFORM FOR PIPE RACK	Vendor U#1	COMMON	60000.00	STR
23	FW710	MONORAIL FOR HOIST & CRANES	Vendor U#1	COMMON	20000.00	STR
24	FW721	AGITATOR SUPPORT	Vendor U#1	COMMON	10000.00	STR
25	FW750	TANK ACCESSORIES	Vendor U#1	COMMON	20000.00	STR
26	FW761	STRUCTURE FOR PIPERACKS	Vendor U#1	COMMON	40000.00	STR
27	FW769	TRESTLE FOR PIPE RACKS	Vendor U#1	COMMON	240000.00	STR
28	FW798	AIR RECEIVERS	Vendor U#1	COMMON	8000.00	STR
29	FW215	MIST ELIMINATOR & ACCESSORIES	Vendor U#1	UNIT#1	40000.00	STR
30	FW219	ABSORBER SYSTEM-BASE	Vendor U#1	UNIT#1	18000.00	STR
31	FW220	ABSORBER SYSTEM-STRUCTURES	Vendor U#1	UNIT#1	450000.00	STR
32	FW221	ABSORBER SYSTEM-CASING BOTTOM	Vendor U#1	UNIT#1	100000.00	STR
33	FW222	ABSORBER SYSTEM-CASING TOP	Vendor U#1	UNIT#1	220000.00	STR
34	FW223	ABSORBER SYSTEM ACCESSORIES	Vendor U#1	UNIT#1	40000.00	STR
35	FW228	ABSORBER-W/D INTERFACE	Vendor U#1	UNIT#1	9000.00	STR
36	FW286	SUPPORTING STR FOR BYPASS DUCT	Vendor U#1	UNIT#1	15000.00	STR
37	FW292	STRUCTURES FOR ELEVATOR	Vendor U#1	UNIT#1	43000.00	STR
38	FW299	MISCELLANEOUS-FGD SYSTEM	Vendor U#1	UNIT#1	10000.00	STR
39	FW722	GALLERIES & RAILINGS FOR TANK	Vendor U#1	COMMON	30000.00	TANK
40	FW742	LIMESTONE SLURRY STORAGE TANK	Vendor U#1	COMMON	69455.05	TANK
41	FW743	AUXILIARY ABSORBER TANK	Vendor U#1	COMMON	272000.00	TANK
42	FW744	FILTRATE TANK	Vendor U#1	COMMON	7025.68	TANK
43	FW745	WASTAGE WATER TANK	Vendor U#1	COMMON	5000.00	TANK
44	FW747	HYDROCLONE WASTE WATER TANK	Vendor U#1	COMMON	13000.00	TANK
45	FW748	PROCESS WATER TANK	Vendor U#1	COMMON	41000.00	TANK
46	FW749	ALL TANKS INTERNAL STRUCTURE	Vendor U#1	COMMON	12000.00	TANK
47	FW226	EMERGENCY QUENCH WATER TANK	Vendor U#1	UNIT#1	5000.00	TANK

2X660MW Maitree STPP						
TENDER NO – PSER:SCT:KLN-T1966:19						
FGD WEIGHT SCHEDULE (U1 & U2)						
48	FW253	EXPANSION JOINT BETWEEN SCRUBR	Vendor U#2	UNIT#2	6000.00	DUCT
49	FW251	EXPANSION JOINT BETWEEN BYPASS	Vendor U#2	UNIT#2	6000.00	DUCT
50	FW267	INSULATION MATERIALS FOR DUCT	Vendor U#2	UNIT#2	40000.00	INS
51	FW268	FIXING COMPONENTS AND CLADDING	Vendor U#2	UNIT#2	40000.00	INS
52	FW213	ABSORBER SYSTEM INTERNALS	Vendor U#2	UNIT#2	25000.00	PIPE
53	FW227	EMERGENCY QUENCH SYSTEM	Vendor U#2	UNIT#2	8000.00	PIPE
54	FW229	W/D WASH SYSTEM	Vendor U#2	UNIT#2	8000.00	PIPE
55	FW244	OXIDATION AIR DISTRIBUTION SYS	Vendor U#2	UNIT#2	10000.00	PIPE
56	FW735	LIMESTONE MILL ACCESSORIES	Vendor U#2	COMMON	1360000.00	RM/EQPT
57	FW212	SLURRY RECIRCULATION PUMP SYST	Vendor U#2	UNIT#2	55000.00	RM/EQPT
58	FW230	AIR OXIDATION SYSTEM	Vendor U#2	UNIT#2	20000.00	RM/EQPT
59	FW792	GYP INTERMEDIATE SILO & ACCSRS	Vendor U#2	COMMON	200000.00	STR
60	FW794	STRUC PLATFRM GYP INTMDTE SILO	Vendor U#2	COMMON	186000.00	STR
61	FW795	SUPPORT STRUCTURE-GYPSUM SHED	Vendor U#2	COMMON	100000.00	STR
62	FW796	SUPPORT-GYP REVERSIBLE CONVYOR	Vendor U#2	COMMON	61000.00	STR
63	FW215	MIST ELIMINATOR & ACCESSORIES	Vendor U#2	UNIT#2	40000.00	STR
64	FW219	ABSORBER SYSTEM-BASE	Vendor U#2	UNIT#2	15727.47	STR
65	FW220	ABSORBER SYSTEM-STRUCTURES	Vendor U#2	UNIT#2	450000.00	STR
66	FW221	ABSORBER SYSTEM-CASING BOTTOM	Vendor U#2	UNIT#2	100000.00	STR
67	FW222	ABSORBER SYSTEM-CASING TOP	Vendor U#2	UNIT#2	220000.00	STR
68	FW223	ABSORBER SYSTEM ACCESSORIES	Vendor U#2	UNIT#2	40000.00	STR
69	FW228	ABSORBER-W/D INTERFACE	Vendor U#2	UNIT#2	9000.00	STR
70	FW286	SUPPORTING STR FOR BYPASS DUCT	Vendor U#2	UNIT#2	15000.00	STR
71	FW292	STRUCTURES FOR ELEVATOR	Vendor U#2	UNIT#2	43000.00	STR
72	FW299	MISCELLANEOUS-FGD SYSTEM	Vendor U#2	UNIT#2	10000.00	STR
73	FW226	EMERGENCY QUENCH WATER TANK	Vendor U#2	UNIT#2	5000.00	TANK
		TOTAL WEIGHT (in MT)			**5976.21**	

NOTE:

1.0	The weight/PGMA given above is tentative and may change based on detail engineering.
2.0	The item/PGMA wise Category / Group distribution is tentative and in case of any discrepency, BHEL Site CM/GM's decision in this regard shall be final.
3.0	If any other PGMA/item is erected by the contractor, then the payment shall be made as per rates in the applicable group for that item, as decided by BHEL Site CM/GM.

2X660 MW Maitree STPP WEIGHT SUMMARY - TG & AUX PKG INCL FGD (UNIT#1)		
SL. NO.	**DESCRIPTION**	**WEIGHT (MT)**
1.0	**TG & AUX**	
1.1	**HARIDWAR - BOI**	**628.99**
1.2	**HARIDWAR - SIEMENS SUPPLY**	**1734.23**
1.3	**HARIDWAR - SHOP SUPPLY**	**1158.23**
1.4	**BHOPAL**	**568.28**
1.5	**HYDERABAD**	**1616.08**
1.6	**PC CHENNAI**	**513.65**
1.7	**TRICHY VALVE**	**120.00**
1.8	**PEM**	**853.95**
TOTAL WEIGHT - TG & AUX (MT)		**7193.41**

NOTE

The quantities/ weights mentioned in weight schedule/ equipment description is approximate only and given to facilitate bidder to make assessment of magnitude of work of the tender. These are liable to variations as per design consideration.

2X660MW Maitree STPP - BHEL Hardwar Tentative BOI Details					
S.No.	**ITEM DESC**	**QTY**	**UNIT**	**Grs. Wt (MT)**	**(Packing Details) LxWxH (in cm)**
1	BUTTERFLY VALVES	1	Set	0.125	62.5X62.5X37.5
2	NRV WITH ALUMINIUM FLAP	1	Set	0.023	31.8X28X15
3	OIL PURIFICATION UNIT	1	No	1.8	225X150X176
4	SPRAY NOZZLES	13	No	0.003	22X22X11
5	DIRT CATCHERS	1	No	0.06	50X45X37.5
6	DAMPER(box1)	1	Set	0.205	92X92X92
	DAMPER (box2)			0.19	92X92X92
7	VARIABLE LOAD SPRING CAGES	1	Set	36	120X100X50 (18 box, wt/box= 2)
				46.2	80X50X40 (18 box, wt/box= 2.1)
10	TURBINE OIL	1	FL.	55.2	276 drums each of 210 Litres
11	DRY AIR PRESERVATION SYSTEM	1	No.	0.75	270x210x250
12	OIL PURIFICATION SYSTEM (CENTRE)	1	No	1.8	225X150X176
14	TURBINE INTEGRAL PIPING	1	Set	13	920X250X270
15	H & S FOR TURBINE INTEGRAL PIPING	1	Set	21	620X100X100 (3 box, wt/box= 7)
				10	620X100X100 (2 box, wt/box= 5)
				1	90X60X60
16	CALIBRATED FLOW NOZZLE ASSLY.	1	No.	3.27	680x150x100
				3.27	680x150x100
17	ANGLE DRAIN VALVE (Pneumatic)	1	Set	6	200X150X150 (20 box, wt/box= 0.3)
18	CONTROL FLUID (FRF)	1	FL.	3.315	13 drums each of 210 Litres each
19	LP BYPASS STOP & CONTROL VALVE	1	Set	1.7	330x170x180
				0.11	100x90x70
				0.16	120x80x80
				0.9	150x110x110
				0.6	150x110x110
				0.15	100x90x70
				0.2	120x120x90
				0.23	120x80x80
				1.46	240x140x170
				1.46	240x140x170
				0.89	120x120x90
				10	390x260x250
				10	390x260x250
				0.72	250x90x110
				0.72	250x90x110
20	STEAM TRAP	1	Set	0.25	62.5X60X75
21	GEAR PUMP (LUB. OIL RECIRCULATE)	1	No	0.07	70X70X50
25	VACUUM BREAKER VALVE WITH PNEU	1	Set	0.19	120x70x90
26	HP RELIEF VALVE	1	No	0.835	195x132x130
27	Oil Module (Cooler Module)	1	No	20	350X270X720
	Oil Module (Tank Module)			25	1000X350X500
28	OIL THROTTLE VALVES	8	No	0.07	50X40X45
				0.07	50X40X45
				0.065	50X40X42.5
				0.045	45X37.5X40
29	SEAL STEAM CONTROL VALVE WITH	1	Set	0.4	150x70x60
30	LEAK STEAM CONTROL VALVE WITH	1	Set	2.4	300x180x110
32	PNEUMATIC GLOBE VALVE	1	Set	0.03	50X40X30
33	HYDRAULIC POWER SUPPLY UNIT FOR TURBINE VALVES	1	Set	7.5	320x280x320
34	BOROSCOPIC VIDEO IMAGE KIT	1		0.0125	23x11x15
37	EMPTY H2 CYLINDER	128	No	0.06	L=145, OD= 23.5
38	EMPTY CO2 CYLINDER	44	No	0.06	L=145, OD= 235
39	EMPTY N2 CYLINDER	12	No	0.06	L=145, OD= 23.5

2X660MW Maitree STPP - BHEL Hardwar Tentative BOI Details					
S.No.	**ITEM DESC**	**QTY**	**UNIT**	**Grs. Wt (MT)**	**(Packing Details) LxWxH (in cm)**
40	VAPOUR EXHAUSTER	2	No	0.08	50x47x50
41	REFRIGERATION GAS DRYER	2	No	1	100x80x140
42	SLIP RING COVER (COMPLETE WITH FABRICATION & LINING)	1	Set	5	450x350x400
43	PRIMARY WATER COOLER (PLATE TYPE)	2	No	1	50x170x170
44	HYDRAULIC UNIT ASSEMBLY	1	Set	0.59	5 nos. boxes (58.4x35.56x25.4); 2 nos boxes (73.66x45.7235.56); 1 no box (58.4x58.4x40.64)
45	GENERATOR INTEGRAL PIPING	1	Set	19.299	….
46	HYDROGEN COOLERS PIPING	1	Set	7.171	….
47	CONDENSOR AIR EVACUATION PACKA	4	Nos.	32	6300X2500X3000
48	AIR EXHAUSTER WITH MOTOR	2	Nos.	0.4	1100x1000x700
49	MULTI BALL BEARING SUPPORT FOR	2	Set	2.976	40X40X21/Bearing
50	SEAMLESS TITANIUM TUBES (FOR CONDENSER)	2	Set	267.8	1370x120x50/pkg (total 134 packages/unit)
51	MOISTURE MEASURING EQUIPMENT	1	Set	0.075	92x92x46 20x26x36 (small Drum)
52	MOTORISED TEMPERATURE CONTROL VALVE WITH ACTUATOR NB250 VAR-02	1	No	1.955	224x140x112
56	PW TEMPERATURE CONTROL VALVE	1	No	0.515	173x97x102
	TOTAL WEIGHT (MT)			**628.99**	

2x660 Maitree STPP - HARIDWAR SAG Supply Details (Tentative)		
Sl no.	**Major Description**	**Grs. Wt (MT)**
1	HP Turbine	145
2	IP Turbine	190
3	LP Turbine - 1	230
4	LP Turbine - 2	230
5	Turbine Bearing	97
6	Turbine Valves	193
7	Turbine Accessories I	41
8	Turbine Accessories II	12
9	Cross Over Pipe	67
10	Turbine Foundation Accessories	0.73
11	Generator Rotor	82
12	Generator (excl. Rotor)	327
13	Foundation Accessories	17
14	Generator Accessories	102
15	Hazardous goods	0.5
	TOTAL WEIGHT (MT)	**1734.23**

(Exact details of all packages to be despatched from SAG shall be intimated after despatch only)

2x660 Maitree STPP U#1 - HARIDWAR Shop Supply Details (Tentative)							
Slno	**Pkgno**	**Description**	**Length (in mm)**	**Breadth (in mm)**	**Height (in mm)**	**Netwt (in kg)**	**Grosswt (in kg)**
Turbine & Aux.							
1	75001	ARRANGE.OF EMBED(ANCHOR POINT) ARRANGE.OF EMBED(ANCHOR POINT)	2550	800	1000	657	777
2	75001	ARRANGE.OF EMBED(ANCHOR POINT) ARRANGE.OF EMBED(ANCHOR POINT)	2550	800	1000	657	777
3	75001	ARRANGE.OF EMBED(ANCHOR POINT) ARRANGE.OF EMBED(ANCHOR POINT)	2550	800	1000	657	777
4	75001	ARRANGE.OF EMBED(ANCHOR POINT) - ANCHOR BOX TYPE-A	2550	800	1000	657	777
5	75001	ARRANGE.OF EMBED(ANCHOR POINT) ARRANGE.OF EMBED(ANCHOR POINT)	2550	800	1000	657	777
6	75001	ARRANGE.OF EMBED(ANCHOR POINT) ARRANGE.OF EMBED(ANCHOR POINT)	3350	800	1000	825	955
7	75001	ARRANGE.OF EMBED(ANCHOR POINT) - EMBED.FOR LPC GUIDE BOLT	3350	800	1000	993	1123
8	75001	ARRANGE.OF EMBED(ANCHOR POINT) - EMBED.FOR LPC GUIDE BOLT	3350	800	1000	993	1123
9	75001	ARRANGE.OF EMBED(ANCHOR POINT) - LOOSE ITEMS	1600	1300	1500	640	790
10	75001	ARRANGE.OF EMBED(ANCHOR POINT) - ANCHOR RODS/NUTS (L=3000)	1600	1300	1500	676	826
11	75001	ARRANGE.OF EMBED(ANCHOR POINT) ARRANGE.OF EMBED(ANCHOR POINT)	1350	1300	1250	647	797
12	75102	CASING UPPER PART	8600	3000	3000	12860	13060
13	75102	CASING UPPER PART	8600	3000	3000	12860	13060
14	75103	CASING UPPER PART	8600	3000	3000	12170	12370
15	75103	CASING UPPER PART	8600	3000	3000	12170	12370
16	75104	RUPTURE DIAPHRAGM ASSEMBLY	2800	2400	1600	1824	2124
17	75107	CASING SIDE WALL (LEFT)	5330	5040	600	7480	7680
18	75107	CASING SIDE WALL (LEFT)	5330	5040	600	7480	7680
19	75108	CASING SIDE WALL (RIGHT)	5030	5040	600	7480	7680
20	75108	CASING SIDE WALL (RIGHT)	5330	5040	600	7480	7680
21	75109	FRONT WALL LP-1 (TS)	8000	5040	1200	14657	14857
22	75109	FRONT WALL LP-2 (TS)	8000	5040	1200	14657	14857
23	75110	FRONT WALL LP-1 (GS)	8000	5040	1200	14657	14857
24	75110	FRONT WALL LP-2 (GS)	8000	5040	1200	14657	14857
25	75111	LP SHAFT SEAL CASING - TS	2000	1650	750	672	822
26	75111	LP SHAFT SEAL CASING - TS	2000	1650	750	672	822
27	75112	LP SHAFT SEAL CASING - GS	2000	1650	750	672	822
28	75112	LP SHAFT SEAL CASING - GS	2000	1650	750	672	822
29	75113	LP SHAFT SEAL COMPENSATOR (TS)	2200	2200	800	715	1015
30	75113	LP SHAFT SEAL COMPENSATOR (TS)	2200	2200	800	715	1015
31	75114	LP SHAFT SEAL COMPENSATOR (GS)	2200	2200	800	715	1015
32	75114	LP SHAFT SEAL COMPENSATOR (GS)	2200	2200	800	715	1015
33	75116	CASING FRAME SECTION	8200	4900	250	6427	6927
34	75116	CASING FRAME SECTION	8200	4900	250	6427	6927
35	75116	CASING FRAME SECTION	2100	1900	1900	3231	3531
36	75116	CASING FRAME SECTION	2000	700	1100	4822	5222
37	75705	LP EXTRACTION A1	2700	1100	1000	504	654
38	75705	LP EXTRACTION A1	2700	1100	1000	504	654
39	75706	LP EXTRACTION A1	2700	1100	1000	504	654

2x660 Maitree STPP U#1 - HARIDWAR Shop Supply Details (Tentative)							
Slno	**Pkgno**	**Description**	**Length (in mm)**	**Breadth (in mm)**	**Height (in mm)**	**Netwt (in kg)**	**Grosswt (in kg)**
40	75706	LP EXTRACTION A1	2700	1100	1000	504	654
41	75707	LP EXTRACTION A1	2800	1900	1000	1086	1236
42	75707	LP EXTRACTION A1	2800	1900	1000	1086	1236
43	75707	LP EXTRACTION A1	2000	1800	900	364	514
44	75707	LP EXTRACTION A1	2000	1800	900	364	514
45	75708	LP EXTRACTION A2	2800	1900	1000	1086	1236
46	75708	LP EXTRACTION A2	2800	1900	1000	1086	1236
47	75709	LP EXTRACTION A2	2700	1900	1000	988	1138
48	75709	LP EXTRACTION A2	2700	1900	1000	988	1138
49	75710	LP EXTRACTION A2	2000	1800	900	388	538
50	75710	LP EXTRACTION A2	2000	1800	900	388	538
51	75711	LP EXTRACTION A3	3150	1900	1000	1357	1507
52	75711	LP EXTRACTION A3	3150	1900	1000	1357	1507
53	75712	LP EXRACTION A3	3500	1900	1500	1300	1450
54	75712	LP EXRACTION A3	1600	800	700	530	630
55	75713	LP EXTRACTION A3	4250	1100	1100	1072	1222
56	75713	LP EXTRACTION A3	4250	1100	1100	1072	1222
57	75716	EXTRACTION PIPE SHEATHING A3	2500	900	700	311	371
58	75716	EXTRACTION PIPE SHEATHING A3	2200	700	600	550	610
59	75716	EXTRACTION PIPE SHEATHING A3	1800	900	600	725	825
60	75716	EXTRACTION PIPE SHEATHING A3	2500	600	500	360	430
61	75716	EXTRACTION PIPE SHEATHING A3	2500	900	700	311	371
62	75716	EXTRACTION PIPE SHEATHING A3	2200	700	600	550	610
63	75716	EXTRACTION PIPE SHEATHING A3	1800	900	600	725	825
64	75716	EXTRACTION PIPE SHEATHING A3	1100	600	500	1063	1163
65	75717	COMPENSATORS FOR CASING GUIDE	5500	1800	800	1960	2260
66	75723	LP CASING ASSEMBLY PARTS	5900	1000	500	1143	1368
67	75723	LP CASING ASSEMBLY PARTS	1500	800	900	1400	1500
68	75723	LP CASING ASSEMBLY PARTS LP CASING ASSEMBLY PARTS	500	500	400	14	34
69	75723	LP CASING ASSEMBLY PARTS	1300	1300	400	111	186
70	76301	SUSPENSION OF LPBP VALVE	3600	800	600	986	1186
71	76301	SUSPENSION OF LPBP VALVE	3600	800	600	986	1186
72	76412	LEAKAGE OIL TANK	1000	1000	3000	515	515
73	76413	WASTE OIL TANK	1000	1000	3000	515	515
74	76801	RATING,COLLABORATION AND COMPANY'S MONOGRAM	1000	550	500	100	125
75	76914	COMPENSATOR	750	750	1050	27.44	50
76	76921	VALVE BLOCK ASSLY	250	200	200	8	12
77	77202	TEMP. & PRESSURE CONNECTIONS	1000	800	800	112	262
82	77207	IMPULSE PIPES	7000	300	300	1000	1300
Generator & Aux.							
83	603	FOUNDATION ITEMS	5800	1120	631	1670	3470
84	606	SKID PLATE	8000	855	330	237	818
85	631	DRY AIR BLOWER	1360	1190	1625	115	648
86	632	ERECTION PEDESTALS	6500	1500	1211	4300	6543
87	633	ROTOR INSERTION DEVICES	2460	1170	1350	1910	2320
88	634	WIRE ROPES FOR ROTOR	1800	1800	410	216	523
89	635	GENERATOR ERECTION DEVICES	3450	1630	795	490	1400
90	636	SPECIAL TOOLS AND TACKLES	800	700	428	80	218
91	645	SEAL OIL STORAGE TANK	5000	1800	2165	1945.2	4144.2

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Slno	**Pkgno**	**Description**	**Length (in mm)**	**Breadth (in mm)**	**Height (in mm)**	**Netwt (in kg)**	**Grosswt (in kg)**
92	646	PW PUMP AND FILTER UNIT	4100	4100	3105	3362.6	6107.56
93	648	SINGLE FLOW S.O.U.-PART I	3800	2500	2165	2599	4216
94	648	SINGLE FLOW S.O.U. -PART II	2900	2500	3165	1300	3021
95	649	LIQUID DETECTOR RACK	2132	840	2340	262	725
96	650	GAS UNIT	2500	1750	2750	897.2	1919.2
97	651	CO2 VAPOURISER	1520	840	880	235.94	502.94
98	652	H2 DISTRIBUTOR	3540	1625	840	173.23	820.23
99	653	CO2 DISTRIBUTOR	4900	1200	665	140.37	846.37
100	654	N2 DISTRIBUTOR	1400	1200	665	55.23	364.23
101	655	DRAIN OIL COLLECTOR	2000	550	840	89	321
102	656	RESINS	1200	600	715	56	233
103	657	TG SYSTEM INTEGRAL PIPING (VALVES)	2750	1400	1565	1587	2327
104	658	TG SYSTEM INTEGRAL PIPING (INSTRUMENTS)	1000	940	1065	121	357
105	660	SLIP RING SHAFT ASSEMBLY	3400	1190	1255	2842	3684
106	661	AIR FILTERS & SEALING WALL	2200	2220	1205	242	1168
107	662	ACCESSORIES OF SLIP RING SHAFT	4200	1620	1005	1263	2455
108	663	BED PLATE, BEARING & BRUSHGEAR	3260	2120	1795	5607	7096
109	664	ROTOR FLUX MONITORING SYSTEM-1	1050	870	2600	300	500
110	664	ROTOR FLUX MONITORING SYSTEM-2	1600	1100	900	90	330
Condenser & Aux.							
111	78001	HOTWELL - I (CONDENSER-1)	10350	2822	1560	7952	7952
112	78001	HOTWELL - II (CONDENSER-2)	10350	2822	1560	7947	7947
113	78004	FRONT END BOTTOM PLATE	8010	2210	1280	5220.6	5220.6
114	78004	FRONT END BOTTOM PLATE	8010	2210	1280	5220.6	5220.6
115	78005	REAR END BOTTOM PLATE	8010	2210	1400	5502.7	5502.71
116	78005	REAR END BOTTOM PLATE	8010	2210	1400	5502.7	5502.71
117	78006	MIDDLE BOTTOM PLATE-1	8010	3850	1220	8072	8072
118	78006	MIDDLE BOTTOM PLATE-1	8010	3850	1220	8072	8072
119	78007	MIDDLE BOTTOM PLATE-2	8010	2630	1220	6395.9	6395.86
120	78007	MIDDLE BOTTOM PLATE-2	8010	2630	1220	6395.9	6395.86
121	78008	MIDDLE BOTTOM PLATE-3	8010	3850	1220	8264.4	8264.42
122	78008	MIDDLE BOTTOM PLATE-3	8010	3850	1220	8264.4	8264.42
123	78010	BOTTOM PLATE (LOOSE ITEMS)	950	450	450	214	264
124	78010	BOTTOM PLATE (LOOSE ITEMS)	950	450	450	214	264
125	78014	LOOSE ITEMS (COND.SUPPORT)	3000	1100	1100	1680	1760
126	78014	LOOSE ITEMS (COND. SUPPORT)	4000	1200	1200	3050	3150
127	78018	LOOSE ITEMS(COND. SUPPORT)	1750	1200	1200	1385	1455
128	78018	LOOSE ITEMS(COND SUPPORT)	1750	1200	1200	1385	1455
129	78019	LOOSE ITEMS(COND SUPPORT)	1300	1300	950	3215	3265
130	78019	EARTH QUAKE PROTECTION DEVICE	1300	1300	950	3215	3265
131	78021	FRONT WATER BOX AND WATER CHAMBER(GEN.SIDE)	7014	4030	4200	30038	30158
132	78021	FRONT WATER BOX AND WATER CHAMBER (GEN.SIDE)	7014	4030	4200	30038	30158
133	78024	FRONT WATER BOX AND WATER CHAMBER (TUR.SIDE)	7014	4030	4200	30661	30781
134	78024	FRONT WATER BOX AND WATER CHAMBER (TUR.SIDE)	7014	4030	4200	30661	30781
135	78027	REAR WATER BOX AND WATER CHAMBER (GEN.SIDE)	7014	4030	3450	28016	28116

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Slno	**Pkgno**	**Description**	**Length (in mm)**	**Breadth (in mm)**	**Height (in mm)**	**Netwt (in kg)**	**Grosswt (in kg)**
136	78027	REAR WATER BOX AND WATER CHAMBER (GEN.SIDE)	7014	4030	3450	28016	28116
137	78030	REAR WATER BOX AND WATER CHAMBER (TUR.SIDE)	7014	4030	3450	28016	28116
138	78030	REAR WATER BOX AND WATER CHAMBER (TUR.SIDE)	7014	4030	3450	28016	28116
139	78032	SIDE WALL(TUR.END-PLATES) CONDENSER-1	7060	2015	230	4095	4095
140	78032	SIDE WALL(TUR.END-PLATES) CONDENSER-2	7060	2015	230	4095	4095
141	78033	SIDE WALL(TUR.END-PLATES) CONDENSER-1	7060	2990	320	11117	11117
142	78033	SIDE WALL(TUR.END-PLATES) CONDENSER-2	7060	2990	320	11117	11117
143	78034	SIDE WALL(TUR.END-LOOSE ITEMS) CONDENSER-1	4750	450	350	588	638
144	78034	SIDE WALL(TUR.END-LOOSE ITEMS) CONDENSER-2	4750	450	350	588	638
145	78041	SIDE WALL(GEN.END-PLATES) CONDENSER-1	7060	2015	230	4095	4095
146	78041	SIDE WALL(GEN.END-PLATES) CONDENSER-2	7060	2015	230	4095	4095
147	78042	SIDE WALL(GEN.END-PLATES) CONDENSER-1	7060	2990	320	11117	11117
148	78042	SIDE WALL(GEN.END-PLATES) CONDENSER-2	7060	2990	320	11117	11117
149	78046	SIDE WALL(GEN.END-LOOSE ITEMS) CONDENSER-1	4750	450	350	588	638
150	78046	SIDE WALL(GEN.END-LOOSE ITEMS) CONDENSER-2	4750	450	350	588	638
151	78047	SHELL INTERNAL STIFFENING RODS	3366	791	658	3406	4013
152	78047	SHELL INTERNAL STIFFENING RODS	3366	791	658	3406	4013
153	78048	SHELL INTERNAL STIFFENING RODS	3366	791	658	3406	4013
154	78048	SHELL INTERNAL STIFFENING RODS	3366	791	658	3406	4013
155	78049	SHELL INTERNAL STIFFENING RODS	3366	791	658	3406	4013
156	78049	SHELL INTERNAL STIFFENING RODS	3366	791	658	3406	4013
157	78050	SHELL INTERNAL STIFFENING RODS	3366	791	658	3406	4013
158	78050	SHELL INTERNAL STIFFENING RODS	3366	791	658	3406	4013
159	78051	SHELL INTERNAL STIFFENING RODS	3366	791	658	3244	3744
160	78051	SHELL INTERNAL STIFFENING RODS	3366	791	658	3244	3744
161	78052	SHELL INTERNAL STIFFENING RODS	3366	791	658	3244	3744
162	78052	SHELL INTERNAL STIFFENING RODS	3366	791	658	3244	3744
163	78053	SHELL INTERNAL STIFFENING RODS	3366	791	658	3244	3744
164	78053	SHELL INTERNAL STIFFENING RODS	3366	791	658	3244	3744
165	78054	SHELL INTERNAL STIFFENING RODS	1000	800	600	880.2	980.2
166	78054	SHELL INTERNAL STIFFENING RODS	1000	800	600	880.2	980.2
167	78055	SHELL INTERNAL STIFFENING RODS	3700	850	700	2319	2519
168	78055	SHELL INTERNAL STIFFENING RODS	3700	850	800	2319	2519
169	78056	SHELL INTERNAL STIFFENING RODS	3700	850	800	2319	2519
170	78056	SHELL INTERNAL STIFFENING RODS	3700	850	800	2319	2519
171	78057	SHELL INTERNAL STIFFENING RODS	3700	850	800	2319	2519
172	78057	SHELL INTERNAL STIFFENING RODS	3700	850	800	2319	2519
173	78058	AIR EXTRACTION PIPING CONDENSER-1	5550	1100	1100	1929	2029
174	78058	AIR EXTRACTION PIPING CONDENSER-2	5550	1100	1100	1929	2029
175	78059	TUBE SUPPORT PLATE	5800	3820	400	5800	6100
176	78059	TUBE SUPPORT PLATE	5800	3820	400	5800	6100
177	78060	TUBE SUPPORT PLATE	5800	3820	400	5800	6100
178	78060	TUBE SUPPORT PLATE	5800	3820	400	5800	6100
179	78061	TUBE SUPPORT PLATE	5800	3820	400	5800	6100
180	78061	TUBE SUPPORT PLATE	5800	3820	400	5800	6100
181	78062	TUBE SUPPORT PLATE	5800	3820	400	5800	6100
182	78062	TUBE SUPPORT PLATE	5800	3820	400	5800	6100
183	78063	TUBE SUPPORT PLATE	5800	3820	400	5800	6100

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Slno	**Pkgno**	**Description**	**Length (in mm)**	**Breadth (in mm)**	**Height (in mm)**	**Netwt (in kg)**	**Grosswt (in kg)**
184	78063	TUBE SUPPORT PLATE	5800	3820	400	5800	6100
185	78064	TUBE SUPPORT PLATE	5800	3820	400	5800	6100
186	78064	TUBE SUPPORT PLATE	5800	3820	400	5800	6100
187	78065	TUBE SUPPORT PLATE	5800	3820	400	4350	4750
188	78065	TUBE SUPPORT PLATE	5800	3820	400	4350	4750
189	78066	TUBE SUPPORT PLATE	5800	3820	400	4350	4750
190	78066	TUBE SUPPORT PLATE	5800	3820	400	4350	4750
191	78067	TUBE SUPPORT PLATE	5800	3820	400	4350	4750
192	78067	TUBE SUPPORT PLATE	5800	3820	400	4350	4750
193	78068	TUBE SUPPORT PLATE	5800	3820	400	4350	4750
194	78068	TUBE SUPPORT PLATE	5800	3820	400	4350	4750
195	78069	SHELL INTERNAL DETAILS	1600	900	1000	2702	2902
196	78069	SHELL INTERNAL DETAILS	1600	900	1000	2702	2902
197	78070	SHELL INTERNAL DETAILS	6000	1200	1000	4486	4786
198	78070	SHELL INTERNAL DETAILS	6000	1200	1000	4486	4786
199	78071	SHELL INTERNAL DETAILS	1300	1200	900	2686	2836
200	78071	SHELL INTERNAL DETAILS	1300	1200	900	2686	2836
201	78072	SHELL INTERNAL DETAILS	1000	1000	800	1426	1526
202	78072	SHELL INTERNAL DETAILS	1000	1000	800	1426	1526
203	78075	LOWER DOME WALL(TS) (CONDENSER-1)	6800	3500	525	10638	10740
204	78075	LOWER DOME WALL(TS) (CONDENSER-2)	6800	3500	525	10815	10917
205	78076	LOWER DOME WALL(TS) CONDENSER-1	8000	2940	390	10203	10305
206	78076	LOWER DOME WALL(TS) CONDENSER-2	8000	2940	390	10682	10784
207	78078	LOOSE ITEMS(LOWER DOME WALL TS)CONDENSER-1	4200	500	500	1961	2024
208	78078	LOOSE ITEMS(LOWER DOME WALL TS)CONDENSER-2	1450	1450	1100	188.1	317.1
209	78103	LOWER DOME WALL (GS) CONDENSER-1	6800	3050	400	9553	9655
210	78103	LOWER DOME WALL (GS) CONDENSER-2	6800	3050	400	9594	9696
211	78104	LOWER DOME WALL(GS) CONDENSER-1	3020	2480	440	2453	2542
212	78104	LOWER DOME WALL(GS) CONDENSER-2	3020	2480	440	2453	2542
213	78107	LOOSE ITEM L D WALL (FWB) CONDENSER-1	2735	1830	150	1785	2015
214	78107	LOOSE ITEM L D WALL (FWB) CONDENSER-2	2850	2000	400	1785	2015
215	78108	LOWER DOME WALL(FWB) CONDENSER-1	7266	2870	950	4618	4618
216	78108	LOWER DOME WALL (FWB) CONDENSER-2	7266	2870	950	4618	4618
217	78109	LOWER DOME WALL (FWB) CONDENSER-1	6412	2430	220	3700	3700
218	78109	LOWER DOME WALL (FWB) CONDENSER-2	6412	2430	220	3700	3700
219	78110	LOWER DOME WALL(FWB) CONDENSER-1	5615	300	220	403	403
220	78110	LOWER DOME WALL (FWB) CONDENSER-2	5615	300	220	403	403
221	78112	LOOSE ITEMS LOWER DOME WALL (FWB) COND.-1	1450	1450	1100	469	598
222	78112	LOOSE ITEMS LOWER DOME WALL (FWB) COND.-2	1050	1050	950	108.3	237.3
223	78113	LOWER DOME WALL(RWB) (CONDENSER-1)	7900	1639	220	3506	3506
224	78113	LOWER DOME WALL(RWB) (CONDENSER-2)	7900	1639	220	3506	3506
225	78114	LOWER DOME WALL(RWB) (CONDENSER-1)	7290	3400	1950	5400	5400
226	78114	LOWER DOME WALL(RWB) (CONDENSER-2)	7290	3400	1950	5400	5400
227	78115	LOWER DOME WALL(RWB) CONDENSER-1	6025	1400	930	2780	2780
228	78115	LOWER DOME WALL(RWB) CONDENSER-2	6025	1400	930	2780	2780
229	78116	LOWER DOME WALL(RWB) CONDENSER-1	7900	1730	380	3615	3615
230	78116	LOWER DOME WALL(RWB) CONDENSER-2	7900	1730	380	3615	3615
231	78118	LOOSE ITEMS LOWER DOME WALL (RWB) COND.-1	2100	2100	2200	1305	1305
232	78118	LOOSE ITEMS LOWER DOME WALL (RWB) COND.-2	2100	2100	2200	1305	1305

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Slno	**Pkgno**	**Description**	**Length (in mm)**	**Breadth (in mm)**	**Height (in mm)**	**Netwt (in kg)**	**Grosswt (in kg)**
233	78121	DOME INTERNAL STIFFENING CONDNSER-1	5350	1750	950	3736	3836
234	78121	DOME INTERNAL STIFFENING CONDENSER-2	5350	1750	950	3736	3836
235	78122	DOME INTERNAL STIFFENING CONDENSER-1	3050	1000	900	2609	2659
236	78122	DOME INTERNAL STIFFENING CONDENSER-2	3050	1000	900	2609	2659
237	78123	DOME INTERNAL STIFFENING CONDENSER-1	2900	1100	800	1140	1190
238	78123	DOME INTERNAL STIFFENING CONDENSER-2	2900	1100	800	1140	1190
239	78124	DOME INTERNAL STIFFENING CONDENSER-1	2000	1900	1300	3867	3967
240	78124	DOME INTERNAL STIFFENING CONDENSER-2	2000	1900	1300	3872	3972
241	78125	DOME INTERNAL STIFFENING CONDENSER-1	3000	1400	900	2917	3017
242	78125	DOME INTERNAL STIFFENING CONDENSER-2	3000	1400	900	2917	3017
243	78126	DOME INTERNAL STIFFENING CONDENSER-1	3000	1100	1400	3678	3778
244	78126	DOME INTERNAL STIFFENING CONDENSER-2	3000	1100	1400	3678	3778
245	78127	LOOSE ITEMS DOME INTERNAL STIFFENING COND.-1	3300	460	460	485	515
246	78127	LOOSE ITEMS DOME INTERNAL STIFFENING COND.-2	3300	460	460	485	515
247	78129	LP HEATER SUPPORT ARRANGEMENT LOOSE ITEMS	1750	1150	950	935	1035
248	78129	LP HEATER SUPPORT ARRANGEMENT LOOSE ITEMS	1750	1150	950	935	1035
249	78130	LP HEATER SUPPORT ARRANGEMENT LOOSE ITEMS	6500	1600	750	4155	4455
250	78130	LP HEATER SUPPORT ARRANGEMENT LOOSE ITEMS	6500	1600	750	4155	4455
251	78132	UPPER DOME WALL (TURBINE SIDE) CONDENSER-1	7632	650	300	1611	1611
252	78132	UPPER DOME WALL (TURBINE SIDE) CONDENSER-2	7632	650	300	1611	1611
253	78133	UPPER DOME WALL(GEN SIDE) CONDENSER-1	7632	650	300	1611	1611
254	78133	UPPER DOME WALL(GEN SIDE) CONDENSER-2	7632	650	300	1611	1611
255	78136	UPPER DOME WALL (FWB) CONDENSER-1	5494	650	300	1028	1028
256	78136	UPPER DOME WALL (FWB) CONDENSER-2	5494	650	300	1325	1325
257	78137	UPPER DOME WALL(RWB) CONDENSER-1	5494	650	300	1325	1325
258	78137	UPPER DOME WALL(RWB) CONDENSER-2	5494	650	300	1325	1325
259	78142	FRONT W/BOX HINGE ARRAN GEMENT	2400	1300	1200	6233	6533
260	78142	FRONT W/BOX HINGE ARRAN GEMENT	2400	1400	800	2704	2964
261	78143	REAR W/BOX HINGE ARRAN GEMENT	1800	900	1200	2295	2495
262	78143	REAR W/BOX HINGE ARRAN GEMENT	1900	900	650	2588	2688
263	78144	FRONT W/BOX HINGE ARRAN GEMENT	850	850	600	318	400
264	78144	FRONT W/BOX HINGE ARRAN GEMENT	850	850	600	318	400
265	78145	REAR W/BOX HINGE ARRAN GEMENT	850	850	600	318	400
266	78145	REAR W/BOX HINGE ARRAN GEMENT	850	850	600	318	400
267	78146	FRONT W/BOX HINGE ARRAN GEMENT	2400	700	400	552	650
268	78146	FRONT W/BOX HINGE ARRAN GEMENT	2400	700	400	552	650
269	78147	REAR W/BOX HINGE ARRAN GEMENT	2400	700	400	552	650
270	78147	REAR W/BOX HINGE ARRAN GEMENT	2400	700	400	552	650
271	78150	FRONT W/BOX HINGE ARRAN GEMENT	1498	1240	400	1037	1037
272	78150	FRONT W/BOX HINGE ARRAN GEMENT	1498	1240	400	1037	1037
273	78151	REAR W/BOX HINGE ARRAN GEMENT	1492	1140	400	890	890
274	78151	REAR W/BOX HINGE ARRAN GEMENT	1492	1140	400	890	890
275	78157	CONDENSER (LOOSE ITEMS)	1000	700	600	200	252
276	78157	CONDENSER (LOOSE ITEMS)	1000	700	600	200	252
277	78158	COND. LOOSE ITEMS (RUBBER CORD FOR BOTH CONDENSER)	1000	700	700	465	525
278	78158	COND. LOOSE ITEMS (RUBBER CORD FOR BOTH CONDENSER)	1000	700	700	465	525
279	78159	FASTENERS (CONDENSER)	1500	1300	1300	2300	2470

2x660 Maitree STPP U#1 - HARIDWAR Shop Supply Details (Tentative)							
Slno	**Pkgno**	**Description**	**Length (in mm)**	**Breadth (in mm)**	**Height (in mm)**	**Netwt (in kg)**	**Grosswt (in kg)**
280	78159	FASTENERS (CONDENSER)	1500	1300	1300	2300	2470
281	78165	CONDENSER LOOSE ITEMS	6200	850	500	650	915
282	78165	CONDENSER LOOSE ITEMS	500	500	500	103.2	126
283	78166	CONDENSER STAND PIPE NO.1 LOOS E ITEMS (FOR BOTH COND)	3200	400	400	55	80
284	78167	STAND PIPE NO.1 (CONDENSER 1&2)	2500	600	500	37.5	67.5
285	78167	STAND PIPE NO.2 (CONDENSER 1&2)	4200	600	600	68	98
286	78169	CONDENSER STAND PIPES NO.2 LOO SE ITEMS FOR(FOR BOTH COND)	3200	400	400	250	350
291	78301	GLAND STEAM CONDENSER	3300	1900	1780	4270	4370
292	78304	LOOSE ITEMS OF GSC	800	450	350	34.3	89.3
293	78305	LOOSE ITEMS OF GSC (FRAGILE)	700	600	500	10	35
294	78315	LP HEATER NO.1	12300	2200	2000	27428	27528
295	78315	LP HEATER NO.2	12300	2200	2000	27428	27528
296	78316	LP HEATER-1 STAND PIPE	2400	550	550	100	150
297	78316	LP HEATER-2 STAND PIPE	2400	550	550	100	150
298	78317	LP HEATER-1 LOOSE ITEMS	500	400	400	64	89
299	78317	LP HEATER-2 LOOSE ITEMS	500	400	400	64	89
304	78320	TROLLEY FOR LP HEATER-1	1350	800	200	332	332
305	78320	TROLLEY FOR LP HEATER-2	1350	800	200	332	332
TOTAL WT (MT)							**1158.23**

2x660 Maitree STPP - Bhopal Supply Details						
S. No.	Scope	Qty. (NO.)	Approx. dimn. (LXWXH) (in mm)	Approx. Unit weight	Unit Wt (MT)	Total Wt (MT)
1. RE Joints						
1.1	**RE Joints (Compensation Type) – 2600 NB**					
1.1.1	Flange Assembly (CW/Box Side)	8	4000 X 4000 X 450	3.9 MT	3.9	31.2
1.1.2	Flange Assembly (Piping Side)	12	4000 X 4000 X 450	3.9 MT	3.9	46.8
1.1.3	Bare Bellow with retaining Ring	14	3300 X 3300 X 450	0.4 MT	0.4	5.6
1.2	**RE Joints (Conventional Type) – 2300 NB**					0
1.2.1	Bare Bellow with retaining Ring	5	4000 X 4000 X 450	0.4 MT	0.4	2
1.2.2	Flange 110TK	10	3300 X 3300 X 150	1.6 MT	1.6	16
2. Flash Tank						
2.1	Flash Tank - A	1	4000 X 2600 X 2600	3.8 MT	3.8	3.8
2.2	Flash Tank - B	1	4000 X 2600 X 2600	3.6 MT	3.6	3.6
2.3	Unit Flash Tank	1	2000 X1500 X 1500	1.3 MT	1.3	1.3
3. Misc. Tanks						
3.1	Clean Oil Tank	1	4500 X 3500 X 3000	8.5 MT	8.5	8.5
3.2	Dirty Oil Tank	1	4500 X 3500 X 3000	8.5 MT	8.5	8.5
3.3	Oil Unloading Vessel	1	2000 X 1000 X 500	0.6 MT	0.6	0.6
3.4	DMCW O/H Tank	1	O/D 2000 X 7150	6.0 MT	6	6
4. BF Valves						
4.01	2600 Dia Electrical	4	3800 X 3200 X 800	18 MT	18	72
4.02	2300 Dia Electrical	1	3800 X 3200 X 800	12.5 MT	12.5	12.5
4.03	2300 Dia Hydraulic	3	3800 X 3200 X 800	18 MT	18	54
4.04	1600 Dia Electrical	1	2500 X 2000 X 750	4.73 MT	4.73	4.73
4.05	1400 Dia Manual	2	2000 X 1800 X 500	3.58 MT	3.58	7.16
4.06	900 Dia Electrical	2	1800 X 1200 X 500	2.1 MT	2.1	4.2
4.07	900 Dia Manual	2	1800 X 1200 X 500	2.0 MT	2	4
4.08	800 Dia Manual	7	1600 X 1000 X 400	1.52 MT	1.52	10.64
4.09	800 Dia MO & LS	3	1600 X 1000 X 400	1.52 MT	1.52	4.56
4.10	700 Dia Manual	2	1600 X 1100 X 400	1.31 MT	1.31	2.62
4.11	700 Dia MO & LS	2	1600 X 1100 X 400	1.31 MT	1.31	2.62
4.12	600 Dia Electrical	5	1500 X 900 X 600	0.85 MT	0.85	4.25
4.13	600 Dia Manual	5	1500 X 1100 X 400	0.83 MT	0.83	4.15
4.14	600 Dia MO & LS	3	1500 X 1100 X 400	0.83 MT	0.83	2.49
4.15	500 Dia Electrical	5	1300 X 800 X 350	0.7 MT	0.7	3.5
4.16	500 Dia Manual	4	1300 X 800 X 400	0.7 MT	0.7	2.8
4.17	500 Dia (16 ATA) Manual	1	1300 X 800 X 400	0.72 MT	0.72	0.72
4.18	450 Dia Manual	2	1300 X 800 X 350	0.5 MT	0.5	1
4.19	400 Dia Electrical	1	1100 X 600 X 300	0.43 MT	0.43	0.43
4.20	400 Dia Manual	2	1100 X 600 X 300	0.43 MT	0.43	0.86
4.21	400 Dia MO & LS	3	1100 X 600 X 300	0.4 MT	0.4	1.2
4.22	400 Dia (16 ATA) Manual	2	1100 X 600 X 300	0.4 MT	0.4	0.8
4.23	400 Dia (16 ATA) MO & LS	2	1100 X 600 X 300	0.4 MT	0.4	0.8
5. HT Motors						
5.01	CEP Motor	3	1980 X 1690 X 3200	7.65 MT	7.65	22.95
5.02	BFP Motor	1	4700 X 4440 X 2240	27 MT	27	27
5.03	DMCW – TG Motor	2	2000 X 1240 X 910	3.15 MT	3.15	6.3
5.04	DMCW – SG Motor	2	1850 X 1200 X 840	2.2 MT	2.2	4.4
5.05	ACW Motor	3	1850 X 1200 X 840	2.25 MT	2.25	6.75
5.06	CWP Motor	3	4650 X 4150 X 3630	37.5 MT	37.5	112.5
5.07	Recirculation Pump Motor	5	2950 X 1900 X 1300	5.4 MT	5.4	27
5.08	Oxidation Blower Motor	2	1850 X 1200 X 840	2.25 MT	2.25	4.5
5.09	Ball Mill Motor	1	1900 X 1500 X 1000	2.6 MT	2.6	2.6
5.1	Drip Pump Motor	2	1200 X 1000 X 2000	2.35 MT	2.35	4.7
5.11	APH/ESP Wash Pump Motor	3	1850 X 1200 X 840	2.2 MT	2.2	6.6
5.12	Raw Water Pump Motor	3	1200 X 900 X 2000	2.35 MT	2.35	7.05
TOTAL WEIGHT (MT)						**568.28**

2X660MW Maitree STPP - BHEL Hyderabad							
Item Description	Quantity	UOM	Dimensions in mm of each item			Unit Weight (Kg)	Gross Weight (MT)
			L	B	H		
HP HEATER 7A	1.0	No	12053	2300	2700	70000	70.00
HP HEATER 7B	1.0	No	12053	2300	2700	70000	70.00
HP HEATER 8A	1.0	No	13580	2300	2700	95000	95.00
HP HEATER 8B	1.0	No	13580	2300	2700	95000	95.00
HP HEATER 9A	1.0	No	10997	2200	2650	86000	86.00
HP HEATER 9B	1.0	No	10997	2200	2650	86000	86.00
EXTERNAL DESUPERHEATER OF HPH 7A	1.0	No	7640	1603	2270	33000	33.00
EXTERNAL DESUPERHEATER OF HPH 7B	1.0	No	7640	1603	2270	33000	33.00
LP HEATER 3	1.0	No	13083	1700	2280	26500	26.50
LP HEATER 4	1.0	No	13188	1700	2280	27500	27.50
LP HEATER 5	1.0	No	11551	1600	2040	24500	24.50
DEAERATOR HEATER ASSLY.	1.0	No	12800	3550	3780	51996	52.00
DEAERATOR ST.TANK ASSLY (SEC-I)	1.0	No	11860	4100	4700	41469	41.47
DEAERATOR ST.TANK ASSLY (SEC-II)	1.0	No	12450	4150	4700	43898	43.90
DEAERATOR ST.TANK ASSLY (SEC-III)	1.0	No	11860	4100	4700	41049	41.05
HEAT EXCHANGER FOR CPU	1.0	No	7616	1650	2000	22000	22.00
DRAIN COOLER	1.0	No	6310	935	1320	6000	6.00
LOC-LUBE OIL RESERVOIR WITH PIPING	2.0	No	5000	4000	3000	8000	16.00
LOC-PUMP ASSEMBLY WITH PIPING	2.0	No	3000	3000	3000	6500	13.00
LOC-TWIN OIL COOLER WITH VENT & DRAIN PI	2.0	No	4716	655	2200	5500	11.00
EOP PIPING ASSEMBLY	2.0	No	2000	1000	800	1500	3.00
DRIVE TURBINE	2.0	No	4350	4900	4250	65000	130.00
TURBINE ENCLOSURE AS PER TC64327-55	2.0	No	4600	6600	4100	7000	14.00
SERVO PRIME 46 TURBINE OIL MEDIUM GRADE	53,340.0	L				48006	48.01
GEAR BOX	2.0	No	1050	1400	1150	1300	2.60
OPU SKID,2400LPH, IE3 MTR, COMPLETE SS	2.0	No	1900	1800	1900	1200	2.40
11KW,220V DC MOTOR STARTER CUBICLE	2.0	No	1600	750	2500	600	1.20
JOP ASLY WITH IE3 MTR, 30LPM,100 KG/CM2	2.0	No	2000	800	600	200	0.40
TO PUMP ASSY,50LPM,3KG/CM2,IE3 MOTOR	2.0	No				200	0.40
GOVERNING OIL CONSOLE	2.0	No	1600	1600	2000	680	1.36
AUXILIARY CONTROL VALVE ASSLY	2.0	No	1500	700	1500	700	1.40
MDBFP WITH BASE PLATE & TUBING	1.0	No	3500	3100	3000	22,500	22.50
MDBP WITH BASE PLATE & TUBING	1.0	No	2200	1900	3000	20,500	20.50
HYD COUP FOR 25% DUTY MDG346 - VAR 06	1.0	SET	4000	3000	4000	11,500	11.50
RC VALVE FOR MDG346 25% DUTY-VAR 12	1.0	No	1100	1100	2900	1,000	1.00
PORTABLE OIL CENTRIFUGE FOR ONLY MDBFP	1.0	No				500	0.50
CON SUCT STRAINER NB400 BFP SUCTION	1.0	No	3100	1000	1000	1,200	1.20
SUCTION STRAINER SIMPLEX BASKET 18" BP	1.0	No	1500	1500	1600	2,350	2.35
CON COUPLING BFP/HC MDG346 30% DUTY BFP	1.0	No	3100	1000	1000	1,200	1.20
MECH SEAL AUX.SKID FOR MDBFP-MDG346	1.0	No				1,000	1.00
HC WORKING OIL VISCOSITY GR:32 ISO VG32	8,820.0	L				7,938	7.94
MECH SEAL AUX. SKID FOR BP-FA1B75	1.0	No				1,000	1.00
TDBFP WITH BASE PLATE & TUBING	2.0	No	3500	3100	3000	22,500	45.00
TDBP WITH BASE PLATE & TUBING	2.0	No	3000	2800	2000	6,500	13.00
BFP SUCTION STRAINER VAR 06	2.0	No	4000	1200	1200	1400	2.80
BP SUCTION STRAINER,VAR NO.14	2.0	No	1500	1500	2000	2500	5.00
MECH SEAL AUX. SKID FOR BFP-MDG405	2.0	No				1,000	2.00
RC VALVE FOR MDG405 50% DUTY-VAR 13	2.0	No	1100	1100	2900	1,000	2.00
MECH SEAL AUX. SKID FOR BP-MLC400X300H	2.0	No				1,000	2.00
CONDENSATE EXTRACTION PUMP	3.0	No	11000	3000	3000	19,000	57.00
CEP FOUNDATION RING ASSY	3.0	No	2200	2200	400	1,000	3.00
CEP CANISTER	3.0	No	7600	2200	2200	3,400	10.20
SUCT STRAINER SIMPLEX BASKET ND500 CEP	3.0	No	1750	1750	2000	1,500	4.50
DRIP PUMP	2.0	No	8500	3000	1600	15,000	30.00
DRIP PUMP FOUNDATION RING ASSY	2.0	No	2200	2200	400	1,000	2.00
DRIP PUMP CANISTER	2.0	No	7600	2200	2200	3,400	6.80
SUCTION STRAINER FOR DRIP PUMP-800MW	2.0	No	1750	1750	2000	1,500	3.00
COMPLETE CW PUMP (90MN)	3.0	No				52,000	156.00
OTHER LOOSE ITEMS		KG				2,06,830	103.42
TOTAL WT (MT)							**1,616.08**

2X660MW Maitree STPP - BHEL PC Chennai			
SL NO	**PGMA**	**WBS Description**	**Weight (KG)**
1	80-323	STEAM TO BFP DRIVE TURBINE	6300
2	80-329	EXTRACTION STEAM TO BFP DRIVE TURBINE	12150
3	80-332	EXTRACTION STEAM TO LP HEATER-2 / 3	5850
4	80-334	EXTRACTION STEAM TO LP HEATER- 4 / 5	9000
5	80-349	AUX STEAM TO GLAND SEALS - TG SCOPE	720
6	80-363	EXHAUST STEAM FROM PRIME MOVERS-TG SCOPE	25200
7	80-370	HP DRAIN FLASH TANK VENT TO ATMOSPHERE	45000
8	80-371	DRAIN FLASH TANK VENT TO CONDENSER	3240
9	80-375	UNLISTED SV EXHAUSTS - TG SCOPE	4500
10	80-379	HPH SV EXHAUST TO FLASH TANK	2700
11	80-381	HP HEATER VENTS - TG SCOPE	4140
12	80-382	LP HEATER VENTS	1890
13	80-385	VENT FROM UNLISTED PPG/EQPT TO COND	10800
14	80-388	CONDENSER AIR EVACUATION PIPING	3600
15	80-400	CONDENSATE SUCTION	9000
16	80-401	CD FROM PUMP TO LPH1/DC INLET TEE AND RE	42300
17	80-402	CD FROM LPH1/DC INLET TEE TO TG TP	29700
18	80-403	CD FROM TG TP TO DEAERATING HEATER	13590
19	80-407	CONDENSATE FOR SEALING OF VACUUM	2700
20	80-408	CONDENSATE DUMP FROM HEADER	720
21	80-419	DEAERATOR SAFETY VALVE EXHAUST TO ATM	4500
22	80-435	UNLISTED SPRAY WATER - TG SCOPE	2160
23	80-442	GLAND STEAM COOLER DRAINS	270
24	80-443	LP HEATER-1 TO CONDENSER	6930
25	80-444	LP HEATER-2/3/4/5 DRAINS AND DRIP PUMP I	14220
26	80-446	DEAERATING HEATER OVER FLOW AND DRAIN	6300
27	80-447	HP HEATER DRAINS	31500
28	80-448	DRAIN FROM UNLISTED EQPT/VESSEL-TG SCOPE	3600
29	80-449	TG CYCLE PIPING DRAINS AND VENTS	20700
30	80-457	MANIFOLDS FOR HP FLASH BOX AND CONDENS	1980
31	80-459	HP FLASH TANK DRAIN TO CONDENSER	2250
32	80-493	HP FLASH TANK VENT TO CONDENSER	2250
33	80-494	LP FLASH TANK VENT TO CONDENSER	3600
34	80-495	LP FLASH TANK DRAIN TO COND	2340
35	80-545	LP CONDENSATE PIPING WITHIN TG HALL FOR	15300
36	80-601	LOW PRESSURE DOSING PIPING	2250
37	80-673	LUBE OIL PIPING SYSTEM	9000
38	80-928	H AND S FOR BOILER LIGHT UP - TG	42300
39	80-930	H AND S FOR SYNCHRONISATION - TG	50400
40	80-942	VLH AND CLH for TG PPG -HERP	11000
41	80-420	BOILER FEED PUMP SUCTION	38700
42	80-992	WELDING ELECTRODES-1	9000
TOTAL WT (in MT)			**513.65**

Note :	Above is indicative list of various piping systems under the scope of work of the contractor. The relevant valves, NRVs, fittings, pressure-temperature connections, Hanger- Supports, temporary pipes etc. (covered under PGMA like 80-913, 80-601, 80-399, 80-918 etc.) for the above piping system shall also be under the scope of work of the contractor, irrespective if PGMA for the same is mentioned. Thermowells and root valves, flow nozzles, orifices etc. are normal part of piping scope of work.

TRICHY VALVE SUPPLY	
PROD	**EST_WT (MT)**
TG VALVE	120

SR. NO	PACKAGE DESCRIPTION	QTY (Nos)	WEIGHT (MT)		REMARKS
			UNIT	TOTAL	
1.00	**Misc. Pumps (Horiz)**				
1.01	Desalination feed pumps	3	4	12	
1.02	HVAC M/u Pump	2	2	4	
1.03	Service water system pumps	2	2	4	
1.04	Potable water pumps for plant	2	2	4	
1.05	Potable water pumps for colony	2	2	4	
1.06	CHP pumps	2	3	6	
1.07	APH WASH pumps	3	2	6	HT MOTOR WT. BY BHOPAL
1.08	AHP sealing pumps	2	2	4	
1.09	FGD Pumps	3	2	6	
1.10	DMCW TG pumps	2	2	4	HT MOTOR WT. BY BHOPAL
1.11	DMCW-SG pumps	2	2	4	HT MOTOR WT. BY BHOPAL
1.12	ACW pumps`	3	3	9	HT MOTOR WT. BY BHOPAL
1.13	DM MU pumps	3	2	6	
1.14	Boiler fill system	2	3	6	
1.15	Condesate Transfer pumps	4	2	8	
TOTAL WEIGHT				**87**	

2X660MW MAITREE STPP-BANGLADESH - PEM SUPPLY

Sl. No.	Package Name	Quantity (Nos / Lot)	DIMENSION			WEIGHT (MT)	Remarks	STACKABLE	TILTABLE	HAZARDOUS
			L (MTR)	W (MTR)	H (MTR)					
CONTROL & INSTRUMENTATION (C&I)										
1	CONTROL VALVE	30	Refer Control Valve annex			28		Stackable with its original packing	NO	NO
2	FLOW ELEMENT - NOZZLE	15	4.0X0.8X0.8			10	Dimension given for individual item. Weight is consolidated for each supply package respectively.	YES	YES	NO
3	FLOW ELEMENT - ORIFICE	10	0.5X1.0X1.0			6	Dimension given for individual item.Weight is consolidated for each supply package respectively.	YES	YES	NO
4	ULTRASONIC FLOW METERS	2.5	3.0X0.8X0.85			0.05	Dimension given for individual item.Weight is consolidated for each supply package respectively.	NO	NO	NO
MECHANICAL AUXILIARY (MAUX)										
14.0	CHEMICAL DOSING SYSTEM							NO	NO	NO
14.1	NAOH	1	4	5	3.5	4				
14.2	AMMONIA	1	3	2	3.5	2				
15	Single Girder EOT / HOT Misc. Cranes	2	10	3	2.5	4	Area given are average area for one SG CRANE	NO	NO	NO
17	CHAIN PULLEY BLOCK	9	1	1	1	9	Area given are average area for one CPB	NO	NO	NO
18	ELECTRIC HOIST	19	1.5	2	2	11	Area given are average area for one Electric hoist	NO	NO	NO
19	LUBE OIL TRANSFER PUMPS	2	1.5	0.6		0.6		NO	NO	NO
22	OXYGEN DOSING SYSTEM	2	2	1	2	1		NO	NO	NO
24	WORKSHOP EQUIPMENTS	1 LOT	100	20	3	450		NO	NO	NO
MECHANICAL PIPING LAYOUT (MPL)										
25	GUN METAL VALVES	1 LOT	1	1	1	0.17	DIMENSION GIVEN OF 1 LOT	PACKED BOXES CAN BE STACKED.	YES	NO
26	BALL VALVES	1 LOT	1	1	1	1.2	DIMENSION GIVEN OF 1 LOT	PACKED BOXES CAN BE STACKED.	YES	NO
27	STEAM TRAPS	1 LOT	1	1	1	0.5	DIMENSION GIVEN OF 1 LOT	PACKED BOXES CAN BE STACKED.	YES	NO
28	AIR TRAPS	1 LOT	1	1	1	0.1	DIMENSION GIVEN OF 1 LOT	PACKED BOXES CAN BE STACKED.	YES	NO
29.1	AIR RELEASE VALVES	1 LOT	0.8	0.6	0.6	1.53	DIMENSION GIVEN OF 1 LOT	PACKED BOXES CAN BE STACKED.	YES	NO
29.2			0.5	0.5	0.5	35	DIMENSION GIVEN OF 1 LOT			
32	BUTTERFLY VALVES(STEAM SERVICE)	1 LOT	3	2.5	2	21	DIMENSION GIVEN OF 1 LOT	PACKED BOXES CAN BE STACKED.	NO	NO
33.1	M.E. BELLOWS	1 LOT	2.5	2.5	1.5	24	DIMENSION GIVEN OF 1 LOT	PACKED BOXES CAN BE STACKED.	NO	NO
33.2		1 LOT	2	2	1	12	DIMENSION GIVEN OF 1 LOT			
33.3		1 LOT	1.5	1.5	1.5	0.9	DIMENSION GIVEN OF 1 LOT			
33.4		1 LOT	1	1	1	0.5	DIMENSION GIVEN OF 1 LOT			
34.1	STEEL GATE/GLOBE/NR VALVES(WATER SYSTEM)	1 LOT	1.5	1.5	1	10	DIMENSION GIVEN OF 1 LOT	PACKED BOXES CAN BE STACKED.	YES	NO
34.2		1 LOT	1	1	1	0.4	DIMENSION GIVEN OF 1 LOT			
MECHANICAL SYSTEM ENGINEERING (MSE)										
36	MISC.PUMPS (VERTICAL)	3	2	2	2	24	dimesnion given for each.	NO	NO	NO
38	SUMP PUMPS/SUBMERSIBLE PUMPS	7	1	1	1	14	dimesnion given for each.	NO	NO	NO
39	COLTCS	2	4	3	3	28	9 T for each Ball separator weight (Max.) 14 T Total per COLTCS	NO	NO	NO
40	SELF CLEANING STRAINERS	2	2.5	1.5	2.5	8	2.5 T for each shell (Max.) 4 T Total per SCS	NO	NO	NO
41	HEAT EXCHANGERS(PLATE TYPE)	4	4	2	4	48		NO	NO	NO
43	DEBRIS FILTER	2								
44	TRAVELLING WATER SCREEN	3	2	2	2	12		NO	NO	NO
TOTAL WEIGHT						**766.95**				

~~ANNEXURE-A1-TCC- FMT~~

TENDER NO PSER:SCT:KLN-T1966:19

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SUB-VENDOR QUESTIONNAIRE

FICHTNER

(Information marked with asterisk (*) is mandatory)

(APPLICABLE FOR SERVICE/ WORK CONTRACTS)

Name of the proposed SERVICES/ WORKS *

1. **Name of Proposed Sub-Vendor ***: _____

Website *: _____

2. **Address of Regd. Office ***:

Details of contact person *:
Name_____

Mobile no._____

Desig._____
E-mail:

- **Country of Head Office ***

- **Field of activities ***

3. **Address of Works***

Details of contact person:
Name_____

Mobile no._____

Desig._____
E-mail:

4. **Branch / Liaison office in Dhaka***

Details of contact person:
Name_____

Mobile no._____

Desig._____
E-mail:

5. **Annual Turnover * & Profit in past three years ***:

#	Annual Turnover in Mn USD	Profit After tax in Mn USD
2015-2016		
2014-2015		
2013-2014		

6. Present & Peak Manpower Handled Status*:

Division Status	Permanent Manpower			Peak Manpower		Remarks
	Graduate		Diploma	Number	Project	
	Technical	Non-Technical				

a) Enclose organization chart of the proposed works (Y / N)
b) Enclose Organization chart of QA / QC Deptt. (Y / N)
c) Enclose List of Qualified Welders with process etc. (Y / N)
d) Enclose List of Qualified NDT personnel with area (Y / N)

7. Approval/ Certificates by National/ International standards/ accredited agency applicable for the proposed services/ works

8. Furnish Experience list of the proposed services/ works *

9. Enclose End User's operational feedback certificate for the proposed services/ works *.

10. Enclose list of equipment & machinery specific to the proposed services/ works*.

This should include name of equipment, capacity, year of manufacturing & nos. etc.:

11. Enclose list of Site Infrastructure & Services Available *

11. Quality management*

11.1 General

11.1.1 Work Instruction for different processes available. (Y / N)
if yes, furnish list.

11.1.2 Records generated during inspection maintained & available for review? (Y / N)

11.1.3 Statistical quality control techniques used? (Y/N)
If yes please furnish details.

11.1.4 ISO certificate for the works available? (Y/ N)
If yes, enclose copy of the certificate.

11.1.5 Quality & HSE Manual for the works available (Y / N)
If yes, enclose copy of the manual.

11.2 Corrective action

11.2.1 Specifically confirm whether System for identifying & disposition of Non Conformity in the process / product is available (Y / N)

11.2.2 Specifically confirm whether System for Customer complains & their satisfactory disposal is available. (Y / N)

11.3 Documentation Control

11.3.1 Procedure available for documentation control (Y / N)

11.4 Control of Inspection, measuring & testing equipment.

11.4.1 Procedure for calibration of testing & measuring instrument available. (Y / N)

12. Certification of sub-vendor *

I CERTIFY THAT THE INFORMATION SUPPLIED HEREIN (INCLUDING ALL PAGES ATTACHED) IS CORRECT.

SEAL

M/S.

Name

SIGNATURE

DESIGNATION

MOBILE NO

EMAIL

PLACE

DATE

13. Certification by Main Supplier *:

ABOVE INFORMATION HAVE BEEN VERIFIED AND FOUND IN ORDER TO COMPLY WITH TECHNICAL SPECIFICATION AS PER EPC-CONTRACT.

SEAL

M/S.

Name

SIGNATURE

DESIGNATION

MOBILE NO

EMAIL

PLACE

DATE

NOTE:

1. COLUMN SHALL NOT BE LEFT UNFILLED. IN CASE OF NOT APPLICABLE / NOT AVAILABLE, THE SAME SHALL BE INDICTED IN THE PROVIDED SPACE.
2. IN CASE PROVIDED SPACE IS NOT ADEQUATE, INFORMATION SHALL BE PROVIDED AS AN ATTACHMENT.
3. PRODUCT CATALOGUE FOR THE PROPOSED EQUIPMENT / ITEM / PROCESS, IF AVAILABLE, SHALL BE ENCLOSED

ANNEXURE B1-TCC-FMT

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:-

TENDER NO. - PSER:SCT:KLN-T1966:19.

ANNEXURE-C1-TCC-FMT

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 :

TENDER NO: PSER:SCT:KLN-T1966:19

VOLUME -III

PRICE SCHEDULE-REV-00

FOR

Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 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 PRICE SCHEDULE, REV-00	
Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 2x660 MW Maitree STPP, Rampal, Bangladesh	
TENDER NO. PSER:SCT:KLN-T1966:19	
SL	**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 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 fify 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.

VOLUME-III PRICE SCHEDULE, REV-00	
Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 2x660 MW Maitree STPP, Rampal, Bangladesh	
TENDER NO. PSER:SCT:KLN-T1966:19	
SL	**PREAMBLE**
12	The tender 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, if the Non-schedule items are not quoted by the bidder, it will be treated at par with rate of corresponding item of CPI/CPWD/PWD/ Bangaldesh schedules 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.
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 Grand Total price will be 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 PRICE SCHEDULE, REV-00		
Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 2x660 MW Maitree STPP, Rampal, Bangladesh		
TENDER NO. PSER:SCT:KLN-T1966:19		
RATE SCH I: TOTAL PRICE		
SL NO	**DESCRIPTION OF WORK**	**TOTAL PRICE (USD)**
1.0	TOTAL PRICE FOR ERECTION, TESTING AND COMMISSIONING OF TG & AUX PKG, AND FGD PKG FOR UNIT 1 AND COMMON SYSTEMS INCLUDING LP PIPING PACKAGE AT 2X660MW MAITREE STPP, RAMPAL, BANGLADESH	
NOTE		
1.0	Bidder to note that total price at sl no 1.0 above shall be considered for evaluation & awarding. As such total price at sl no 1.0 should be complete in all respect for the full scope defined and considering all terms and conditions.	
2.0	Bidder to note that percentage break-up of above total price is frozen and indicated in SCH-II and subsequent schedules.	
3.0	Bidder shall note that while the allocated price of SCH-II correspond to their respective prices, rates of various components will be worked out by apportioning the amounts wrt respective indicated weight/quantities. As such, any uncalled figure / amount noted at any other place / schedule of Volume-III will not be reckoned, and will stand null & void.	
4.0	Based on mode of finalisation of contract, either through Reverse Auction or price bid opening, followed by negotiation, if any, while absolute price may change, percentage allocation as per the price schedule shall remain unchanged.	
5.0	Based on the item wise 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 upto 3 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.	
6.0	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.	
7.0	Price format shall not be changed by bidder in any case, since it may lead to cancellation of bidder's offer.	

VOLUME-III
PRICE SCHEDULE, REV-00

Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 2x660 MW Maitree STPP, Rampal, Bangladesh

TENDER NO. PSER:SCT:KLN-T1966:19

SCH-II: TOTAL PRICE BREAK-UP

SL. NO.	DESCRIPTION OF WORK	QTY	UOM	WEIGHTAGE
1.0	**TG & AUX PKG - UNIT #1 & COMMON SYSTEMS**	1	LOT	**0.44795181**
1.1	Lumpsum price for providing manpower, supervision, T&P, etc for unloading of generator stator, generator rotor, HP turbine, IP rotor and LP rotor, LPC inner-outer upper half, LPC inner casing assembly (LH), exciter, turbine integral piping (TIP); verification; transporting to place as directed by engineer; preservation; identification & arranging issue & taking delivery of materials from BHEL store/ storage yard, etc; transportation of these to pre-assembly yard/ place of erection; temporary storage; preservation as required prior to erection after receipt; watch & ward; erection; chemical cleaning of piping, etc; testing; commissioning; trial operation; PG test (assistance), commissioning manpower support after commercial run; handing over (including finish painting), etc, in line with specification/ drawings/ documents/ test procedures approved by BHEL/ owner, for the total scope defined in technical specification and terms & conditions of tender, taking into account all clarifications, confirmations, agreements till date, of steam turbine & aux, generator & aux, condenser, auxiliaries, pump, heaters, LP dosing system, colts; tanks; integral piping; TG piping; etc.at Unit #1 & common system.			
1.2	**HANDLING & SHIFTING**	1	NO	**0.00802128**
	Total price for loading onto suitable Hydraulic trailer (at site), handling & shifting of Generator Stator to the point from where it will be lifted for erection.			
2.0	**FGD - UNIT #1 & COMMON SYSTEMS**	1	LOT	**0.20772943**
	Total price for erection, testing & commissioning of FGD system of U#1 and various common systems as per tender specification.			
3.0	**LP PIPE**	1	LOT	**0.33629748**
	Total price for Erection, testing, commissioning of LP PIPING consisting of Plant Water piping, Fire Protection system piping, and various balance piping systems such as instrument air, service air, drinking water, service water systems, DMCW, ACW, etc. of unit # 1 & 2.			
	TOTAL			**1.000000000**

Note:

1.0	The erection work shall include necessary welding, fititngs, clamps, fixtures, etc. including finishing work as may be requried for completion of the work.
2.0	The above BOQ is to be read in conjunction with technical specs and annexures provided with the tender. Based on the above price break-up on the basis of allocated weigtage, separate orders shall be issued for sl. No. 1.0 (on Lumpsum basis), 2.0 (On item rate basis) & 3.0 (On item rate basis).

VOLUME-III PRICE SCHEDULE, REV-00				
Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 2x660 MW Maitree STPP, Rampal, Bangladesh				
TENDER NO. PSER:SCT:KLN-T1966:19				
SCH-III - PRICE BREAK-UP - FGD - UNIT #1 & COMMON SYSTEMS				
SL. NO.	**DESCRIPTION OF WORK**	**QTY**	**UOM**	**WEIGHTAGE**
PRICE BREAK-UP OF SL. NO. 2.0 OF SCH-II				
1.0	ROTATING MACHINE (RM) / EQUIPMENT	402.00	MT	0.01354834
2.0	STRUCTURE (STR)	1583.00	MT	0.11325891
3.0	TANK	454.48	MT	0.03251668
4.0	PIPE	372.00	MT	0.04404927
5.0	DUCT	12.00	MT	0.00085856
6.0	INSULATION (INS)	80.00	MT	0.00349767
TOTAL PRICE		**2903.48**		**0.20772943**

Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 2x660 MW Maitree STPP, Rampal, Bangladesh

TENDER NO. PSER:SCT:KLN-T1966:19

SCH-IV- LP PIPE PACKAGE

SL NO	DESCRIPTION	QTY		WEIGHTAGE
PRICE BREAK-UP OF SL. NO. 3.0 OF SCH-II				
1.0	Handling from storage, erection, welding, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of River/Canal water piping / DMCW piping / Plant Water piping, etc. **Carbon Steel piping (all sizes above 800mm OD and upto 1422mm OD**) and associated material (covering fittings and valves etc) as per tender. Payment shall be released as per following. (i) Erection - 35%; (ii) Alignment - 5%; (iii) Welding - 39.5%; (iv) NDT - 10%; (v) Hydraulic test - 5%; (vi) Painting completion - 5% and (vii) As-built drawing submission - 0.5%.	50	MT	0.00298128
2.0	Handling from storage, erection, welding, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of ACW piping / DMCW piping / Seal Air/ Plant Water piping / DM Water / Service and Portable water piping **Carbon Steel piping (all sizes above 169mm OD and upto 800mm OD**) and associated material (covering fittings and valves etc) as per tender. Payment shall be released as per following. (i) Erection - 35%; (ii) Alignment - 5%; (iii) Welding - 39.5%; (iv) NDT - 10%; (v) Hydraulic test - 5%; (vi) Painting completion - 5% and (vii) As-built drawing submission - 0.5%.	484	MT	0.03323981
3.0	Handling from storage, erection, welding, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of Fuel Oil Piping/ DMCW piping / Seal Air/ Plant Water piping / Service and Portable water piping / Condensate Transfer System / DM make-up water system - **Carbon Steel piping (all sizes below and up to OD 169mm**) and associated material (covering fittings and valves etc) as per tender. Payment shall be released as per following. (i) Erection - 35%; (ii) Alignment - 5%; (iii) Welding - 39.5%; (iv) NDT - 10%; (v) Hydraulic test - 5%; (vi) Painting completion - 5% and (vii) As-built drawing submission - 0.5%.	532	MT	0.03737831
4.0	Handling from storage, erection, welding, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of **Duplex SS (stainless steel) LP piping system (Raw water, CW System, ACW system, Desalinated water, etc.) - for dia up to 450 NB)** and associated material (including fitting and valves etc) as per tender. Payment shall be released as per following. (i) Erection - 35%; (ii) Alignment - 5%; (iii) Welding - 39.5%; (iv) NDT - 10%; (v) Hydraulic test/ leakage test - 10%; and (vi) As-built drawing submission - 0.5%.	109	MT	0.02184882

Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 2x660 MW Maitree STPP, Rampal, Bangladesh

TENDER NO. PSER:SCT:KLN-T1966:19

SCH-IV- LP PIPE PACKAGE

SL NO	DESCRIPTION	QTY		WEIGHTAGE
PRICE BREAK-UP OF SL. NO. 3.0 OF SCH-II				
5.0	Handling from storage, erection, welding, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of **Stainless Steel- LP piping system (DM water, Service water, Inst Air system, CW System, ACW system, Desalinated water, etc.) - for dia up to 450 NB)** and associated material (including fitting and valves etc) as per tender. Payment shall be released as per following. (i) Erection - 35%; (ii) Alignment - 5%; (iii) Welding - 39.5%; (iv) NDT - 10%; (v) Hydraulic test/ leakage test - 10%; and (vi) As-built drawing submission - 0.5%.	56	MT	0.00893177
6.0	Handling from storage, erection, welding/ jointing, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of **instrument air and service air system piping (up to 200 NB galvanised & threaded)** and associated material (including fitting and valves etc) as per tender. Payment shall be released as per following. (i) Erection - 35%; (ii) Alignment - 5%; (iii) Jointing - 39.5%; (iv) NDT - 10%; (v) Pnuematic test - 10%; and (vi) As-built drawing submission - 0.5%.	118	MT	0.00811234
7.0	Handling from storage, erection, welding/ jointing, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of **PU coated CS piping of various system (900 NB to 3300 NB)** and associated material (including fitting and valves etc) as per tender. Payment shall be released as per following. (i) Erection - 35%; (ii) Alignment - 5%; (iii) Jointing - 30%; (iv) NDT - 10%; (v) PU coating (including PU coating material supply for joints) as per rqmt at joints - 9.5%; (vi) Pnuematic test - 10%; and (vii) As-built drawing submission - 0.5%.	100	MT	0.00745313
8.0	Handling from storage, erection, welding/ jointing, non-destructive testing, inspection, internal cleaning & painting (as per scope), final painting, testing & commissioning of **Rubber Lined CS piping of Intake water, PT Water, Blowdown system, ACW, etc. (300 NB to 800NB)** and associated material (including fitting and valves etc) as per tender. Payment shall be released as per following. (i) Erection - 35%; (ii) Alignment - 5%; (iii) Jointing - 39.5%; (iv) NDT - 10%; (v) Pnuematic test - 10%; and (vi) As-built drawing submission - 0.5%.	576	MT	0.03951811

Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 2x660 MW Maitree STPP, Rampal, Bangladesh

TENDER NO. PSER:SCT:KLN-T1966:19

SCH-IV- LP PIPE PACKAGE

SL NO	DESCRIPTION	QTY		WEIGHTAGE
PRICE BREAK-UP OF SL. NO. 3.0 OF SCH-II				
9.0	Handling from storage, fabrication, erection, welding, inspection, fixing/ embedding, painting etc of **hangers, supports & structures, misc supporting material etc.** all complete. Payment shall be released as per following. (i) Erection - 60%; (ii) Welding - 35%; (iii) Painting completion - 4.5% and (iv) As-built drawing submission - 0.5%.	200	MT	0.01566971
10.0	Handling from storage, erection, welding, inspection, fixing/ embedding, painting etc of **RE joints, expansion bellows, annubars & flow elements** all complete. Payment shall be released as per following. (i) Erection - 60%; (ii) Welding - 35%; (iii) Painting completion - 3% and (iv) As-built drawing submission - 2%.	30	MT	0.00181137
11.0	Fabrication of **mitre bends, tees** of sizes NB 250 and above for various carbon steel LP piping systemetc from straight pipes. Straight pipes will be supplied by BHEL free. Payment shall be released as per following. (i) Fabrication - 95%; (ii) Erection - 5%.	100	MT	0.01089907
12.0	Laying and necessary connection of all type pipes including fitting of flanges, nozzles, nuts bolts, stud nuts, gaskets, pipe fittings, connecting required valves and nozzles as per drawing etc. as required for completion of Piping System for following sizes of Pipes of '**Fire Protection system**'. Payment shall be released as per following: (i) Erection - 35%; (ii) Alignment - 5%; (iii) Welding - 39.5%; (iv) NDT - 10%; (v) Hydraulic test - 5%; (vi) Painting completion - 5% and (vii) As-built drawing submission - 0.5%.			
12.1	Pipe sizes upto 80 NB	621	MT	0.04263309
12.2	Pipe sizes beyond 80 NB	1,389	MT	0.09530780
13.0	Wrapping of burried pipe covering supply and application of **wrapping & coating material (2 layers, each 2 mm thick)** of burried pipe as per tender specification, drawing/document and as per BHEL instruction. (Qty indicated is surface area of buried pipe in sq mtr). Payment shall be released as per following. (i) Supply - 80% and (ii) Application - 20%.	6250	SQM	0.01030460

VOLUME-III
PRICE SCHEDULE, REV-00

Erection, testing, commissioning, handing over, etc of steam turbine & aux, generator & aux, pumps, auxiliaries, and FGD, etc. of Unit#1 & common system including LP Piping at 2x660 MW Maitree STPP, Rampal, Bangladesh

TENDER NO. PSER:SCT:KLN-T1966:19

SCH-IV- LP PIPE PACKAGE

SL NO	DESCRIPTION	QTY		WEIGHTAGE
PRICE BREAK-UP OF SL. NO. 3.0 OF SCH-II				
14.0	Wrapping of burried pipe of Fire Fighting and Fire protection system with the application of **wrapping & coating material** as per tender specification, drawing/document and as per BHEL instruction. (Qty indicated is surface area of buried pipe in sq mtr). (Wrapping coating materials shall be supplied by BHEL at free of cost)	625	SQM	0.00020827
	TOTAL			**0.33629748**
NOTE				
1	Cathodic protection, wherever applicable, as per drawing shall be carried out by BHEL. The successful bidder shall co-ordinate for the smooth applciation of same with BHEL and the agency deployed by BHEL.			