BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. Of India Undertaking)
POWER SECTOR, EASTERN REGION
BHEL BHAWAN, PLOT NO. DJ-9/1 , SECTOR II ,
SALT LAKE CITY, KOLKATA, WEST BENGAL, INDIA
Phone : 033-23216130-31,033-23216130 FAX : 033-23211960

NOTICE INVITING TENDER (NIT)

OFFERS are invited from *REPUTED AND EXPERIENCED BIDDERS* (meeting pre-qualification criteria as mentioned) through E-PROCUREMENT PORTAL https://eprocurebhel.co.in ONLY for the subject job by the undersigned on behalf of BHARAT HEAVY ELECTRICALS LIMITED as per the tender document.
ISSUE OF TENDER TO ANY BIDDER SHALL NOT CONSTRUE THAT THE BIDDER IS CONSIDERED TO BE QUALIFIED.
FOLLOWING POINTS RELEVANT TO THE TENDER MAY PLEASE BE NOTED AND COMPLIED WITH:

Salient Features of NIT

SL NO	ISSUE	DESCRIPTION	
i	**E-TENDER NUMBER**	**PSER:PUR:PMX:350(VI):006 (ENQ:21:PP:0015:PUR:8) DATE: 11/05/2021**	
ii	**Broad Scope of job**	**PROVIDING READY MIX CONCRETE FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPAL UPAZILA, BAGERHAT DISTRICT, BANGLADESH.**	
iii	**DETAILS OF TENDER DOCUMENT**		
a)	PART – B	GENERAL CONDITIONS OF CONTRACT (GCC)	**Applicable**
b)	PART – C	TECHNICAL SCOPE AND SPECIAL TERMS AND CONDITIONS (SCC)	**Applicable**
c)	PART – F	GENERAL TERMS & CONDITIONS OF REVERSE AUCTION	**Applicable**
d)	PART – E	PRICE SCHEDULE and UNPRICE SCHEDULE	**Applicable**
e)	PART – H	FORMS AND PROCEDURES ETC.	**Applicable**
iv	**ISSUE OF TENDER DOCUMENTS**	***a)*Online through e-procurement platform at** https://eprocurebhel.co.in/ ***b)*in BHEL website (www.bhel.com, CPP Portal): For tender view purpose only.** **START DATE: 11/05/2021**	**a) Applicable** **b) Applicable**
v	**DUE DATE & TIME OF OFFER SUBMISSION**	**Date: 25/05/2021, Time: 14-00 Hrs.** **(Offer to be submitted online only through e-procurement platform at** https://eprocurebhel.co.in/	**Applicable**
vi	**TECHNO-COMMERCIAL BID OPENING OF TENDER**	**Date: 25/05/2021, Time: 16-30 Hrs.** **(online only through e-procurement platform at** https://eprocurebhel.co.in/**, participating bidders may witness the same online only)**	**Applicable**
vii	**CURRENCY**	**United States dollar (USD)**	**Applicable**
viii	**EMD AMOUNT**	NIL	**Not Applicable**
ix	**COST OF TENDER**	-	Not Applicable
x	**LAST DATE FOR SEEKING CLARIFICATION**	**Date: 20/05/2021 (UP TO 12:00 Hrs.)**	**Applicable**
xi	**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).	Not Applicable
xii	**INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM)**	*IP SHALL BE APPLICABLE .* *DETAILS OF IEM IS AS UNDER* **NAME :** Shri Arun Chandra Verma, IPS (Retd.) **ADDRESS:** Flat No. C -1204, C Tower, Amrapali, Platinum Complex, Sector 119, Noida (U.P.) **EMAIL:** acverma1@gmail.com & **NAME :** Shri Virendra Bahadur Singh, IPS (Retd.) **ADDRESS:** H. No. B-5/64, Vineet Khand, Gomti Nagar,	**Applicable**

		Lucknow – 226010 **EMAIL:** vbsinghips@gmail.com	
xiii	**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 →Tender Notifications →View Corrigendums & CPP portal →Tender Notice & E-PROCUREMENT PORTAL https://eprocurebhel.co.in) and not in the newspapers. Bidders to keep themselves updated with all such information.**	**Shall be intimated to bidder**

The offer shall be submitted as per the instructions of tender document. Only One set of tender document (**in original, downloaded from website**) signed by authorised company rep. of bidder and stamped on each page shall be submitted as detailed further, as given below. Bidders to note specifically that all pages of tender document, including these NIT pages etc. appearing in the website for this particular tender shall be submitted by them (after signing/stamping on each page) as a part of their offer. **Price shall not be mentioned by them anywhere in the techno-commercial portion of offer. Price shall be mentioned in the relevant price schedule only and to be submitted in e-procurement portal/platform in the form and manner mentioned in tender.**

For E-Procurement Assistance & Training, NIC PORTAL Helpdesk Contacts as per following: -

For any technical related queries please call at 24x7 Help Desk Number
0120-4001 002, 0120-4200 462, 0120-4001 006, 0120-6277 787

Email Support
Address: A) For any Issues or Clarifications relating to the published tenders, bidders are requested to contact the respective Tender Inviting Authority
Technical - support-eproc@nic.in

For any difficulty in downloading the tender from internet website, they should contact this office (Dy. Manager, Purchase or SGM, Purchase Phone no. 033-23398223/8220). No alteration/changes by bidders is permitted in the tender/NIT appeared in the website.

1. Successful bidder shall have to submit additional set of tender/sign on tender document provided by BHEL, if so decided by BHEL.
2. This is an e-tender floated online through our E-Procurement Site https://eprocurebhel.co.in. The bidder should respond by submitting their offer online only in our e-Procurement platform at https://eprocurebhel.co.in. Offers are invited in two-parts only. No Hard copy bid or bids through email/ fax shall be accepted. Bids are invited in two parts & shall be submitted as described below:

OFFER DESCRIPTION	DOCUMENTS TO BE UPLOADED & MODALITY OF UPLOADING
TECHNICAL OFFER	1. Scanned copy of Covering letter of offer (To be attached in **Attachment** section) 2. Scanned copy of Entire tender documents signed & stamped in each page by authorized representative of the bidder except price bid (To be attached in **Attachment** section). 3. Scanned copy of Techno-Commercial Offer (To be attached in **Attachment** section) 4. Duly filled all annexures except price & unpriced format (To be attached in **Attachment** section). 5. Copy of records notes of Pre-Bid Conference, if applicable/ pre-bid MOM. (To be attached in **Attachment** section) 6. Copy of Tender change notice (TCN), if applicable (To be attached in **Attachment** section) 7. All supporting documents/ Annexures etc. as applicable (To be attached in **Attachment** section). 8. **No deviation certificate** in bidder's letterhead as per format given in Tender (To be attached in **Attachment** section).
PRE-QUALIFICATION PART	9. Pre-qualifying documents with all credentials as per tender. (To be attached in PQ **Attachment** section)
UNPRICED PRICE BID	10. Price schedule –Unpriced but mentioning only quoted / unquoted against each item as per tender.

PRICE BID	11. Duly filled in Price Schedule as per tender. Any other document uploaded in the price bid, apart from tendered Price schedule, shall not be taken into cognizance for evaluation of offer.

4. **EARNEST MONEY DEPOSIT (EMD) of NIL,** in the form & manner prescribed in tender, shall be submitted by bidder as mentioned below, failing which the bidder's offer is liable for rejection.

4.1 Every tender must be accompanied by the prescribed amount of Earnest Money Deposit in any one of the following forms:

a) **Cash deposit as permissible under the extant Income Tax Act** (Before tender opening) - The amount should be remitted by the party to the Cashier of Bharat Heavy Electricals Limited, PS-ER, Kolkata between 14.00 hours and 16.00 hours on working days and cash receipt issued by him shall be enclosed along with the tender.

b) **Electronic Fund Transfer** credited in Bharat Heavy Electricals Limited, PS-ER's account (before tender opening). RTGS details of BHEL-PSER is available in tender.

c) **Banker's Cheque/Pay Order/Demand Draft** payable at Kolkata duly pledged in favour of Bharat Heavy Electricals Limited, Kolkata (along with offer).

d) Any other mode as per latest guidelines issued by Govt. of India.

In case total EMD amount is more than INR 20 LAKH, the amount in excess of INR 20 LAKH may be accepted in the form of Bank Guarantee from scheduled bank. The bank Guarantee in such cases shall be valid at least for six months.

4.2 Tenders received without Earnest Money in full in the manner prescribed above are liable to be rejected.

4.3 The Earnest Money Deposit of the successful tenderer will be retained as part of Security Deposit.

4.4 EMD given by all unsuccessful tenderers shall be refunded on acceptance of award/LOI/PO by successful tenderer. The EMD of the successful bidder shall be returned after submission of Security Deposit BG (SDBG).

4.5 EMD shall not carry any interest.

4.6 BHEL reserves the right of forfeiture of Earnest Money Deposit submitted by the tenderer if:-

EMD by the tenderer shall be forfeited as per tender documents if -

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

b) The contractor fails to deposit the required Security Deposit or commence the work within the period as per LOI/contract.

c) The successful bidder/vendor refuses to honour the order after award of the same on him and/or withdraws his bid and/or unilaterally changes the offer and/or any of its items and conditions within the validity period.

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

Scan copy of documents in support of submission of EMD to be uploaded along with techno-commercial offer in e-procurement portal/platform. In case of EMD submission through banker's cheque/pay order/demand draft, same to be submitted in sealed envelope (superscribing tender reference) to Head-Purchase/Dy Manager/Purchase, BHEL Bhawan, DJ-9/1, Sector-2, Karunamoyee, Salt Lake City, Kolkata-700091, West Bengal prior to latest due date of submission of offer.

SPECIAL NOTE:

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

B) **All documents/annexure submitted with the offer shall be properly annexed and placed in respective places of the offer as per enclosure list mentioned in the covering letter. BHEL shall not be responsible for any missing documents.**

C) **Integrity Pact**

(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	Email
1.	Shri Arun Chandra Verma, IPS (Retd.)	Flat No. C -1204, C Tower, Amrapali, Platinum Complex, Sector 119, Noida (U.P.)	acverma1@gmail.com
2.	Shri Virendra Bahadur Singh, IPS (Retd.)	H. No. B-5/64, Vineet Khand, Gomti Nagar, Lucknow - 226010	vbsinghips@gmail.com

(b) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (Part-1, 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:

Name : Avijit Pan
Deptt : Purchase
Address : BHEL Bhawan, DJ 9/1 Sec-II, Salt Lake, Kol-91
Phone : (Landline/ Mobile):033-23398220
Email : avijitpan@bhel.in
Fax : 033-23211960

Name : Ujjwal Howlader
Deptt : Purchase
Address : BHEL Bhawan, DJ 9/1 Sec-II, Salt Lake, Kol-91
Phone : (Landline/ Mobile):033-23398223
Email : ujjwalh@bhel.in
Fax : 033-23211960

5. No deviation with respect to tender clauses and no additional clauses/ suggestions/clarification in Techno-commercial bid/Price bid shall normally be considered by BHEL. Bidders are requested to positively comply with the same. Offers with deviation are liable for rejection.
6. BHEL reserves the right to accept or reject any or all offer without assigning any reasons thereof. BHEL also reserve the right to cancel the offer wholly or partly without assigning any reason thereof. BHEL also reserve the right to split/part award the job. Also BHEL shall not entertain any correspondence from bidders in this matter (except for the refund of EMD).
7. Bidders are free to visit the site and study the prevailing site condition including law & order etc. before quoting (if applicable). 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. No additional claim shall be entertained by BHEL in future, on account of non-acquaintance of site/machine conditions at the time of bidding.
8. For any clarification on the tender document, you may seek the same in writing or through e-procurement portal/platform as per specified format within the last date of seeking clarification as per tender. BHEL shall not be responsible for receipt of queries after due date of seeking clarification due to postal delay, and receipt of any query after due date shall not be entertained.
9. BHEL may decide holding Pre-bid Discussion [PBD] with all intending bidders. On such communication from BHEL, the bidder shall ensure participation for the same at the appointed time, date and place as may be decided by BHEL. Outcome of PBD (if any) shall also form part of tender.
10. In case of absence of any queries from bidder(s), their quoted price will be PRESUMED to be final and complete with reference to the tender documents (including Tender change notes (TCNs), clarifications, corrigendum issued by BHEL, if any). Bidders are requested to study the tender documents in detail and prepare their queries/clarifications accordingly. All such queries / clarifications shall be cleared/replied by BHEL. Such clarification letters, corrigendum and/or Tender change notes (TCNs), if issued by BHEL, shall form part of tender document.
11. 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/ contradictions between any two clauses of tender document, the same to be brought to the knowledge of BHEL by bidders in writing for clarification before due date of seeking clarification, otherwise, more stringent requirement as may be interpreted by BHEL shall prevail and shall be binding on you. Any typing error/missing pages/other clerical errors in the tender documents, noticed by you must be pointed out before submission of offer, or else, BHEL's interpretation shall prevail & binding on you.
12. Unless specifically mentioned otherwise, bidder's quoted price shall deemed to be in compliance with tender including PBD.
13. Tender document containing above mentioned volumes shall be signed & stamped in all pages including this covering letter. Price bid shall be furnished in the specified format enclosed with the tender. Any additional copy, if required, may be taken by photocopying from the tender document given in the web.
14. **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 qualify for the subject job on the basis of pre-qualification evaluation & Techno-Commercial bids etc. BHEL reserves the right to reject the**

bidders with unsatisfactory past performance in the execution of a contract. BHEL's decision in this regard shall be final & binding.

15. The bidder shall submit documents in support of possession of 'Pre-Qualifying Requirements" duly self-certified and stamped by the authorized signatory, indexed and properly linked in the format for PQR. In case BHEL requires any other documents/proofs, these shall be submitted immediately (if applicable).
16. **The bidder may have to produce original document for verification if so decided by BHEL.**
17. While BHEL reserves the right to open the price bid of the offers in camera, the date & time to open the tender opening shall be intimated to the bidders in case BHEL decides it to be 'Public opening' and in such a case, one authorized representative of the bidder shall be allowed to attend.
18. Validity of the offer shall be for SIX (06) MONTHS from the due date of offer submission (including extension, if any).
19. Bidders are required to submit their BEST price as per tender Price Schedule format in e-procurement portal/platform in the form & manner as mentioned in tender.
20. Price Bids shall be evaluated in the manner as prescribed in Price Schedule. However, Unit Rates shall also be furnished if applicable in the Price Schedule.
21. **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.**
22. Taxes and duties shall be as per SCC of the tender. Statutory variation of taxes and duties (plus or minus) in accordance with Govt. Notifications to the account of BHEL. Any imposition of new / additional Duty / Tax at the time of supply shall be borne by BHEL.
23. ***"BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on www.bhel.com) for this tender. RA shall be conducted among the techno-commercially qualified bidders.***

    Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered for RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking."
24. Bidders are requested to note that the accepted / agreed tender terms (technical, commercial or on Reverse Auction) in their original offer cannot be altered / withdrawn by their own during the processing of tender.
25. Unsolicited discounts received after opening of techno commercial bid shall not be considered for evaluation. However, if the party who has submitted the unsolicited discount/rebate becomes the L-1 party, then the awarded price shall be after considering the discount.
26. **"The offers of the bidders who are on the banned list as also the offer of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site www.bhel.com".**

    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.

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

28. Suspension of Business dealings: BHEL reserves the right to take action against contractors who fail to perform or indulge in malpractices, by suspending business dealings with them as detailed in Annexure-VII.

29. "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 Udyam Registration Certificate or 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 – V 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.

30. Indian suppliers, falling under the purview of Public procurement (preference to make in India) order 2017 by Govt. of India, vide order no. P-45021/2/2017-B.E.-II dated 15th June, 2017 & all subsequent clarifications can avail the intended benefits, as per provisions of the order subject to minimum local content shall be 50%, margin of Purchase preference shall be 20% & modality of preference to make in India shall be as per aforesaid order.

31. "For this procurement, the local content to categorize a supplier as a Class-I local supplier/ Class-II local supplier/ Non-Local supplier and purchase preference to Class-I local supplier, is as defined in Public Procurement (Preference to Make in India), Order 2017 dated 04-06-2020 issued by DPIIT. In case of subsequent orders issued by the Nodal Ministry, changing the definition of local content for the items of the NIT, the same shall be applicable even if issued after issue of this NIT, but before opening of Part-II bids against this NIT".

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

32. **GeMAR and PTS Report ID: GEM/GARPTS/28042021/XEVTSJ2RBZDN, Date – 28/04/2021**

33. The GeM Seller ID shall be mandatory before placement of order / award of contract for goods and services to the successful bidder(s). --- **Not Applicable**

34. **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 SCHEDULE: PART- E
    d. TECHNICAL SPECIFICATION/SCOPE AND SPECIAL CONDITIONS OF CONTRACT (SCC)-PART-C

e. GENERAL CONDITIONS OF CONTRACT (GCC)-PART-B
f. FORMS AND PROCEDURES - PART- H

for BHARAT HEAVY ELECTRICALS LTD

Dy. Manager/ (PUR)

All the bidders are requested to note that all the errata / technical clarifications / corrigendum / extension etc. shall be published THROUGH E-PROCUREMENT PORTAL **(https://eprocurebhel.co.in)** and in website www.bhel.com & http://eprocure.gov.in . As such, all the bidders are requested to be in continuous touch with these websites.

Agency	Contact details	
BHEL, PSER, Kolkata	Address	BHARAT HEAVY ELECTRICALS LIMITED, POWER SECTOR – EASTERN REGION 2ND FLOOR, BLOCK-DJ, PLOT- 9/1, SECTOR, SALT LAKE CITY, KOLKATA – 700 091
	Phone no.	033-23398223, 23398220, 23398226, 23211690
	FAX no.	033-23211960
	E-mail ID	**ujjwalh@bhel.in, avijitpan@bhel.in, bsandipan@bhel.in**
NIC E-PROCUREMENT PORTAL	**For E-Procurement Assistance & Training, NIC PORTAL Helpdesk Contacts as per following: -** For any technical related queries please call at 24 x 7 Help Desk Number 0120-4001 002, 0120-4200 462, 0120-4001 006, 0120-6277 787 Email Support Address: A) For any Issues or Clarifications relating to the published tenders, bidders are requested to contact the respective Tender Inviting Authority Technical - support-eproc@nic.in	

Enclosures:

01. ANNEXURE-I: Pre qualifying Criteria.
02. ANNEXURE-II : No Deviation Certificate
03. ANNEXURE-III: Format for Self Certification regarding Local content (LC) for Product/ Services/ Works
04. ANNEXURE-IV: CERTIFICATE (regarding bidder from a country which shares a land border with India)
05. ANNEXURE-V: Certificate by Chartered Accountant
06. ANNEXURE-VI: Format for seeking clarification
07. ANNEXURE-VII: Suspension of business dealing with Suppliers/Contractors
08. ANNEXURE-VIII: Declaration for Relation in BHEL
09. PART – F: General Terms & conditions for Reverse Auction.
10. Tender documents as per this NIT.

ANNEXURE-I

PRE-QUALIFICATION CRITERIA

JOB	**PROVIDING READY MIX CONCRETE FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPAL UPAZILA, BAGERHAT DISTRICT, BANGLADESH.**
TENDER NO	**PSER:PUR:PMX:350(VI):006 (ENQ:21:PP:0015:PUR:8) DATE: 11/05/2021**

SL NO	CRITERIA
	FINANCIAL CRITERIA:
1.0 (A)	BIDDER SHOULD HAVE AVERAGE MINIMUM ANNUAL FINANCIAL TURNOVER OF **USD 3.88 MILLION** OR EQUIVALENT AMOUNT DURING THE LAST 3 (THREE) YEARS, ENDING ON 31-03-2020 OR CORRESPONDING FINANCIAL YEAR FOLLOWED BY THE BIDDER. AND HAVING POSITIVE NET WORTH AS ON LATEST AUDITED ACCOUNTS AS SUBMITTED FOR PARA 1.0(C)
(B)	BIDDER MUST HAVE EARNED PROFIT IN ANY ONE OF THE LAST THREE FINANCIAL YEARS ENDING ON 31-03-2020 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 31-03-2020 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	**TECHNICAL CRITERIA**
2.1 2.2	BIDDER SHOULD HAVE SUPPLIED CONCRETE / EXECUTED CONCRETE WORK WITH BATCHING PLANT WITHIN LAST SEVEN YEARS ENDING ON LATEST DUE DATE OF BID SUBMISSION AGAINST ANY OF THE FOLLOWING: a) ATLEAST **60000 CUM** VOLUME OF CONCRETE WITHIN A COMMON PERIOD OF TWELVE CONSECUTIVE MONTHS IN CUMULATIVE OF TWO CONCURRENTLY RUNNING / COMPLETED CONTRACTS. OR b) ATLEAST **40000 CUM** VOLUME OF CONCRETE WITHIN A PERIOD OF TWELVE CONSECUTIVE MONTHS IN ONE RUNNING / COMPLETED CONTRACT. DOCUMENTS NEED TO BE SUBMITTED IN SUPPORT OF ABOVE. OR BIDDER HAVING EXPERIENCE IN THE FOLLOWING CAN ALSO PARTICIAPTE IN THE TENDER; **a.** HAVING INTEGRATED CEMENT PLANT WITH CLINKERING FACILITY AND ANNUAL CEMENT PRODUCTION CAPACITY OF **MINIMUM 3.0 LACS MT.** b. HAVING BATCHING PLANT/PLANTS OF COMBINED CAPACITY OF **120 CUM/HR**. c. HAVING EXPERIENCE IN SUPPLY OF READY MIX CONCRETE. BIDDER COMPLYING CRITERIA UNDER "2.2 (a)" ABOVE WILL BE THE PRIME BIDDER. BIDDER WHO DOESN'T MEET THE CRITERIA AS PER SL.NO. 2.2 (b) & 2.2 (c) ABOVE, MAY TIE-UP WITH AN AGENCY FOR THE SAME.SUITABLE CREDENTIAL OF THE BIDDER INCLUDING THE TECHNICAL TIE-UP WITH EXPERIENCED RMC MANUFACTURER IN SUPPORT OF ABOVE SHALL BE SUBMITTED.

GENERAL

A	TECHNICAL TIE-UP IS ALLOWED.
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	IN CASE THE JOB IS UNDER EXECUTION/ ONGOING JOB, THE VALUE OF EXECUTED PORTION OF THE JOB SHALL BE AT LEAST CORRESPOND TO THE RESPECTIVE VALUES SPECIFIED ABOVE EVEN IF THE CONTRACT HAS NOT BEEN COMPLETED OR CLOSED.
D	THE BIDDER SHOULD HAVE ACHIEVED THE CRITERIA SPECIFIED IN THE PRE-QUALIFICATION CRITERIA, EVEN IF THE CONTRACT HAS NOT BEEN COMPLETED OR CLOSED.
E	BIDDER SHALL SUBMIT ABOVE PRE-QUALIFICATION CRITERIA FORMAT, DULY FILLED-IN, SPECIFYING RESPECTIVE ANNEXURE NUMBER AGAINST EACH CRITERIA AND FURNISH RELEVANT DOCUMENT IN THE RESPECTIVE ANNEXURES IN THEIR OFFER.

ANNEXURE – II

NO DEVIATION CERTIFICATE

(TO BE SUBMITTED IN BIDDER'S LETTERHEAD)

To
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	**PROVIDING READY MIX CONCRETE FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPAL UPAZILA, BAGERHAT DISTRICT, BANGLADESH.**	
Ref	1.0	**TENDER NO - PSER:PUR:PMX:350(VI):006 (ENQ:21:PP:0015:PUR:8) DATE: 11/05/2021**
	2.0	Other references (if any).

Dear Sir,

With reference to above tender, this is to confirm you that we have gone through each and every terms and conditions mentioned in the enquiry (Terms and Conditions) and we offer our unqualified acceptance of the same. This is also 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/newspapers and in case of 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 *and confirm our acceptance to* ***reverse auctioning process*** and we hereby convey our unqualified acceptance to all terms and conditions as stipulated in the tender and NIT.

It is also confirmed that the price has been quoted in the format received with the enquiry. We confirm that, we do not have any objections to splitting the quantity among the different bidders by BHEL and price shall remain firm till the completion supply of full ordered quantity.

Any deviation found subsequently at any time during execution of order shall be treated null and void.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorised
representative of the contractor)

ANNEXURE-III

Format for Self Certification regarding Local content (LC) for Product/ Services/ Works

Date:

_____ S/o, D/o, W/o _____, Resident of _____ do hereby solemnly affirm and declare as under:

That the percentage of local content for the Product/ Services/ Works offered by the bidder/supplier against the subject tender **(TENDER NO: PSER:PUR:PMX:350(VI):006 (ENQ:21:PP:0015:PUR:8) DATE: 11/05/2021** is _____%. We certify that the item(s) offered meets the local content requirement for **< Class-I Local Supplier / Class-II Local Supplier/ Non-Local Supplier, tick the applicable option >**. We are also enclosing the details of the location(s) at which the local value addition is made.

That I agree to abide by terms and conditions of Department of Industrial Policy & Promotion issued vide Notification No: P-45021/2/2017-B.E.-II Dated: 15-06-2017 & P-45021/2/2017-PP (BE-II) Dated: 28-05-2018, of Department of Promotion of Industry and Internal Trade issued vide Notification No: P-45021/2/2017-PP(BE-II) Dated: 29-05-2019 & P-45021/2/2017-PP (BE-II) Dated: 04-06-2020.

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

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

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

I agree to maintain all information regarding my claim for LC in the Company's record for a period of 2 years and shall make this available for verification to any statutory authorities

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

For and behalf of _____ (Name of Firm/ entity)

Authorized signatory of Firm/ entity
<Insert Signature, Stamp of Authorized signatory, Name, Designation and Contact No and date>

ANNEXURE-IV

CERTIFICATE

(regarding bidder from a country which shares a land border with India)

(To be submitted in the bidder's letter head)

In-line with Department of Expenditure's (DoE) Public Procurement Division Order vide ref. F.No.6/18/2019-PPD dated 23.07.2020 & 24.07.2020

Job: PROVIDING READY MIX CONCRETE FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPAL UPAZILA, BAGERHAT DISTRICT, BANGLADESH.

Tender No.: PSER:PUR:PMX:350(VI):006 (ENQ:21:PP:0015:PUR:8) DATE: 11/05/2021

"I have read the tender clauses pertaining to Department of Expenditure's (DoE) Public Procurement Division Order (Public procurement no 1, 2 & 3 vide ref. F.No.6/18/2019-PPD dated 23.07.2020 & 24.7.2020) regarding restrictions on procurement from a bidder of a country which shares a land border with India. I hereby certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that this bidder fulfills all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached]".

For and behalf of _____ (Name of the bidder)

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

ANNEXURE-V

Certificate by Chartered Accountant on letter head

This is to Certify that M/s ....., (hereinafter referred to as 'company') having its registered office at ..... is registered under MSMED Act 2006, (Entrepreneur Memorandum(Part-II) / UAM / Udyam Registration No..... 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
3. ***For Enterprises (having EM-Part-II / UAM):*** *Investment in plant and machinery or equipment is Rs.....……. Lacs and turnover is Rs. .....…….Lacs {as notified in MSME notification no. S.O. 2119 (E) dated 26-06-2020}.*
4. ***For Enterprises (Udyam, registered under Udyam Registration Portal):*** *Investment in plant and machinery or equipment is Rs.....Lacs and turnover is Rs.....Lacs {as notified in MSME notification no. S.O. 2119 (E) dated 26-06-2020}.*

(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-VI

FORMAT FOR SEEKING CLARIFICATION

Job	**PROVIDING READY MIX CONCRETE FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPAL UPAZILA, BAGERHAT DISTRICT, BANGLADESH.**			
Tender No	**PSER:PUR:PMX:350(VI):006 (ENQ:21:PP:0015:PUR:8) DATE: 11/05/2021**			
Sl. no	**Reference clause of tender document**	**Existing provision**	**Bidder's query**	**BHEL's clarification**

ANNEXURE-VII

SUSPENSION OF BUSINESS DEALINGS WITH SUPPLIERS/ CONTRACTORS

1.0	**Suspension of Business dealings with Suppliers/ Contractors**
1.1	BHEL reserves the right to take action against Suppliers/ Contractors who fail to perform or indulge in malpractices, by suspending business dealings with them.
1.2	Suspension of business dealings with Suppliers/ Contractors could be in the form of following: -- **a) Hold within the unit for specific item(s)/ material category(ies)/ type of work(s) for one year.** **b) Hold within the unit for all item(s)/ material category(ies)/ type of work(s) for two years** **c) Banning across BHEL for all items/ material category(ies)/ type of work(s) for three years.** The Supplier may be either put on hold or banned, as detailed hereinafter on the basis of one or more of the category wise reasons as enumerated hereunder.
1.3	**Hold within the unit for a specific item(s)/ material category(ies)/ type of work(s) shall be imposed in the following cases, if** i) In the last three consecutive supplies of a specific material category, average quality rating, as provided in the supplier performance rating (SPR) as per SEARP, falls below 80% of the quality weightage. This is irrespective of supplies against PO(s) having single/ multiple delivery schedules. Note: Not applicable in cases for erection works of Power Sector Regions, where separate guidelines for evaluation of capacity of bidders is being followed. ii) Two consecutive delays, for reasons of delay attributed to the Supplier, in execution of the contracts where delay occurred is such that a) prescribed maximum LD time limits of the contracts is exceeded or b) delay period has equaled/ exceeded half the original delivery period specified in the contracts whichever among the above is earlier. iii) a) Overall SPR (Supplier Performance Rating) in that particular Unit in line with SEARP falls below 60% of the specific material category. b) Bids of contractors (in PS-MSX portal) shall not be considered (if average score of last six months falls 60% or below as per guidelines for evaluation of capacity of bidders formula). Note: – for (b), No specific period of hold shall be applicable. iv) Supplier works are under strike/ lockout for a period of more than three months. **Hold within the unit for all item(s)/material category(ies)/ type of work(s) shall be put in the following cases, if** i) Supplier tampers with tendering procedure affecting ordering process. ii) Supplier has misused BHEL documents/ drawings/ technical information or has breached the confidentiality agreement with BHEL. iii) after placement of order, Supplier fails to execute the contract. iv) within warranty period as per contract, Supplier continues to supply low/ less/ non-performing equipment/ services, repetitive failures, remains non-responsive. v) Wherever risk purchase clause (amounting to more than 5% of contract value) has been invoked. vi) After price bid opening but before placement of order, Supplier withdraws his offer or varies it in any manner within the validity period.
1.4	**Banning across BHEL shall be imposed in following cases, if**
1.4.1	i) Supplier is found to be responsible for submitting fake/ false/ forged documents, certificates, or information or misrepresentation/ wilful suppression of facts, or has resorted to unethical, illegal means or has forged BHEL documents, certificates etc. for securing business, meeting PQR or for enlistment in BHEL or with customers other than BHEL. ii) In spite of warnings, the Supplier persistently violates or circumvents the provisions of labour laws/ regulations/ rules or other statutory requirements. iii) Supplier is found to be involved in cartel formation or in any other act so as to influence the bidding process or influence the price. iv) The Supplier has indulged in malpractices or misconduct such as bribery, corruption and fraud, pilferage, coercion etc. v) The Supplier is found guilty by any court of law for criminal activity/ offences involving moral turpitude in relation to business dealings. vi) Supplier is found to have obtained any internal information/ documentation of BHEL by unauthorized means. vii) The foreign Principals along with the representing Agent shall be banned together if information submitted by them about their precise relationship, commission/ remuneration etc. payable/ receivable and other particulars as asked by BHEL, as per the extant guidelines regarding dealing with Agents of Foreign Suppliers is found false/ incorrect, at any stage. viii) Supplier has substituted, damaged, failed to return, or unauthorizedly disposed off free issue materials/ tools etc. of BHEL.
1.4.2	A Supplier can also be banned with the approval of Director (E, R&D) provided a direction to this effect has been received from the administrative ministry of the Government.

Note: Above shall be applicable along with Guidelines for "Suspension of Business dealings with Suppliers/ Contractors" available in BHEL website http://www.bhel.com. These shall form part of tender documents.

ANNEXURE-VIII

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: **PSER:PUR:PMX:350(VI):006 (ENQ:21:PP:0015:PUR:8) DATE: 11/05/2021**,

I/We hereby submit the following information pertaining to relation/relatives of Proprietor/Partner(s)/Director(s) employed in BHEL.

Tick (√) any one as applicable:

1. The Proprietor, Partner(s), Director(s) of our Company/Firm DO NOT have any relation or relatives employed in BHEL

OR

2. The Proprietor, 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 Authorized 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.

PART - F

GENERAL TERMS & CONDITIONS OF REVERSE AUCTION

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

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

2. *Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered for RA.*

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

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

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

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

7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" which is inclusive of all cost elements in line with terms & conditions of the tender for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.

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

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

10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure VI) as provided on case-to-case basis to Service provider within two working days of Auction without fail.

11. *Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the "Business Rules of Reverse Auction", which will be communicated before the Reverse Auction.*

12. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party. 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 for suspension of business dealings (as available on www.bhel.com)*, shall be initiated by BHEL and the results of the RA scrapped/ aborted.

13. Reverse Auction will be conducted if two or more bidders are techno-commercially qualified. In case of two or three qualified bidders, there shall be no elimination of H1 bidder (whose quote is highest in sealed envelope price bid). In case of four qualified bidders, the H1 bidder shall be eliminated whereas in case of five qualified bidders, H1 & H2 bidders shall be eliminated. However, in case of six or *more qualified bidders are available, RA would be conducted amongst first 50% of the bidders arranged in the order of prices from lowest to highest. Number of bidders eligible for participating in RA would be rounded off to next higher integer value if number of qualified bidders is odd (e.g. if 7 bids are qualified, then RA will be conducted amongst lowest four bidders). However, there will be no elimination of qualified bidders who are MSE or qualifying under PPP-MII, Order 2017, irrespective of the number of bidders qualifying techno-commercially.*

In case of multiple H1 bidders, all H1 bidders (excluding MSEs and bidders qualifying under PPP-MII, Order 2017) shall be removed provided minimum two bidders remain in fray, else no H1 removal.

PART – B: GENERAL CONDITIONS OF CONTRACT (GCC)

SL. NO.	BHEL STANDARD TERMS	Bidder's confirmation	Deviation
1.	Our requirement will be used at **BHEL - MAITREE PROJECT SITE, RAMPAL, BANGLADESH**. Techno-commercial & Pre-Q bids shall be opened first & afterwards price bid shall be opened for qualified bidder(s), who have qualified in Techno-commercial & Pre-Q bids. Tenders will be received up to **14.00 Hours** on the said due date. **If the vendor submits offer i.e. Technical & Price bid together in single attachment, the offer shall be liable for rejection.** **Price should be submitted as per tender format only & uploaded in the price section.** Note: In order to maintain sanctity of the tender system, it is advised that one Agent cannot represent two suppliers or quote on their behalf in a particular tender. In the tender, either one agent on behalf of the principal/OEM or Principal/OEM itself can bid but both cannot bid simultaneously for same item/product.		
2.	If any vendor sought to quote through their agents "They have to inform to BHEL in advance, before opening date. Otherwise the offer will be treated as Unsolicited Offer and same will not be opened".		
3.	BHEL keeps its right to **reject / load** any offer which is having deviations to BHEL Specifications, Standard Terms & Conditions. All the bidders shall submit their offers only by filling the original BHEL tender documents. No other offer will be entertained. In case of Technical-Cum-Commercial bid, copy of the price bid has to be used to indicate commercial terms without price.		
4.	The equipment offered shall be strictly conforming to the specification and for complete unit.		
5.	No offer for individual accessories or part machinery will be accepted.		
6.	**PAYMENT TERMS:** **Shall be as per SCC of tender. No advance shall be paid. Payment shall be paid in USD only.**		
7.	**WARRANTY/GUARANTEE: As specified in SCC OF TENDER.**		
8.	**DELIVERY TERMS: As specified in SCC OF TENDER.**		
9.	**DISCOUNTS:** Discounts offered by the vendor in price shall not be entertained by BHEL. The vendor should factor in his discount in the price offer only. In-spite of the same, if a discount is offered by the bidder, the same shall not be considered for evaluation of the offer, but purchase order shall be issued on bidder's final discounted price.		
10.	**LIQUIDATED DAMAGE/PENALTY CLAUSE:** Since time is the main essence of the contract, the mobilization by bidder is to be made within the time limit prescribed in relevant clause of the tender. In case contractor fails to mobilize within the period specified in the contract, BHEL will reserves the right to levy liquidated damages at the rate of 0.5% (half percent) of the awarded contract value delayed for each week of delay or part thereof without prejudice to any other relief or compensation due to BHEL under any other conditions of the order subject to a maximum limit of 10% of total contract value. In case of delay in mobilisation of bidder, for reasons not attributable to BHEL, the `Liquidated Damages' clause shall be strictly enforced, unless extension of delivery date is granted through an amendment to the work/ purchase order. Above clause to be read in conjunction with Cl.no. 25.0 of SCC.		
11.	**a. SECURITY DEPOSIT BANK GUARANTEE(SDBG): Not Applicable** **b. PERFORMANCE BANK GUARANTEE (PBG): Not Applicable**		

	The original bank guarantee shall be sent directly by bank to BHEL under Registered Post (A.D.).		
12.	The sealed tenders super scribing tender number and due date should be **addressed to:** **Deputy Manager/Purchase, Bharat Heavy Electricals Limited, PSER, BHEL BHAWAN, DJ-9/1, SALT LAKE, SECTOR-II, KOLKATA - 700 091, India**.	Not Applicable	
13.	**INSPECTION:** **As specified in SCC OF TENDER.**		
14.	**CONSIGNEE DETAILS OF THE EQUIPMENT :-** **As specified in SCC OF TENDER.** All documents / correspondences must bear the Tender no. / Purchase Order No. & Date.		
15.	The manufacturing **progress** will have to be furnished to us periodically in the form and manner required by us.		
16.	Supplier must submit with their offer list of customers (with their full address and their purchase reference number) to whom they have supplied similar machine in the past five years. The year of supply should also be indicated.		
17.	The quotation should be valid at least for a period of **NINETY (90) DAYS** from the tender due date of submission (extended, if any). Price Variation Clause will not be entertained.		
18.	**FORCE MAJEURE :** The vendor shall be subject to force majeure clause defined as under : This force majeure is herein defined as any cause which is beyond the control of the tenderer which they would not have foreseen or with a reasonable amount of diligence could not have foreseen and which subsequently affect the performance of the contract such as SRCC (strike riot and civil commotion), earthquake, flood, acts of god, acts of any government, domestic or foreign including but not limited to war. The tenderer shall not be liable for delay in performing his obligation resulting from any force majeure clause as referred to and/or defined above. The date of completion will be subject to hereinafter provided be extended by a reasonable time even though such cause may occur after tenderer's performance of his obligation has been delayed for other causes.		
19.	**ARBITRATION & CONCILIATION**		
19.1	**ARBITRATION :**		
19.1.1	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 19.2 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 19.1.1 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.		
19.1.2	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.		
19.1.3	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.		
19.1.4	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.		
19.2	**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 (as available in www.bhel.com)). The Procedure 2.3 together with its Formats (as available in www.bhel.com) 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 (as available in www.bhel.com)) 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 (as available in www.bhel.com)) with effect from the date as intimated by BHEL to it.		
19.3	**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.		

20.	**JURISDICTION :** All disputes or differences arising out of or in connection with the Purchase Order shall be subject to the exclusive jurisdiction of Courts (pecuniary or territorial) viz Commercial Court Rajarhat/ District Court Barasat (24 PGN North) as the case may be and Calcutta High Court at Kolkata		
21.	**RIGHTS OF BHEL:** **(A)** To withdraw any portion of work/supply and/or to restrict / alter the quantum of work/supply as indicated in the contract during the progress of work/supply and get it done through other agency and/or to suit BHEL's commitment to its customer or in case BHEL decides to advance the date of completion due to other emergency reasons / BHEL's obligation to its customer. **(B)** To terminate the contract or withdraw portion of work/supply 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/Supplier's poor progress of the work vis-à-vis execution timeline as stipulated in the Contract, backlog attributable to contractor/supplier including unexecuted portion of work/supply 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/Non-supply by the Contractor / Supplier within scheduled completion/delivery period as per Contract or as extended from time to time, for the reasons attributable to the contractor/supplier. iv) Termination of Contract on account of any other reason (s) attributable to Contractor/Supplier. v) Assignment, transfer, subletting of Contract without BHEL's written permission resulting in termination of contract or part thereof by BHEL. vi) Non-compliance to any contractual condition or any other default attributable to Contractor/ Supplier. (#) In-case inputs from BHEL/Customer are likely to be delayed or are actually delayed, this delay may also be taken into account while considering balance period available for execution of Contract. **(C)** 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/Supply (*) as per rates of new contract B= Value of Balance scope of Work/Suppy (*) as per rates of old contract being paid to the contractor / supplier 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 / supply (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 / Supply 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: In-case portion of work is being withdrawn, contract quantities pertaining to portion of work withdrawn shall be considered as 'Balance scope of work / supply' for calculating Risk & Cost amount. **(D)** LD against delay in executed work/ supply in case of Termination of Contract : LD against delay in executed be work / supply shall calculated in line with LD clause as per GCC/SCC/TCC/Special note/any other annexure of tender document (in compliance with order of precedence), for the delay attributable to contractor / supplier. For this purpose, contract value shall be taken as		

	Executed Value of work / supply for the purpose of limiting the maximum LD value. Method for calculation of "LD against delay in executed work / supply" 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 / supplier = T1 ii) Let the value of executed work / supply till the time of termination of contract= X iii) Let the Total Executable Value of work / supply for which inputs/fronts were made available to contractor / supplier and were planned for execution till termination of contract = Y iv) Delay in executed work / supply attributable to contractor/supplier i.e. T2=[1-(X/Y)] x T1 v) LD shall be calculated in line with LD clause [as per GCC/SCC/TCC/Special note/any other annexure of tender document (in compliance with order of precedence)] of the Contract for the delay attributable to contractor / supplier taking "X" as Contract Value and "T2" as period of delay attributable to contractor/ supplier. **(E)** Recoveries arising out of Risk & Cost and LD or any other recoveries due from Contractor. Following sequence shall be applicable for recoveries from contractor / supplier on whom risk & cost has been invoked, after informing the contractor / supplier of the total proposed recovery : a) Dues available in the form of Bills payable to contractor / supplier, SD, BGs against the same contract. b) Demand notice for deposit of balance recovery amount shall be sent to contractor/ supplier, if funds are insufficient to effect complete recovery against dues indicated in (a) above. c) If contractor / supplier 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 / supplier against other contracts in the same Region / Unit shall be considered for recovery. ii) If recovery cannot be made out of dues payable to the contractor / supplier 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 / supplier. iii) In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor / supplier.		
22.	**LOADING FACTORS FOR DEVIATION TO BHEL STANDARD TERMS & CONDITIONS**		
i)	Bank Guarantee: Non submission of 10% BG (if applicable) will attract 10% loading on the offers.		
ii)	**Penalty Clause**: Non acceptance of penalty clause will attract maximum 10% loading on the offer and accordingly proportionate percentage will be loaded for accepting less percentage of penalty clause. Ex: If the supplier has accepted for maximum 5% penalty clause, then balance 5% will be loaded.		
iii)	For all other Terms & Conditions, if the offer is not confirming to the same, BHEL at its discretion shall load the same and the loading pattern shall be intimated to the bidders before price bid opening. However BHEL reserves the right to cancel a bid in case of non-acceptance of any terms and conditions finally arrived before price bid opening.		
23	**Note**: The offers not complying the above Terms & Conditions will not be accepted.		

Note:

01. In case of any conflict / inconsistency in any clause of the tender or between various sections of the tender, bidder should bring the same in writing to BHEL for clarification before submission of the bid, failing which the most stringent interpretation of the clause in favour of BHEL shall be adopted and the same shall be binding to the bidder.
02. Any deviation sought by the bidder should be indicated in the techno-commercial offer.
03. ***Bidder should write "accepted" in the column "Bidder's confirmation" for each clause, if the conditions are agreeable or else should write the deviations sought in "Bidder's Deviation(if any)" column. Offers with deviation are liable for rejection.***
04. If any clause left blank, shall be presumed that the clause is accepted by the bidder.

SIGNATURE OF THE BIDDER WITH SEAL AND DATE

PART-E

PRICE SCHEDULE (UNPRICED) - VOLUME-III

PLEASE REFER
E-PROCUREMENT PORTAL https://eprocurebhel.co.in

PART-E

PRICE SCHEDULE - VOLUME-III

PLEASE REFER
E-PROCUREMENT PORTAL https://eprocurebhel.co.in

PART-H:

FORMS AND PROCEDURES

F-01

RTGS FORMAT

Form for getting payment through RTGS (Real Time Gross Settlement)

01. NAME OF VENDOR:
02. ADDRESS:
03. VENDOR'S BANK A/C NAME:
04. VENDOR'S BANK A/C NO.:
05. NAME OF BANK:
06. NAME OF BRANCH:
07. BRANCH PH. NO.:
08. CITY:
09. IFSC CODE OF THE BRANCH:

THE CHARGES IF ANY FOR PAYMENT THROUGH RTGS MAY BE RECOVERED FROM THE BILL SUBMITTED BY US.

SIGNATURE OF AUTHORISED REPRESENTATIVE OF VENDOR WITH DATE & SEAL

CONFIRMATION BY BANKER WITH OFFICE SEAL

Note: Incorrect information will create accounting complications and payment will be delayed.

F-02

VENDOR DETAILS

1. **Name & address of the vendor/company:**

2. **PAN No. of the vendor/company (scan copy of PAN Card):**

3. **Contact Person for the vendor/company:**

4. **Mobile number & E-mail of the contact person:**

5. **VAT / TIN:**

5. **CST:**

SIGNATURE OF THE BIDDER WITH DATE & SEAL

F-03

FORMAT FOR DETAILS OF BIDDER

NAME OF BIDDER	
FAX NO.	
Registration Number*	
Name of Partners / Directors	
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 company/ undertaking/joint venture/partnership/other}	
Company Category* {micro unit as per MSME/small unit as per MSME/medium unit as per MSME/Ancillary unit/project affected person of this company/ssi/ other}	
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*	
Mobile*	

SIGNATURE OF THE BIDDER WITH DATE & SEAL

F-04

DECLARATION OF THE BIDDERS

Job: PROVIDING READY MIX CONCRETE FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPAL UPAZILA, BAGERHAT DISTRICT, BANGLADESH.

01. I, ……...hereby certify that all the information and date furnished by me with regard to this Tender No. **PSER:PUR:PMX:350(VI):006 (ENQ:21:PP:0015:PUR:8) DATE: 11/05/2021** are true and complete to the best of my knowledge.

02. I have gone through the tender specifications, scope of work, terms and conditions mentioned in Annexure as well as General and Special conditions of contract and various stipulations in detail and agree to abide by them and comply with the requirements and intent of specifications.

03. I also certify that there have been no deviations from the tender requirements in the bid submitted against this tender.

04. I further certify that I am duly authorized representative of the under mentioned tenderer and hold a valid power of attorney to this effect, a copy of which is enclosed.

Signature:

Name :

Date :

Designation:

Seal:

Tenderers Name and address

F-05

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 No: **PSER:PUR:PMX:350(VI):006 (ENQ:21:PP:0015:PUR:8) DATE: 11/05/2021**
2) All other pertinent issues till date

I/We, _____ hereby declare and confirm that we have visited the Project Site as referred in BHEL Tender Specifications 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 carry out work as detailed in above mentioned Tender Specification, in accordance with Terms & Conditions thereof.

Yours faithfully,

(Signature, Date & Seal of Authorized
Representative of the Bidder)

Date:

Place:

Validate Print Help

Item Rate BoQ

Tender Inviting Authority: BHEL-PSER

Name of Work: "PROVIDING READY MIX CONCRETE FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPAL UPAZILA, BAGERHAT DISTRICT, BANGLADESH".

E-TENDER NO. PSER:PUR:PMX:350(VI):006 (ENQ:21:PP:0015:PUR:8) DATE: 11/05/2021.

Name of the Bidder/ Bidding Firm / Company :	

PRICE SCHEDULE (REV-00)

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only, rate filled here will automatically reflect in SCH-1 - TOTAL PRICE

NUMBER #	TEXT #	NUMBER #	TEXT #
SL. NO.	DESCRIPTION OF EQUIPMENT/ITEM	TOTAL QUOTED PRICE (IN USD) (IN FIGURE)	TOTAL QUOTED PRICE (IN USD) IN WORDS
1	2	13	55
1.1	"PROVIDING READY MIX CONCRETE FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPAL UPAZILA, BAGERHAT DISTRICT, BANGLADESH". DETAILS AS ENUMERATED IN THE TENDER.		USD Zero Only

VOLUME-III, PRICE SCHEDULE, REV-00	
JOB: "PROVIDING READY MIX CONCRETE FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPAL UPAZILA, BAGERHAT DISTRICT, BANGLADESH".	
E-TENDER NO.: PSER:PUR:PMX:350(VI):006 (ENQ:21:PP:0015:PUR:8) DATE: 11/05/2021.	
BIDDER'S NAME	**0**
PREAMBLE	
SL. NO.	**DESCRIPTION**
1.0	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 various volumes of tender and other tender sections as applicable and shall have precedence over any contrary statement mentioned any where in this document.
2.0	The work shall be carried out strictly as per specifications, description of the items in these schedule and / or engineer's instructions. Drawings enclosed 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.
3.0	Items of work provided in this schedule but not covered in this specification shall be executed strictly as per instruction of the engineer.
4.0	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.
5.0	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 thirty percent (± 30%) of the awarded price** as per LOI .
6.0	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.
7.0	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.
8.0	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.
9.0	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.
10.0	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.
11.0	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.
12.0	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.
13.0	In case if the Non-schedule items are not quoted by the bidder, it will be treated at par with rate of corresponding item of BPWD schedule as prescribed in the tender / BOQ cum Rate Schedule.
14.0	No interest, whatsoever, shall be payable by BHEL on the security deposit, any bank guarantee submitted or any amount due to successful bidder/contractor.
15.0	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.

VOLUME-III, PRICE SCHEDULE, REV-00			
JOB: "PROVIDING READY MIX CONCRETE FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPAL UPAZILA, BAGERHAT DISTRICT, BANGLADESH".			
E-TENDER NO.: PSER:PUR:PMX:350(VI):006 (ENQ:21:PP:0015:PUR:8) DATE: 11/05/2021.			
	BIDDER'S NAME	**0**	
SCH-1-TOTAL PRICE			
SL. NO.	**DESCRIPTION OF EQUIPMENT/ITEM**	**PRICE SCHEDULE REF**	**TOTAL QUOTED PRICE (IN USD)**
1.0	**"PROVIDING READY MIX CONCRETE FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPAL UPAZILA, BAGERHAT DISTRICT, BANGLADESH". DETAILS AS ENUMERATED IN THE TENDER.**	**SCH 2 - BREAK UP OF TOTAL PRICE**	0.00
NOTE:-			
1.0	Bidder shall quote total price for total price of SCH-1- Part only at sl no 1 above. All other amounts/ rates of each item of works in respective schedules/ parts will be derived based on allocated percentages. As such, any uncalled figure/ amount noted at any other place/ schedule of Volume-III will not be recknoed & will stand null & void.		
2.0	Bidder to note that total price at sl no 1.0 above shall be considered for evaluation & awarding. As such grand total price should be complete in all respect for the full scope defined and considering all terms and conditions.		
3.0	Bidder to note that SCH-2 is Break- up of Total Price.		
4.0	Bidder to note that SCH-3 covers supply of RMC, unless specified otherwise in the description of items.		
5.0	Bidder's quoted total price at Sl. no 1 above respectively shall be apportioned into amount of various items of works based on allocated percentages against respective item, in respective schedules/ parts. As such, bidder shall not indicate/ quote any amount/ rate in these schedules/ parts and any amount/ rate quoted against any item shall not be taken into cognizance/ account and offer may be liable for rejection.		
6.0	Based on the itemwise percentage allocations, the amount for the individual items of the Bill of Quantity shall be arrived at. The rates of individual items shall be derived from the amount against each items after roundeding off .		
7.0	Bidders to note that this is an item rate contract. Payment shall be made for the actual quantities of work executed at the unit rate arrived at as per Sl No.8 below.		
8.0	Unit rates of each item of works of respective schedules/ parts will be derived by dividing derived amount by corresponding quantities. In deriving the unit rates of each item in this manner, figures only upto **4** decimal places will be taken into account. Any adjustment, if required, due to such methodology, will be effected in final bill.		
9.0	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.		
10.0	Price format shall not be changed by bidder in any case and it may lead to cancellation of their offer.		
11.0	The quantity of items may vary during execution mainly due to actual requirement etc. The unit rates work out from the overall amount quoted & accepted by BHEL shall be considered and no separate unit rates shall be allowed. Unit rates shall be valid throughout the contract period.		
12.0	For payment of non schedule items, the rate shall be derived as per relevant GCC/SCC Clause or Schedule of Rates 2018, PWD, Govt. of Bangladesh. USD equivalent of BDT will be paid at the Selling Exchange Rate of USD (of our banker) as on the date of payment.		
13.0	The quoted rate shall remain firm for one year from date of start of work, as certified by Construction Manager, BHEL and thereafter rates will be increased by 3% (Three Percent) for additional period limited to one year, if the job gets extended due to delay attributable to BHEL.		

VOLUME-III, PRICE SCHEDULE, REV-00			
JOB: "PROVIDING READY MIX CONCRETE FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPAL UPAZILA, BAGERHAT DISTRICT, BANGLADESH".			
E-TENDER NO.: PSER:PUR:PMX:350(VI):006 (ENQ:21:PP:0015:PUR:8) DATE: 11/05/2021.			
	BIDDER'S NAME	**0**	
SCH-2- BREAK UP OF TOTAL PRICE			
SL NO	**DESCRIPTION OF EQUIPMENT/ITEM**	**PRICE SCHEDULE REF**	**WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1**
1.0	CONCRETE	SCH 3 -CONCRETE	100.0000000%
	TOTAL		**100.0000000%**

VOLUME-III, PRICE SCHEDULE, REV-00

JOB: "PROVIDING READY MIX CONCRETE FOR 2X660 MW MAITREE SUPER THERMAL POWER PROJECT AT MOIDARA VILLAGE, RAMPAL UPAZILA, BAGERHAT DISTRICT, BANGLADESH".

E-TENDER NO.: PSER:PUR:PMX:350(VI):006 (ENQ:21:PP:0015:PUR:8) DATE: 11/05/2021.

BIDDER'S NAME	0

SCH-3- CONCRETE

SL. NO.	DESCRIPTION OF EQUIPMENT/ITEM	UOM	QTY.	WEIGHTAGE (Nearest to the 6 decimal points) W.R.T THE TOTAL OF VENDOR QUOTED PRICE IN SCH-1
	Supply of Concrete including cost of establishment of Design mix of various grades ,Trial mix, labour, materials and equipment for handling, transportation, batching, mixing with mechanised equipments like batching plant, complete as per specifications, relevant laws of Bangladesh, manufacturer's recommendation, and guideline of ASTM C94-16b / relavant BS standards / equivalent international standards, as approved by BIFPCL/BHEL and as per direction of engineer in charge for the following. Transportation of concrete will be done by the user(civil agency) ***[The cement shall be conforming to ASTM C150-07 with C3A content 5% to 8 % as specified in type- I unless stated specifically in the Item except item No. 6A & 6B)***			
A	**CONCRETE FOR PCC & RCC**			
1	Supply of **grade C8/10** as per BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard (with well graded **picked jhama birck chips** conforming to ASTM C33 including breaking chips and screening) with normal workability for Pain Cement Concrete.	CUM	150	**0.099600%**
2	Supply of Concrete of **grade C8/10** as per BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard (with maximum **37.5 mm graded aggregate** shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1 or equivalent) with normal workability for Pain Cement Concrete.	CUM	650	**0.477100%**
3	Supply of **grade C12/15** as per BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard (with well graded **picked jhama birck chips** conforming to ASTM C33 including breaking chips and screening) with normal workability for Plain Cement Concrete.	CUM	125	**0.096200%**
4	Supply of Concrete of **grade C12/15** as per BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard (with maximum **37.5 mm graded aggregate** shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1 or equivalent) with normal workability for Plain Cement Concrete.	CUM	6750	**5.567000%**
5	Supply of Concrete of **grade C16/20** as per BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard with **19 mm nominal size graded aggregate** shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1 or equivalent with normal workability for Plain Cement Concrete.	CUM	1850	**1.580000%**
6A	Supply of Design Mix cement concrete conforming to BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard for reinforced concrete works with coarse sand and graded hard stone aggregate of **19 mm nominal size** shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1 including use of plasticizer/ superplasticizer conforming to BS EN 934 (latest) or equivalent international standard to achieve required slump in concrete for pumping. **[The cement shall comply with Portland Composite Cement - Group CEM II/B-M as per EN-197]**			
a)	Grade C20/25	CUM	175	**0.160500%**
b)	Grade C25/30	CUM	450	**0.424600%**
c)	Grade C30/37	CUM	2500	**2.425700%**
6B	Supply of Design Mix cement concrete conforming to BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard for reinforced concrete works with coarse sand and graded hard stone aggregate of **12.5 mm nominal size** shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1 including use of plasticizer/ superplasticizer conforming to BS EN 934 (latest) or equivalent international standard to achieve required slump in concrete for pumping. **[The cement shall comply with Portland Composite Cement - Group CEM II/B-M as per EN-197)**			
a)	Grade C20/25	CUM	650	**0.584200%**
b)	Grade C25/30	CUM	950	**0.878700%**
7A	Supply of Design Mix cement concrete conforming to BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard for reinforced concrete works with coarse sand and graded hard stone aggregate of **19 mm nominal size** shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1 including use of plasticizer/ superplasticizer conforming to BS EN 934 (latest) or equivalent international standard to achieve required slump in concrete for pumping.			
a)	Grade C20/25	CUM	2400	**2.269500%**
b)	Grade C25/30	CUM	2150	**2.091800%**
c)	Grade C30/37	CUM	52250	**52.262700%**
d)	Grade C35/45	CUM	125	**0.128800%**
7B	Supply of Design Mix cement concrete conforming to BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard for reinforced concrete works with coarse sand and graded hard stone aggregate of **maximum 12.5 mm nominal size** shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1 including use of plasticizer/ superplasticizer conforming to BS EN 934 (latest) or equivalent international standard to achieve required slump in concrete for pumping.			
a)	Grade C16/20	CUM	125	**0.106800%**
b)	Grade C20/25	CUM	900	**0.851000%**
c)	Grade C25/30	CUM	645	**0.627500%**
8	Supply of Design Mix cement concrete conforming to BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent International code for reinforced concrete works of **grade C30/37** in **machine foundations** with addition of suitable plasticizer conforming to BS 934 or equivalent International standard to achieve a **slump more than 125mm** in concrete as per manufacturer's recommendation with 19 mm nominal size graded aggregate shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1or equivalent.	CUM	150	**0.153900%**
9	Supply of Design Mix cement concrete conforming to BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent International code for reinforced concrete works of **grade C35/45** in **machine foundations** with addition of suitable plasticizer conforming to BS 934 or equivalent International standard to achieve a **slump more than 125mm** in concrete as per manufacturer's recommendation with 19 mm nominal size graded aggregate shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1or equivalent.	CUM	125	**0.133400%**
9A	Extra over SL. No. A.6 to A.8 for **controlling of temperature** of fresh concrete to less than 25 degree centigrade using ice, including all related arrangements for providing, storing and mixing of ice with water, cooling of aggregates etc. All complete as per specification, drawing and instruction of engineer in charge.	CUM	75	**0.007100%**
9B	Extra over items A 6 to A 11 for providing and mixing approved **Bipolar Concrete penetrating Corrosion inhibiting** admixture in concrete as per detail specification of manufacturer etc. all complete and and as approved by BIFPCL/BHEL.	Kg	85	**0.002200%**
10	Supply of concrete conforming to relevant BSEN/ASTM code or equivalent international code with coarse sand and graded hard stone **aggregate 12.5mm / 6 mm nominal size** shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1or equivalent. etc complete as per following.			
a)	1:2:4 (1 part cement, 2 part sand, 4 parts of aggregate by volume)	CUM	550	**0.453600%**
b)	1:1.5:3 (1 part cement, 1.5 part sand, 3 parts of aggregate by volume)	CUM	675	**0.583100%**
11	Supply of Design Mix cement concrete as per BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equvalent International code for reinforced concrete works using graded aggregate for Concrete in water retaining / conveying structures including addition of suitable plastisizer cum waterproofing cement additives confirming to BS 934 or equivalent international standard to achieve a **slump more than 125** mm in concrete as per manufacturers recommendation and conforming to limits of permeability as per relevant BS code or equivalent international code and specification **with 19 mm nominal size graded aggregate** for following grades.			
a)	C 25/30 grade	CUM	75	**0.094800%**
b)	C 30/37 grade	CUM	125	**0.163700%**
12	Supply of **cement slury** in proportion 1:3(Cement : Sand) for priming of concrete pump etc. as per requirement placed by Concrete user through BHEL.	CUM	75	**0.035100%**
B	**CONCRETE FOR PRE-CAST WORK**			
13	Supplying of concrete of **grade C40/50** for pre-cast concrete as per BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard with **19 mm nominal size stone aggregate** shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1or equivalent.	CUM	750	**0.780200%**
C	**CONCRETE FOR ROAD WORK**			
14 a)	Supplying **dry lean concrete** of required thickness of **grade C8/10** as per BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard (with well graded picked jhama birck chips conforming to ASTM C33) including breaking chips and screening all complete for **Road Work.**	CUM	5250	**4.093800%**
14 b)	Supplying **dry lean concrete** of required thickness of **grade C12/15** as per BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard (with well graded stone aggregates conforming to ASTM C33) including breaking chips and screening all complete for **Road Work.**	CUM	150	**0.128700%**
15A	Supplying **cement concrete of grade C25/30** conforming to BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard with coarse sand and graded hard stone aggregate of **19 mm nominal size** shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1or equivalent with approved admixture (if required), all complete for **Road Work**.	CUM	7200	**6.952100%**
15B	Supplying **cement concrete of grade C30/37** conforming to BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard with coarse sand and graded hard stone aggregate of **19 mm nominal size** shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1or equivalent with approved admixture (if required), all complete for **Road Work.**	CUM	13450	**13.720800%**
D	**CONCRETE FOR CAST IN SITU PILES**			
16	Supply of cement concrete grade C30/37 confirming to BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 with a minimum cement content of 400 Kg per cum of concrete including all materials, hard stone **aggregate of 19 mm** nominal size shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1or equivalent, plasticizer wherever required all complete for **casting of Cast-in situ Piles.**	CUM	150	**0.153100%**
E	**CONCRETE FOR PRE CAST PILES**			
17	Supply of cement concrete as per BS EN 12794 2005 using cement concrete **grade C40/50** confirming to BS EN 206:2013+A1:2016 or ACI 211.1-91 (2009) & ACI 318-14 or equivalent international standard with a minimum cement content of **400 Kg per cum** of concrete including all materials, hard stone aggregate of **19 mm nominal size** shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1or equivalent, plasticizer wherever required all complete for casting of **Pre-cast Piles.**	CUM	1750	**1.820400%**
18	Transportation of Concrete from existing Batching Plant to the work spot upto Pouring Point within the plant premises by providing Transit Mixer of standard capacity, operator, fuel, including incidental all complete within the project premises for all leads as directed by Engineer In Charge of BHEL.	CUM	2500	**0.092300%**
	TOTAL USD			**100.000000%**

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

Providing Ready Mix Concrete

for 2x660 MW

Maitree Super Thermal Power Project

at

Moidara Village, RampalUpazila,

Bagerhat District, Bangladesh

BharatHeavyElectricalsLimited
(AGovt.ofIndiaUndertaking)
PowerSector– EasternRegion
Plot–DJ9/1,Sector-II,Salt Lake
Kolkata-700091

CONTENTS

The Special Conditions of Contract (SCC) inscribed hereunder shall be read and construed along with General Conditions of Contract (GCC, Volume-IA) and in case of any conflict or inconsistency, the provision of the Special Conditions of Contract, Volume-IC shall prevail.

1.0	**PROJECT SYNOPSIS AND GENERAL INFORMATION**
1.1	The 2 x 660 MW MAITREE SUPER THERMAL POWER PROJECT is located in Moithara Village, RampalUpazila, 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.
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 Mongla- Khulna Highway. Nearest Domestic airport is Jessore, Bangladesh at a distance of about 93 KM and international airport is Dhaka at a distance of 263 KM, Bangladesh
1.3	Owner: BIFPCL (**BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED)**
2.0	**Name of Work**
2.1	**SCOPE OF THE WORK**
	The scope of work includes the followings: 1. Procurement, Supply, storing, of approved quality aggregates, Cement, admixtures etc. for concrete of various grades as per details given price schedule of Volume-III or elsewhere in the contract document. 2. Establishment of Design mix of various grades as per BS EN-206 and BS 8500or ACI-211.1-91 (2009) & ACI-318 – 2014 or equivalent International Standard or as directed by Engineer In Charge. 3. Production of concrete in computerized automatic batching plant of required capacity as per quality norms and as per Field Quality Plan (FQP) approved by Customer. 4. Conducting various tests in established concrete testing Laboratory at site as per FQP. 5. Majority of RMC Supply shall be done at batching plant to the transit mixers placed by respective vendors of BHEL. However, if required as per instruction of BHEL, RMC shall be transported to Pouring Point by the RMC Agency.
2.1.2	Mix design (C 8/10, C 12/15, C 16/20, C 20/25, C 25/30, C 30/37, C 35/45, C 40/50 or as required grade) for all concreting shall be carried out from a reputed & approved laboratory of BHEL / BIFPCL. Contractor may add admixture and for minimizing of cement content in line with relevant BS code as advised by BHEL time to time without any additional cost. Some of the design mixes are available at site. Vendor may adopt the existing design mixes or design may be carried out from listed approved laboratory for Maitree Project.However,if required, trial mix may have to be done to establish Mix Design at Site before production.

2.1.3	The work to be performed under this specification consists of providing all labour, materials, consumables, equipment, temporary works, temporary storage sheds for contractors own use, temporary colony for labour and staff, temporary site offices, constructional plant's transportation/ handling and all incidental items not shown or specified but reasonably implied or necessary for the completion of subject scope, all in strict accordance with the specifications including revisions and amendments thereto as may be required during the execution of work.
2.1.4	Batching plant area along with 6m wide & approx. 200m long approach road shall have to be properly hard surfaced with interlocking pavers or machine made bricks in herring bond (2 layers) with adequate drainage system.There should be separate area for parking of bulker and transit miller. However, in case the agency shall not execute the above work, discount of USD 45,000/- shall be provided over & above the awarded price.
2.1.5	The supply of RMC is in final stage of project. Requirement of RMC is expected to taper down towards the end of the contract period. If for any reason, additional quantity of RMC is required beyond the contractual quantity (+130%), the vendor shall provide the same at a mutually agreed price. However, the agency shall be provided in advance (2 months minimum) of such requirement to arrange construction material. If it is observed consecutively for two months that RMC consumption has reduced to less than 5000 cum/month, Vendor shall be allowed partial demobilization of T&P's , manpower & other resources based on mutual agreement The scope of RMC shall be used to complete all balance civil works required for the Project within this contract. It may be required to retain minimum facilities to provide RMC up to end of Project Completion. In case RMC requirement beyond contractual time period of 1 year is reduced to less than 5000 cum/month, agency shall have to retain minimum one (01) no Batching Plant and minimum manpower along with matching other T&P's for the extended contract period
2.1.6	Minimum two-month stock of raw material including admixture are to be maintained all time at batching plant. Also, the agency has to procure approx. 5 % extra construction materials (which are not readily available in Bangladesh) to take care of exigencies. Such material if found surplus towards end shall be dealt as per procedures of NBR guidelines prevailing at the time.
2.1.7	During the end phase of the contract, it may so happen that there is inconsistent RMC requirement at site due to which availibility of stock of aggegates at site may be disrupted. In event of such unforseen circumstances at site, BHEL may provide aggregate (10mm/20 mm) FREE OF COST and RMC shall be supplied by Vendor at a mutual agreed price.
2.1.8	SANITARY:- The Contractor shall furnish and maintain sanitary facilities for the use of all personnel engaged in the Work under this Contract. These facilities shall be subject to the approval by the Employer.
2.1.9	The scope shall also include testing of material & concrete in laboratory with necessary equipment for conducting relevant tests as required. Instruments used in Lab shall have valid calibration certificate from authorized agency.
2.1.10	All quality standards& other technical requirements shall be strictly adhered to. The Bidder shall fully apprise himself regarding prevailing conditions at the 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 mentioned in the specifications.
2.1.11	All works under this specification, unless specified otherwise, shall conform to the latest revision and/or replacement of the following or any other British Standard Specifications and Codes of Practice. In case any particular aspect of work is not covered specifically by customer Specification, any other international standard practice as may be specified by the Engineer shall be followed.
3.0	**SITE VISIT**
3.1	Contractor should visit site and acquire full knowledge & information about site conditions prevailing at site and in and around the plant premises together with all the statutory, obligatory, mandatory requirements of various authorities before submission of the bid in line with the above, **site visit**

	confirmation will be required to be submitted by the bidder with the technical bid.
3.1	**OPEN SPACE FOR OFFICE &STORAGE**
3.1.1	Open spaces for material storage yard & construction of temporary site office shall be allocated as made available by the customer / BHEL free of cost. Contractor has to make his own arrangements for labour colony including Electricity and water for the labour colony.
3.1.2	Construction of necessary stores and storage of materials shall be in contractor's scope. BHEL shall provide available space as received from customer on mutually agreed basis. Security of stores & work place shall be in Contractor's scope.
3.1.3	**REMOVAL OF TEMPORARY FACILITIES**
	When the Work is completed all such temporary structures and facilities shall be removed from the Site and the area shall be restored to its original condition.
3.2	**WATER**
3.2.1	Construction water of required quality will be made available before start of work at one point within 500 m from work premises free of cost to the Bidder. Bidder has to installminimum 50 cum Capacity of water storage tank in Batching Plant area.
3.2.2	Further necessary network for construction & drinking water system shall be done by the bidder at his own cost.
3.2.3	Contractor should arrange on their own, drinking water in their labour colony.
3.2.4	BHEL shall not be responsible for any inconvenience or delay caused due to any interruption of water supply and the contractor shall claim no compensation for delay in work for such interruption. Contractor may make standby arrangement for water for which no separate payment shall be made by BHEL.
3.2.5	Contractor will have to arrange for storage of water to meet the day-to-day requirement. Bidder will ensure adequate supply of construction water to meet the requirement of water during major concreting.
3.2.6	Construction water shall be supplied for only production of concrete and for that meter shall have to be installed by the vendor. Vendor has to arrange water for maintenance of all batching plant machineries. Separate water storage shall be arranged for service water needs. The availability of water in Maitree project may be limited. Contractor shall ensure that no water is wasted. In this regard the contractor shall take all necessary measure towards preservation of water.
3.3	**ELECTRICITY**
3.3.1	BHEL Shall Provide Construction Power free of charge at 415V level at one point (within 500 M from his workplace / batching plant), bidder has to make his own distribution arrangement to draw electricity. However, During Construction Power interruption, vendor has to keep their DG back-up to maintain steady production of Concrete till end of contract. The bidder will have to procure & install adequate area illumination system during construction right from start of his work. This system will include temporary pole lighting, portable lighting towers with sufficient DG back-up for area lighting at different working areas for execution of the work & safety of workmen within the quoted rate. The illumination should be such that minimum illumination requirement as specified in specification or any-where for general illumination is maintained. GENERAL: - If any other voltage level (other than normally available) is required, the same shall be arranged by the contractor from power supply as above. Contractor will have to provide at his 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 the necessary charges including replacement by calibrated meters is to be borne by the contractor. Supply of electricity shall be governed by Electricity Act and Installation Rules and other Rules and Regulation as applicable. The contractor shall ensure usage of electricity in an efficient manner and the same may be audited by BHEL time to time. 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.
3.3.2	The bidder shall have to provide earth leakage circuit breaker at each point wherever human operated electrical drives / T&Ps are deployed.
3.3.3	The power supply will be from the available source of customer. 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 contractor due to such non-supply on the grounds of idle labour, machinery or any other grounds.
3.3.4	Bidder will have to arrange sufficient illumination at their own work areas.
3.3.5	The contractor 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 contractor to step up the progress of work after restoration of electric supply so that overall progress of work is not affected.
3.3.6	The contractor shall have to make arrangement at their own cost for illumination that will be required in the working area for execution of the work & safety of workmen.
3.3.7	The contractor shall have to make arrangement at their own cost for illumination etc in labor colony. However there may be provision of Chargeable Power for labor colony for which contractor has to install meters and necessary accessories
4.0	**TOOLS & PLANTS**
4.1	All the tools and plants required for execution of the above work are in contractor's scope.
5.0	**MATERIAL SUPPLY**
5.1	SUPPLY OF MATERIALS – All requisite approved quality materials viz. cement aggregates, sand, admixtures and consumables (like gas, electrodes etc. and other materials required for the work) shall be supplied by the contractor in time during execution. BHEL shall not supply any materials for this work.
5.1.1	Cement shall be as per Technical specification and BOQ item of the contract
5.1.2	Test certificates in respect of Cement for each consignment to be furnished and also to be tested as per FQP before use. The contractor shall submit the consumption statement of cement used in the works along with bill.
6.0	**INSPECTION, TESTING AND INSPECTION CERTIFICATES**
6.1	The engineer, his duly authorized representative and / or an outside inspection agency acting on behalf of BHEL / owner shall have access at all reasonable times to inspect & examine the materials & workmanship of the works during its manufacture and if part of the works is being manufactured or assembled on other premises or works, the vendor shall obtain for the engineer and for their duly authorized representative permission to inspect as if the works were manufactured or assembled on vendor's own premises or works. Necessary arrangement for carrying out inspection including supply of labour, IMTEs, area illumination and scaffolding, if required will be vendor's responsibility and same has to be carried out within the quoted price.
6.2	To facilitate advance planning of inspection in addition to giving inspection notice the vendor shall furnish quarterly inspection program indicating schedule dates of inspection at customer hold point and final inspection stages. Updated quarterly inspection plans will be made for each 3 consecutive months and shall be furnished before beginning of each calendar month.
6.3	Before any materials, plant / equipment leaves the place of manufacture, BHEL shall be given the option of witnessing inspections & tests for compliance with specifications & related standards. The

	vendor shall give the engineer / inspector 15 days written notice of any material being ready for testing. Such test shall be to the vendor's account except for the expenses of the inspector. The engineer / inspector, unless the inspection is waived will attend such tests within 15 days of the date on which the equipment is notified as being ready for test / inspection, failing which the vendor may proceed with test which shall be deemed to have been made in the inspector's presence and he shall forthwith forward to the Inspector duly certified copies of test reports.
6.4	The engineer or inspector shall within 15 days from the date of inspection as defined herein give notice to the vendor of any objection w.r.t. drawing / equipment / workmanship which in his opinion not in accordance with the specification / contract. The vendor shall either make modification as may be necessary to meet the said objection or explain to the engineer/ inspector giving reasons that no modifications are necessary to comply with the contract.
6.5	When the factory tests have been completed at the vendor's or sub-vendor's works, the engineer or inspector shall issue a certificate to this effect within reasonable time after completion of tests but if the tests are not witnessed by the engineer or Inspector the certificate shall be issued within 15 days of the receipt of vendor's test certificate by the engineer inspector. Completion of these tests or the issue of the certificates shall not bind BHEL to accept the equipment should it on further tests after erection be found not to comply with the contract.
6.6	In all cases where the vendor provides the tests at the premises of the vendor or any sub-vendor, the vendor except where otherwise specified shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the engineer/ inspector to carry out effectively such tests on the equipment in accordance with the contract and shall give facilities to the engineer/ inspector to accomplish testing.
7.0	**INSURANCE**
7.1	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.
7.2	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.
7.3	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.
7.4	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.
7.5	Other conditions of Insurance shall be as per relevant clause of GCC/SCC.
8.0	**DEVIATIONS/ CLARIFICATIONS**

8.1	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 his 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.
9.0	**DEWATERING**
9.1	Contractor shall ensure at all times that his work area & approach / access roads are free from accumulation of water, so that the materials are safe and the operation of plant / progressive delivery 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.
10.0	**TIME SCHEDULE/ COMPLETION PERIOD**
10.1	The entire work under the scope of work shall be successfully completed in all respect as below: 1. Completion of Supply of Concrete: **Twelve (12)** months from date of start of first supply of RMC, as certified by Construction Manager, BHEL. 2. Mobilization at site shall be done within 30 days from date of written intimation from BHEL. The exact date of start of work shall be reckoned based on certificate of Construction Manager, BHEL. 3. Approximate monthly RMC output**12000- 15000**Cum of concrete may have to be supplied during peak period. 4. However Actual/daily requirement shall be finalized based on requirement to be indicated by BHEL Engineer on day to day basis.
11.0	**PRICE BID**
11.1	Bidder shall quote their price in USD as per the format of Volume-III, price schedule (Latest revision) only.
11.4	**EVALUATION OF PRE-QUALIFICATION CRITERIA.**
11.4.1	For finalizing the value under Financial & Technical requirement of Pre-Qualification Criteria, following procedure to be followed for value other than INR/ USD/ BDT:
11.4.1.1	Any other currency (INR/BDT/etc) shall be converted to USD at the selling Exchange Rate of USD as per State Bank of India (SBI) publication on tender floating date. If the date happens to be a holiday / or rate is not published, then the exchange rate of next day / next published day will be considered.
12.0	**TERMS OF PAYMENT**
12.1	The contractor shall submit his running bill (RA bill) once in a month at the end of each month in line with payment terms / billing schedule indicated below. The RA bill complete in all respects accompanied by BHEL engineers certified / measurement sheet, jointly signed, will be paid after passing of the bill subject to completeness & correctness. The measurement will be taken as specified in terms & conditions of contract and certified by the BHEL engineer of actual work. However, no extra payment shall be made in the event of delay in release of payment. 95% pro-rata monthly RA payment shall be considered for payment based on monthly work completion certificate to be issued by BHEL engineer as per approved BBU/Price Schedule. The payment shall be released **within 30**days from the date of receipt of complete invoice along with all necessary documents including Engineering Certificate.
12.2	Out of above 95%, 3% of gross bill amount shall be paid in the following manner on certification by BHEL engineer after compliance of each of following activity in each month. In case of non-fulfilment of respective activity by contractor in each month, no payment shall be made by BHEL

	against corresponding activity and no claim of bidder at a later date, whatsoever, in this regard shall be entertained by BHEL.
12.2.1	0.7 % shall be paid on compliance of housekeeping of contractor's working area and store/ office areas.
12.2.2	0.3 % shall be paid on compliance of general illumination of contractor's working area and stores, office area.
12.2.3	0.2 % shall be paid on compliance of applicable OHSAS requirement as per guidelines of BHEL/ PSER and as specified in the tender.
12.2.4	0.3 % shall be paid on compliance of applicable safety requirement as per guidelines of BHEL/ PSER and as specified in the tender.
12.2.4.5	1.5% shall be paid on submission of soft & hard copies of MSQR (Monthly Site Quality Report) related to all Field Quality activities which has to carry out at site as per approved FQP.
12.3	Balance 5% shall be after completion of warranty period of 3 months from the date of completion of work and handing over back of site / land to BHEL/BIFPCL.
12.4	Contractor shall make their own arrangement for making payment of impending labour wages and other dues in the meanwhile.
12.5	Contractor have to submit BHEL entry gate pass for cement and other materials required for the work, in absence of which their corresponding RA bills shall not be processed.
12.6	Subject to any deduction which BHEL may be authorized to make under the contract, the contractor shall on the certification of the BHEL engineer at site, be entitled to payment explained hereunder.
12.7	The bills will be sent to BHEL, Site Finance for scrutiny and payment will be made after processing / verification only.
12.8	The measurement will be taken by BHEL engineer as per relevant clause of GCC / specification and certify regarding actual work executed in measurement book and bills for work. However no additional payment shall be made in the event of delay in release of payment beyond the stated period.
12.9	All admissible recovery / adjustment, etc. shall be made from interim payable amount.
12.10	**BHEL site at its discretion may split up percentage break up and effect payment to suit the site condition, cash flow requirement, according to the progress of work.**
12.11	Payment shall be made in USD as per orderfrom BHEL site office. Since payment shall be made in Bangladesh. Bangladesh, Income Tax shall be deducted, if applicable. But no Indian Income Tax shall be deducted. The quoted / accepted price shall remain Firm throughout the contract period Including extension period, if any. However, price variation shall be paid / recovered as per relevant clause.
13.0	**TAXES, DUTIES ETC**
13.1	**Import in Bangladesh:**
13.1.1	Supplier may please note that import for the project shall be in the name of our Employer/ Owner of/ 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. However, if any of the taxes as mentioned above are paid by the supplier as per the extant law in force in Bangladesh, the same shall be reimbursed at actual subject to production of documentary evidence in support of such payment. However, the supplier shall obtain prior approval of BHEL before deposition of such taxes. **Any tax(es) paid without prior approval of BHEL Site Office shall not be reimbursed at a later stage.**

	Further, any documentation needed or facilitating the Imports like Bill of Entry, Bill of Lading, Packing List, Certificate of Origin etc. will be submitted by the supplier in reasonable time having regard to the time for delivery of the work and the time for completion. Documents required for import clearance at Bangladesh Customs shall be provided / arranged by BHEL from Customer based on supplier's documents as above.
13.1.2	Temporarily imported erection materials, machineries and spare parts during construction period of Project. Such items shall be exported within six months from the commercial operation date. Documentation for the same to be submitted/maintained by the bidder. Bidder shall quote the iratest/price inclusive of all taxes, duties in line with provisions as mentioned above etc.,if any.BHEL.
13.1.3	The supplier should correctly and accurately classify all the materials, supplies, equipment, tools and other articles to be shipped under the subject purchase order as per the Harmonized Commodity Description and Coding System. The supplier may refer the website of Bangladesh Customs Authority in this regard (http://www.bangladeshcustoms.gov.bd/trade_info/operating_center).
13.1.4	The Supplier shall promptly unload the materials, supplies, equipment, tools and other articles.
13.1.5	The supplier shall be responsible for import of all permanent imported items including freight forwarding,custom clearance on both side at India & Bangladesh, port handling, port charges and C&F commission &their offer Price should consider Demurrage, Landing fee and Additional Border Charges, and various other charges/fees imposed by the Customs Authority, Port Authority or any other authority. No extra payment shall be paid by BHEL in this regard. **The price shall be FO.R. site (Batching Plant)as such and shall be inclusive of all such requirement.**
13.1.6	Any Taxes for exporting material from source country & as applicable in the source country shall be on supplier's account. However, supplier to take into consideration Duty Free Export Provisions in source country, as applicable, including that in GST in case of exports from India. As such,while offering the rates, the supplier may take into account the benefit of above provisions,as the cost of input to the supplier will be net of such taxes and adjust their offer price accordingly to make it more competitive. In case of supply from India Supplier to take in to consideration applicable, Zero Rated Export Provisions under GST Law.
13.2	**BANGLADESH VAT**
13.2.1	The Supplier 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.
13.2.2	The supplier shall raise Tax Invoice (Challan Patra) as per Rule16 (1) (Musak-11) of the Value Added Tax Rules,1991 mentioning Name, Address and VAT Registration Number of BHEL site office. Supplier shall note that theTax Invoice complying with Rule16(1) of the Value Added Tax Rules,1991mustcontainthe'Billto'and'Shipto'detailsasbelow: BHEL VAT Regn. No. 000761853 NAME Bharat Heavy Electricals Limited ADDRESS Power Sector Eastern Region, 2x660 MW Maitree Super Thermal Power Project Moidara Village, Rampal Upazila, Bagerhat District, Bangladesh
13.2.3	The supplier 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.
13.2.4	Except otherwise mentioned above all taxes, Charges, Royalties, Cess and any Levy and other Taxes in or outside Bangladesh for input materials supplied, input services for the execution of the contract shall be borne by contractor and shall not be payable extra by BHEL. The bidder shall carry out his due tax diligence and get acquainted with there levant tax laws in this regard.
13.2.5	**SUPPLIERS SHALL QUOTE PRICE EXCLUDING BANGLADESH VAT**
13.2.5.1	The supply of Ready Mix Concrete ((HeadingNo.68.10) is treated as "Manufacture as per the Bangladesh VAT Act, 1991 and such manufacture of Ready Mix Concrete is exempted from payment of Bangladesh VAT vide S.R.O.No.-167–AIN/2018/790-Mushak dtd.07-06-2018.
13.2.5.2	The bidder shall take into account the above notification and accordingly raise Tax Invoice showing the turnover as exempted turnover mentioning the S.R.O. No and Date.
13.2.6	**VALUEADDEDTAXDEDUCTIONATSOURCE:**
13.2.6.1	BHEL shall make deduction of VAT at source (VDS), as/if applicable, from the Running Account Bills of the supplier depending upon the status of the supplier like "Manufacturer", "Trader" or "Procurement Provider" as per the extant provision of the Value Added Tax Act, 1991 read with the relevant Notification issued there under. BHEL shall issue VAT Deduction Certificatein "Musak-12kha" to enable the bidder to take credit of the same while paying his Output VAT. Since VAT is separately payable by BHEL as mentioned in clause 14.1.5 and since VDS is adjustable by supplier against his output tax, hence Supplier shall quote price excluding Bangladesh VAT.
13.2.7	**INCOME TAX DEDUCTION AT SOURCE:**
13.2.7.1	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 there under)shall be deducted at prevailing rates on Gross Invoice value from the bills unless Exemption Certificate from the appropriate authority/authoritiesis/ are furnished under Income Tax Laws of Bangladesh
13.2.8	Since payment shall be made in Bangladesh. Bangladesh Income Tax shall be deducted, if applicable. But no Indian Income Tax shall be deducted.
13.2.9	The Bidder shall carry out their own tax diligence to get acquainted with there levant rules and regulations of Bangladesh pertaining to the subject job. Except otherwise pointed out as exempted in Taxes & Duties clause, all other taxes and duties as applicable in source country and in Bangladeshis to Bidder's Account.
13.2.10	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.
13.3	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 introduce data later date.
13.4	Any Taxes for importing materials applicable in the source country shall be on bidder's account.
14.0	**PRICE VARIATION CLAUSE/ ESCALATION**

14.1	The quoted rate shall remain firm for one year from date of start of work, as certified by Construction Manager, BHEL and thereafter rates will be increased by 3% (Three Percent) for additional period limited to one year, if the job gets extended due to delay attributable to BHEL.
15.0	**PROJECT MANAGEMENT/ CONSTRUCTION MANAGEMENT**
	To meet the need of construction management at site, contractor shall provide the following services within quoted / accepted rates.
15.1	**CUSTOMS CLEARANCE**
	The Contractor 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 Contractor's personnel. 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 Contractor. Further, if the Contractor is delayed in submitting necessary shipping documents to the Employer, the demurrage charges by the Port Authority will be borne by the Contractor. Tools and equipment and other equipment of the Contractor for use during construction but which are to remain the property of the Contractor and which are to be exported by the Contractor from Bangladesh at the completion of the Work shall be carefully documented and specially listed to facilitate both import and export. The Contractor shall determine prior to shipment the customs regulations applicable to this special case as well as normal import rules and regulations applicable. The Contractor shall also be responsible for inland transport by barge/ truck/train to the Site.
15.2	**RECEIVING, TRANSPORTING, HANDLING AND STORAGE**
	The Contractor shall receive, transport, handle, store and install all materials and equipment furnished under these specifications, or otherwise involved in the implementation of this Contract. It shall be the responsibility of the Contractor to determine the availability and capacity of transportation and unloading facilities (including for the transportation, delivery and receipt of all equipment, materials, Plant to the Site) and to make the required arrangements to secure the necessary facilities for the same. The Contractor shall be responsible for the prompt unloading of all equipment or materials. The Contractor shall pay any demurrage incurred due to delay in unloading and for any other reasons. The Contractor shall handle materials and equipment carefully to prevent damage or loss. The use of bare rope slings for handling will not be permitted unless specifically approved by the Engineer. Special handling devices shall be used when necessary to avoid damage. In addition the Contractor shall also comply with the requirements of Technical Specification with respect to the receipt, transportation, handling and storage.
15.3	**PLATFORMS**
	Open platforms shall be constructed by the Contract or at least 50cm above grade and shall have adequate flooring and base structure to support the stored materials and equipment.
15.4	**INDOOR STORAGE**
	IndoorstorageshedsshallbeconstructedbytheContractorbysuitablemeans for keeping materials and equipment from contact with the ground and to protect it from the environment and outside atmosphere. Sensitive equipment (including inter-alia, electrical, I&C and other equipment) must be kept in dustproof and ventilated rooms and mean shave to be provided to maintain the moisture content at required levels, in accordance with Good Industry Practices.
15.5	**SHORING**
	Shoring shall be provided by the Contractor to safely support materials and equipment not less than 30cm above the ground. The ground shall be compacted and concreted or asphalted.
15.6	**WEATHERPROOF COVERINGS**

	Weather proof and flame resistant sheeting of sufficient size for outdoor storage shall be provided by the Contractor. The sheeting shall be carefully placed and tied down to prevent moisture and wind from entering underneath the sheeting and to otherwise protect the equipment, materials and other Plant.
15.7	**IDENTIFICATION OF CONTRACTOR'S EMPLOYEES,VEHICLES &BUILDINGS**
	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. 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. 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 Health, Safety and Environment (HSE) Plan of BHEL. 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. 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.
15.8	**EXPATRIATE PERSONNEL**
	The Contractor shall submit to 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 Employer at least thirty (30) days prior to their expected arrival in Bangladesh. Any expense associated with illness of the Contractor's personnel, including replacement thereof, shall be to the Contractor's account. 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. All accommodation sand amenities for the Contractor's personnel and families (including all staff and labour) must be provided by the Contractor, and the Employer shall not have any liability for the same.
15.9	**SAFETY**
	The Contractor shall comply with all ordinances and regulations including, but not limited to, National, State, Municipal laws and Department of Labour, Transmigration and Co-operation Regulations, and other Applicable Laws that are in force in the locality of the Works and shall comply with any instructions that may be from time to time issued by Employer. The safety rules and regulations laid down in the Health, Safety and Environment (HSE) Plan are to be strictly adhered to.
15.10	**CONTRACT PLANNING AND CONTROL**
	Before starting the Work at the Site, the Contractor shall submit the detail site management organization for approval by the Employer. Such proposals shall show clearly the Contractor's key

	personnel, classification and qualification with the detailed information and curriculum vitae for above key personnel. The Contractor's Representative, site manager and senior key personnel who will be responsible for working closely with the Employers staff to achieve efficient execution of the Contract shall be competent to conduct meetings and communications in the English language. The management organization shall include a planning and programming tools covering the Work, and shall apply the latest techniques in communication and analysis. The Contractor shall nominate a planning engineer to co-ordinate all planning activities.
15.11	**RELEASE OF INFORMATION**
	The Contractor shall not communicate or use in advertising, publicity, or sales release, photographs or other reproductions of the Work under this Contract, or descriptions of the size, dimensions, quantity, quality, or other information concerning the Work unless prior written permission has been obtained from the Employer.
15.12	**SAFETY &ACCIDENT PREVENTION**
	It shall be the Contractor's responsibility to maintain throughoutthe construction period, a safety and accident prevention program satisfactory to the Employer which meets the requirements of Applicable Laws and of all other Governmental Authorities authority having jurisdiction over the Works. The rules and regulations laid down in the Health, Safety and Environment (HSE) Plan must be adhered to at all times.
15.13	**SECURITY**
	The Contractor shall be solely responsible for the security of all equipment and materials incorporated or to be incorporated in the Work by him and all equipment, materials, tools, supplies, structures, facilities and others properly used in the execution of the Work while in his care and custody. The Contractor shall conformal so to any specific security requirements of Employer but such compliance shall not relieve the Contractor from thetotal responsibility for security.
15.14	**HOUSING &TRANSPORT**
	The Contractor shall arrange for suitable housing units together with furnishing and utilities in the close proximity of the construction Site for accommodation of all his expatriate personnel. If the services of any expatriate personnel of the Contractor or its Subcontractors. If the Contractor decides in consultation with the Employer that the health or safety of any of his personnel is or might be jeopardized by political or health hazards in Bangladesh, the Contractor may, after forty-eight (48) hours' notice, order its employees and the employees of its Subcontractors and suppliers to return to their headquarters or other safe location, in which case the Work will be deemed to be suspended for the duration. The Contractor shall provide to the extent agreed transport vehicles for use during construction period by the expatriate as well as local personnel.
15.15	**PROPRIETARY NAMES**
	Whenever a material or article is specified or described on the plants by using the name of a proprietary product or by using the name of a particular manufacturer or vendor, the specific item mentioned shall be understood as establishing the type, function and quantity desired. Unless otherwise specified, other manufacturers' products which in the opinion of the Employer are equivalent of those specified will be accepted. Such it ems shall be submitted for approval prior to their incorporation in the Works.

15.16	**PERFORMANCE OF THEWORK**
	TheContractorshallconductall Worksinsuchamannerastocausetheleast possibledisturbance ordamage to theenvironment.Incaseswheresome temporary disturbanceordamageisunavoidably causeddueto thenatureofthework, the Contractorshall,assoonaspossible,removethecauseofsuch temporary disturbance,repairthedamageand,ingeneral,restoretheaffectedareastotheir original condition to the extentpossibleand inamannersatisfactory tothe Employer,thelandownerand anyauthorities. PriortocommencementoftheWork,theContractorshallprovidedetailsofitsEMP specificallyaddressing thefollowing: Environmental managementsystemandmanual – policies, standards and procedures,andprograms; organization / responsibilities; Training Incidentand accidentinvestigation; Managementsupport; Environmentalprotection,mitigationandrestoration; Emergencypreparednessandresponse; • Socio-economic plans,includinghistoricalandculturalresources; • audit,monitoring andcorrectiveaction; • informationandrecordsmanagement;and, • Integrationofsafety&healthrequirements withtheEMP. AllaspectsoftheEMPandtheenvironmentworkrequirementsaretheContractor's accountabilityandtheContractor,itsmanagementanditsSitesupervisorystaffwill be held responsiblefor itsimplementation. All relevantHealth, Safety andEnvironment(**HSE)**issues,resultsof auditand monitoringplans and programs,and HSE performanceindicatorswillbe communicated to theContractor's managementandtheEmployerthroughdaily inspectionmeetingsand reports,weekly constructionmeetings,monthlymeetings, and in termsof themonthlyprojectreport. TheContractorshallensurethathehascompleteknowledgeofallthelaws,statutes, statutoryinstruments,regulations,rules,treatiesandconventions(by whatevername or title),environmental protectionregimesandotherApplicableLaws,ineachofthe jurisdictionswhereheshallperformthe Work.The Contractorshallalsotakeall necessarymeasures toprotectthe atmosphere, ocean,rivers,groundwater,seaports andlandfrompollution.Inanyeventthe Contractorshallpromptlyuseitsbestefforts to eliminate and cleanup anypollution caused,directlyorindirectly,bytheContractor orwhich occursattheSite,orothersites associated with thisWork. The Contractorshallcooperateinallrespectswithanyparticipantenvironmental representativesandwithgovernmentalpersons,andallowthemtoinspectanyand allequipmentoroperationsthattheywishtoobserve.The Contractorshall,atall times,beready todiscusstheimplementationoftheContractor'ssafety,healthand environmental protectionprogram.
15.17	**INSTRUCTION TO WORKERS (ORIENTATION / INDUCTION)**
	The Contractor shall ensure that all employees, subcontractors, servants and agents (and employees, servants and agents of all Subcontractors) participating in the Work, are advised about

	the strategy and plan for managing the environmental-social issues related to the work, and on their role and responsibility; instructed on the requirements of environmental laws, rules, regulations and specific permit conditions applicable to the area and the Work; instructed on the application and use of the required personal protective equipment (PPE) for their job duties and functions; and, have received the appropriate training in the use, application and maintenance of PPE.
15.18	**RISK MANAGEMENT**
	The Contractor shall clearly state the management methods and techniques to be used to identify potential hazards and risks at any stage prior to the execution of a particular activity. If required, specific procedures shall be developed by the Contractor to eliminate or mitigate the hazard to a safe level prior to the work being authorized. All requirements of the project's environmental impact assessments ("EIA") and other relevant assessments and conditions of approvals accorded by the relevant Governmental Authorities must be considered by the Contractor in the development of the Contractor's Health, Safety and Environment (HSE) Plan, EMP and other related/relevant plans. The Contractor is required to implement a system whereby all risks associated with hazardous substances, whether chemicals, by-products, effluents or waste materials, are minimized and/or eliminated. In conjunction with its emergency plans and procedures, the Contractor shall develop and submit to the Employer's Representative a "Safety Philosophy Document" that details the strategy to be adopted for control and shutdown systems, including alarms and programmable electronic control systems.
15.19	**EMERGENCY PREPAREDNESS, RESPONSE &CONTINGENCY PLAN**
	The Contractor shall prepare an Emergency Preparedness, Response and Contingency Plan (a detailed program of action to minimize the effects of an abnormal event requiring prompt actions beyond normal procedures to protect human life, minimize injury and safeguard the environment) for environmental and personal safety emergencies or incidents. This plan shall be found within the Contractor's Safety & Health and/or Environmental Programs. The purpose of the plan shall be to limit insurance and damage to people, property and the environment respectively. The plans, procedures, and trained personnel shall be in place for the duration of the Contract to manage and control emergency situations and incidents in a proper and expeditious manner.
15.20	**SERVICING AND FUELLING**
	To ensure adequate response capability in the event of a fuel, ground spill or other spill, all fuel transport vehicles and the Contractor's foreman vehicles shall carry a suitable amount of commercial absorbent material. In addition, floating absorbent pads and booms for spill clean- up on open water shall be kept accessible on the construction Site. All service vehicles and/or equipment utilized for re-fuelling must be equipped with automatic shut-off valves. All equipment or servicing activities with the potential for accidental spills (e.g., oil changes, hydraulic repair, coolants) will require appropriate containment methods to be in place (i.e., storage containers, impervious liners, absorbent materials, etc.) prior to the start of the activity.
15.21	**SOIL AND GROUND WATER PROTECTION**
	The Contractor shall develop and implement soil and groundwater protection measures. Protection measures shall include building and impervious floors, where appropriate. The Contractor shall make an assessment of groundwater quality prior to the start of construction and prior to commissioning to demonstrate to Employer's Representative that construction activities have not adversely affected the environment. Groundwater quality shall be monitored throughout the construction phase.

15.22	**HEALTH HAZARDS**
	Worker and public health is a critical part of any HSE management program. The Contractor shall control substances and materials that may be a hazard to worker's health. These controls shall be a combination of hazard communication, safe work systems and the controlled handling and disposal of hazardous materials The Contractor's controls shall commence at contract preparations and procurement stages, where all vendors and subcontractors shall be required to submit Material Safety Data Sheets ("MSDS") for all hazardous materials that will be supplied, provided or brought onto the Site. These MSDSs shall be forwarded to Contractor's HSE Manager for review and records management. In the event hazardous materials are to be used, the Contractor shall carry out assessments according to recognized international standards, to determine if there are any more suitable or less hazardous materials that could be substituted for the original materials. Only when the Project Manager, Employer and his Engineer and the Contractor are satisfied that assessments have been completed, and control measures are adequate to protect worker health, the materials shall be allowed on the project worksite. The Contractor's control measures shall include: • Material transport, storage, labelling, packaging, and disposal, • Personnel protective equipment (PPE), • Health surveillance and monitoring, and • Emergency procedures and training. All explosive materials to be used for blasting during Site preparation shall only be handled by approved and qualified personnel. All explosive materials shall be stored in a secure, limited access sites, protected from workers and the public, and removed from the site every day and immediately after use. All radioactive equipment and materials shall only be used by qualified, approved and permitted personnel. Radioactive materials must be stored in approved and protected containers. Radioactive materials and waste products shall not be disposed of on-site but removed in protective containers and disposed at government approved storage and disposal sites
15.23	**WASTE MATERIAL MANAGEMENT**
	The Contractor shall ensure that waste management identification, handling, transport and disposal are addressed in the development of their HSE management plans. The Contractor's employees responsible for handling hazardous materials (including wastes) shall receive training and certification in the handling, transport, storage and disposal of chemicals and regulated or hazardous materials. Where applicable, Workplace Hazardous Materials Information System ("WHMIS") certification and training, or its equivalent, shall be made available to employees. Regular written updates shall be included for continued employee awareness. The Contractor shall ensure proper segregation and isolation for wastes that could react together in the event of a leak or other incident. These facilities shall include lockable, fire proof cabinets or storage in shelving units separated by fireproof barriers or walls. The Contractor shall dedicate a space for waste and drum storage. The storage area must be easily accessible for spill containment and emergency response and not be susceptible to flooding.

	For any waste storage area which could accumulate hazardous gases, vapors, or dust due to the nature of the wastes stored, the Contractor must supply suitable ventilation or other controls to ensure exposure by employees is kept below required minimum standards. Storage areas for hazardous wastes shall be designated as restricted areas and shall be suitably equipped to control an incident involving a leak or spill. The Contractor shall make available suitable fire extinguishing equipment and proper electrical bonding equipment in all areas involving the handling and storage of flammable and reactive wastes. Disposal of wastes by burning will not be allowed on the construction site. Sumps and waste pits shall not be used for waste storage at the work site. Sumps should only be used for temporary control and containment of spills, equipment leaks, etc. If the Contractor encounters former sump sites or waste pits during ground surveys, the Contractor shall be identify and investigate the same. If any contamination is suspected, the Contractor shall excavate, remove and where required replace with an approved sump container system. The Contractor shall develop and implement a waste disposal control system. This system shall control every load of waste leaving the worksite, detailing the type of waste disposal, waste origin and destination, approximate weight, date and transport details on a waste manifest/document. These documents shall be audited.
15.24	**SPILL RESPONSE AND CONTROL**
	All spills shall be stopped and cleaned up immediately to avoid potential impact to water and soil quality. All spills shall be reported using the Incident Management Process. Under no circumstance contaminated material may be “stored” on the work site. All spills shall be rapidly stopped and appropriately eliminated as defined in the Contractor’s Emergency Preparedness, Response and Contingency Plan. Spills shall be contained in a way that will prevent their redistribution. All ground spills shall be contained as quickly as possible through diking, suction methods, excavation and the use of absorbents or other appropriate recovery techniques. A list including the type, quantity and location of the storage of retaining and clean up equipment to be used during construction shall be prepared. The list shall include the procedures and mitigation measures to be used in case of a spill. A written inventory will also be prepared, before starting construction works, including lubricants, fuels, solvents, chemicals and other materials that might be accidentally discharged during construction. All on-site fuel storage tanks shall be located in an impermeable secondary containment area with a holding capacity equal to 110% of the largest tank within the berm. For above ground tanks, the tanks shall be surrounded by a berm, the entire area covered with a suitable commercial absorbent material and with a sealed plastic liner to form an area that can be pumped out in the event of a leak in the tank. A waste handling plan shall be made with the purpose of identifying the procedures necessary for cleaning and disposing of residues from a major spill. In the event of a spill, the Contractor shall make all resources available to contain and clean up the spill. Traffic shall be minimized in and around the spill site.

15.25	**NOISE CONTROL**
	Noise level specifications to be followed by the Contractor in design, assessment and monitoring activities are based upon the maximum (acceptable) levels which plant personnel may be exposed during their normal working duties. The Contractor shall be familiar with and comply with the environmental guidelines as issued by the relevant Governmental Authorities in Bangladesh, including the Department of Environment, Government of Bangladesh and other relevant Applicable Laws. All internal combustion motors of vehicles, machinery and equipment used during the construction phase, shall have adequate noise silencers, and shall be kept in good operating conditions, during the entire construction period. Where temporary noise pollution of greater than 85 dBA will occur, temporary silencers shall be used. Equipment noise should not exceed the specified limits at accessible locations.
15.26	**CONSTRUCTION TRAFFIC PLANNING**
	The Contractor shall ensure that the construction Site is organized in such a way that pedestrians can move safely and without risk. The Contractor shall firstly select the lowest period of traffic flow for equipment crossings; and secondly, ensure that traffic patterns and entrances to private and public roads for access are not obstructed during construction activities. All site entry will be controlled by vehicular passes. Road closures, on-site and off-site, shall be with the approval of the Contractor's site manager and/or road closure permit. Site traffic shall be minimized and speed limits posted and enforced.
15.27	**HOUSEKEEPING**
	All construction debris and other garbage shall be continuously collected and disposed at an approved facility. At the end of each day, all waste material shall be removed from the construction Site and deposited at the approved allocated area. The approved procedures to manage waste shall be specified in the Contractor's waste management plan. All empty hazardous material containers shall be removed from the work area as soon as is practicable. All empty gas containers and bottles shall be returned to their storage area and secured properly. The Contractor's shall prepare a pest and vector control program to address specific site conditions, including a mosquito control program.
15.28	**CONSTRUCTION CAMPS**
	The location of work places, camps, areas of storage and installation of works, compression, regulation and communication stations shall be located on levelled land, avoiding areas with non-cohesive soils to avoid erosive processes. Health conditions in the camp shall be controlled in order to prevent contamination of adjacent groundwater or surface water resources. Domestic sewage generated at the construction sites shall be eliminated by two systems of septic/absorption tanks or chemical toilets located on the sites. Solid combustible garbage shall be collected and secured daily, until disposal, to prevent the attraction of livestock, vermins and wild animals. Residue shall be disposed of, along with non-combustible garbage, in a disposal location approved by the Authorities. Upon abandonment, the camp site area shall be cleared of all trailers, piping, cable, insulation, lumber, blockage, metal wastes, etc., and re-graded according to the landscaping concept. These guidelines and procedures for the management of domestic and other waste shall be specified in a plan.
15.29	**SITE REGULATION MANUAL**

	The Contractor shall thirty (30) days prior starting any Work at the Site furnish a detailed and comprehensive site regulation manual for its proposed operation and works on the Site, which shall be based on the site related regulations and requirements in the Contract and which shall be subject to Employer's approval. All work on the Site, shall be carried out in compliance with the so approved site regulation manual.
15.30	**PLANNING & MONITORING**
15.30.1	The bidder shall prepare detail work schedule (L-3) as per the requirement given in this document. This schedule must include all material procurement, Tools & Plant, manpower etc. deployment with key activities for each sub-system / components. This network must conform to the overall project schedule. The bidder should also ensure monitoring of these activities at least weekly basis to start with and on daily basis whenever required by BHEL.
15.30.2	The bidder shall also prepare progress report indicating progress on key activities, management summary for critical activities and list of actions requiring attention of BHEL. This schedule is to be preferably made in MS PROJECTS, so that the same is compatible with BHEL's project management software.
15.30.3	The contractor's site office must have facilities of communications like Fax, E-mail, and telephone with STD facility within a month from LOI.
15.30.4	**PROGRESS REPORTING**
15.30.4.1	The bidder shall submit daily, weekly and monthly progress reports for work force, materials reports, consumables (cement, aggregates, admixtures etc.) report and other reports as per pro-forma considered necessary by BHEL. In case of any failure on contractor's part to comply with this, BHEL may at its discretion, consider to withhold part payment against their RA bills.
15.30.4.2	The progress report shall indicate the progress achieved against planned with reasons indicating delays, if any, and shall give the remedial actions which the contractor 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.
15.30.4.3	The daily work force reports shall clearly indicate the work force deployed, category-wise specifying also the activities in which they are engaged.
15.30.4.4	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 contractor shall present program of subsequent week. The contractor shall constantly update/revise his work program to meet the overall requirement.
15.30.4.5	Periodic progress reviews on the entire activities of execution in respect of supply and works in scope of bidder will be held once in a month at Kolkata / site. These meetings will be attended by reasonably higher officials of the contractor and will be used as a forum for discussing all areas where progress needs to be speeded up. The contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.
15.30.4.6	Successful bidder has to provide for electronic / computerized storing and re-production / printing / plotting of various data, log sheets, protocols, measurements etc. These may be stored in CD (as per requirement) and handed over to BHEL as per requirement.
15.30.5	**PHOTOGRAPHS**
	Agency shall submit site progress Photographs in Soft/Hard copies as per requirement of BHEL.
15.30.6	**SITE ORGANIZATION**

15.30.6.1	The contractor 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 construction manager for site operations with sufficient level of authority to take site decisions. The vendor will submit organization chart (showing the name of SITE-IN-CHARGE) with individual bio-data indicating various levels of experts to be posted for supervision and execution, quality, material management, planning, safety, etc. The organization shall be reinforced from time to time, as required to make up slippage (if any) from the schedule without any commercial implication to BHEL. The organization chart is to be submitted within 10 days from the date of LOI.	
15.30.6.2	Following (minimum) engineering manpower with power plant construction background to be deployed at site by the successful vendor for their day to day supervision etc.	
15.30.6.2.1	Qualified safety officers (exclusive for safety supervision for project jobs).	Officer – One No.
15.30.6.2.2	Safety Supervisor	One No for Night Shift
15.30.6.2.3	Engineer & Quality Assistant for quality inspection.	One no Engineer (Minimum 2 years' Experience) One Quality assistants (Diploma In Civil Engineering)
15.30.6.2.4	Planning/Billing Engineer (exclusively for planning/Billing)	One no. Engineer
15.30.6.3	Deputation of above man-power shall be jointly decided at site in line with requirement.	
15.30.6.4	Engineer / supervisor for other functions like store & purchase, material management, fin, administration etc. are to be provided as per site requirement and not considered above.	
15.30.6.5	In the event of non-deputation of safety officer/engineer/safety supervisor/quality assistant by the bidder as per above agreed schedule, BHEL shall reserve the right to deduct USD 800 per man-month for safety officer/engineer, USD 650 per man-month for the safety supervisor /quality assistant.	
15.30.6.6	BHEL reserves the right to reject or approve the list of personnel proposed by the contractor. 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.	
15.30.6.7	In addition to above, a well experienced qualified engineer to be designated, as 'Project Co-coordinator', shall be deployed by the contractor. Such engineer shall have adequate exposure on the job and shall remain fully involved in all planning activities, guidance etc. to contractor's own team during the complete execution period of contract.	
15.30.6.8	The contractor 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.	
15.30.6.9	Parallel working of all installed batching plants is envisaged. Hence every batching plant should have independent operator and adequate supporting staff round the clock to cater all the batching plants as per requirement. However, with prior intimation routine maintenance shall be allowed phase wise.	
15.30.6.10	The contractor should also submit network programs for the production of various grades of concrete. These networks shall show the BIFCL/ BHEL hold points, which have to be cleared by BIFCL/ BHEL, or their authorized representatives. These programs for the erection would clearly identify responsibilities of the contractor and BIFCL/ BHEL. It is the responsibility of the contractor to get the Networks approved by BHEL within four weeks of the date of finalization of award of work/ placement of LOI.	
16.0	**QUALITY CONTROL & QUALITY ASSURANCE**	
16.1	Contractor's engineers & supervisors shall be adequately qualified and also inclined to do a quality job. The quality assurance engineer shall co-ordinate all aspects of quality control, inspection, implementation of quality assurance procedures laid down in Quality Plan and technical specification by BHEL. He shall fill up quality assurance log sheets / formats and submit to BHEL for acceptance.	

	The contractor shall fill up, maintain & preserve the quality records in computerized media. BHEL's authorized representative shall be given free access at all time to such quality related records etc. for inspection, review etc.
17.0	**QUALITY ASSURANCE PROGRAMME**
17.1	The contractor shall arrange for suitable quality assurance programme to control all activities pertaining to the scope of work, as necessary. Such programs shall be outlined by the contractor & shall be finally accepted by BHEL. A quality assurance programme of the contractor shall generally cover the following.
17.2	Organization structure and qualification data for key personnel of the contractor for the management and implementation of proposed quality assurance programme
17.3	The procedure for source inspection, incoming raw material inspection, verification of material purchased etc.
17.4	System for maintenance of records.
18.0	**GENERAL REQUIREMENTS – QUALITY ASSURANCE**
18.1	All materials, and equipment covered under the specification shall be procured, manufactured, erected, commissioned and tested, as applicable, at all stages as per comprehensive quality assurance program. An indicative program for inspection / test, to be carried out by the contractor, for some of the major items is given in the respective technical specification.
18.2	Field quality plan will detail out the quality practices and procedures etc. to be followed by the contractor's site quality control organization, during various stages of site activities from receipt of material / equipment at site.
18.3	BHEL reserves the right to carry out quality audit 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.
18.4	Quality audit / 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 any way limit the liabilities and responsibilities of the contractor in earning satisfactory performances of equipment/ service as per specification.
18.5	All the latest relevant codes as per technical specification should be available with the contractor at site within 15 days from the date of placement of LOI or otherwise specified by Construction Manager/ Project Manager, BHEL.
19.0	**HEALTH, SAFETY & ENVIRONMENT**
19.1	**REFER DOCUMENT NUMBER: HSEP:14-MAITREE: VENDOR Date: 05.05.2016**
	DOCUMENT TITLE:HEALTH, SAFETY AND ENVIRONMENT PLAN FOR 2X660MW MAITREE SUPER THERMAL POWER PROJECT
20.0	**SPECIFIC REQUIREMENTS FOR ISO 9002**
20.1	Contractors shall ensure that all their staff / employees are exposed to periodical training programs conducted by qualified agencies/ personnel on ISO 9002 Standards.
20.2	Contractor shall ensure that the quality is maintained in all the works connected with this contract at all stages of the requirement of BHEL.
20.3	Contractor shall ensure that all MMDs that are used, whether owned by the contractors or used on loan, are calibrated by the authorized agencies and the valid calibration certificate will be available with them for verification by BHEL. A list of such instruments possessed by the contractor at site with its calibration status is to be submitted to BHEL Engineer for control.
20.4	Contractor shall ensure that fitness certificate of the tools & plants that are in use whether owned by contractor or taken on loan, are tested by authorized agency and the valid fitness certificate is available for verification by BHEL.
20.5	Contractors shall arrange for the inspection of the works at various stages as required by BHEL. The contractors shall take immediate corrective action for the non-conformances if any, observed and pointed out by BHEL.

21.	**INTEREST BEARING RECOVERABLE ADVANCE/ MOBILISATION ADVANCE**
21.1	Not applicable in this tender.
22.0	**OVER RUN CHARGES**
22.1	Not applicable in this tender.
23.0	**DELETED**
24.0	**DELETED**
25.0	**LIQUIDATED DAMAGES**
25.1	If the contractor fails to maintain the required progress of work which results in delay in the completion of the works 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 ceiling specified below. 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, Supplementary / Additional Items and PVC. If Completion of work goes beyond specified contract period 12 (Twelve) months from date of start of work, as certified by Construction Manager, BHEL, LD will be imposed with maximum LD amount shall be 10 % of total contract value. BHEL shall deduct the amount of such LD from any money due or which may become due to the contractor and/or recover such compensation from the bank guarantees / security deposit/ retention amount/ payable RA Bills of the contractor. To be entitled to impose such compensation, BHEL will not be required to prove that he has incurred such amount as actual damage. BHEL reserve the right to cancel the order/ contract or a portion thereof at the risk & cost of the contractor and the contractor shall be liable to BHEL for any excess costs thereof.
26.0	**GUARANTEE / WARRANTY**
26.1	The contractor will be responsible for the quality of concrete supplied, quality of materials / design of concrete mix. In case the concrete fail to give the required strength, the cost of re-test, demolition & other cost / charges shall be recovered from the vendor. Decision of Engineer in this regard is final & binding on the vendor.
26.2	Guarantee / warranty period shall be 3 months from the date completion of work. Commencement of guarantee period shall be from the date completion of work under this contract as certified by BHEL.
27.0	**EXTENSION OF TIME FOR COMPLETION**
27.1	If the completion of work as detailed in the scope of work gets delayed beyond the contract / completion period due to reasons not attributable to contractor, the contractor shall make request for an extension of the contract and BHEL at its discretion may extend the contract.
27.2	Based on review of agreed & jointly signed L-3 / construction schedule (as enumerated in the tender), the balance work 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 contractor. Further 'Time extension' or 'Time extensions' at the end of previous extension shall be worked out similarly.
27.3	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.
27.4	A joint program 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 contractor as per specified format. Review of the programme and record of shortfall shall be done.
27.5	During the period of 'Time extension', contractor shall maintain their resources as per mutually agreed program

27.6	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 solely to contractor after adjusting delay attributable to BHEL& Force majeure and recoverable from the dues payable to the contractor.		
28.0	**EARNESTMONEYDEPOSIT(EMD / SECURITY DEPOSIT (SD) / PERFORMANCE BOND (PB)**		
	Not applicable for this tender		
28.1	**PERFORMANCE BOND**		
	Performance bond is not applicable.		
29.0	**CERTIFICATE TOWARDS COMPLETION**		
29.1	The work under the scope of the contractor 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 contractor.		
30.0	**SPLITTING OF THE CONTRACT**		
30.1	Not applicable for this tender		
31.0	**CIVIL LABORATORY**		
31.1	BHEL shall extend its facility for all quality tests. However, vendor to arrange supports like manpower, sampling and shifting of materials/cubes etc. For hourly / frequent checks like Moisture correction for aggregates need to be arranged by vendor. Consumables / chemical required /demanded by BHEL shall be arranged by bidder within quoted rates.		
31.2	Concrete Cubes shall be taken at site as per FQP / instruction of BHEL and the same shall be tested at Site / Govt. approved laboratory / Institution if required at your own cost.		
31.3	Other than above mentioned test, any testing required to be carried out at site as per FQP / joint discussion at site and technical specification have to be arranged by you for all the works at your own cost		
32.0	**CONSTRUCTION SCHEDULE**		
32.1	Entire work shall be carried out in accordance with the broad supply schedule given below, within the stipulated period. Within 30 days of LOI, the contractor shall discuss with BHEL site engineer & furnish detail construction schedule (L-3/ L-4) indicating all major activities and get it approved from BHEL engineer. This schedule will undergo review and based on progress vis-à-vis project requirement, contractor shall have to submit revised schedule for approval of BHEL		
32.1.1	**Sl no.**	**Major Milestone**	**Time from the date of written intimation by BHEL.**
	1	Report to Construction Manager / BHEL Site	15 days
	2	Completion of Installation of 1st Batching Plant.	45 days
	3	Completion of Installation of 2nd Batching Plant.(from 1st BP installation)	15 days from 1st BP Installation
	4	Completion of Installation of 3rd Batching Plant.(from 2nd BP installation)	15 days from 2nd BP Installation
	5	Completion of finalization of Aggregate sources	20 days
	6	Completion of finalization of admixture sources	25 days
	7	Completion of finalization & approval of Design Mixes of concrete	40 days
	8	Start of production of Concrete	45 days
32.2	Contractor shall establish mix design for all concrete grades by taking trial mix at site after submission of Design Mix of various Concrete grades or from authorized agency (As per BHEL / Customer		

	approval). Contractor shall ensure adding of admixture and minimizing of cement content in line with relevant BS Code.	
32.3	The contractor shall plan his work in such a manner so as to meet the overall project schedule, in consultation with BHEL/ BIFCL engineer	
32.4	Periodic progress reviews on the entire activities of execution in respect of supply & works in scope of contractor will be held once in a month at Kolkata / site. These meetings will be attended by reasonably higher officials of the contractor and will be used as a forum for discussing all areas where progress needs to be speeded up. The contractor shall be further responsible for ensuring that suitable steps are taken to meet various targets decided upon such meetings.	
32.5	Above schedule is indicative. The contractor shall plan his work in such a manner so as to meet the overall project schedule, in consultation with BHEL/BIFCL Engineer.	
33.0	**MATERIAL HANDLING**	
33.1	No material is envisaged to be issued by BHEL	
33.2	However, all the materials (to be supplied by you) are to be handled by you and you will be solely responsible for safe custody of the same.	
34.0	**TOOLS & PLANTS (TO BE PROVIDED BY CONTRACTOR)**	
34.1	Tentative list of T&P to be deployed by contractor for successful completion of work is detailed below. No T&P shall be provided by BHEL	
34.2	It may be noted that the list is not exhaustive and is only for general guidance. The contractor is required to provide all necessary T&P (other than those specified to be provided by BHEL, if any) measuring (calibrated) instruments & handing equipment to maintain work progress for timely completion of total work as per contract. In case of project requirement, some activities may have to pre-pone. In such cases the contractor may have to deploy additional T&P. Quoted rate shall be inclusive of such emerging requirements. However, contractor shall submit deployment plan of all T&P along with tender bid.	
34.3	In the event of any failure on the part of the contractor to deploy T & P to sustain desired work progress, BHEL may at his discretion also terminate the contract on this ground and take out any or whole amount of the contract from the scope of the contractor. In the event of failure of contractor to deploy necessary and sufficient T&P/ IMTEs to maintain work progress, BHEL will be at liberty to arrange the same at the risk & cost of contractor including transportation cost of same from any of BHEL site/ other agency & charges as applicable shall be deducted from contractor's RA bill. Decision of BHEL in this regard will be final & binding on contractor.	
34.4	Following Major T&Ps to be deployed by contractor of each package within the indicated time from date of LOI / hand over of site which is applicable.	
	Major T&P items	**Deployment Schedule from the date of written intimation by BHEL .**
34.4.1	1 No. 40'0" x 8'0" or 2 Nos. 20'0" x 8'0" office Porta Cabin	Within 30 days
34.4.2	1 no. Dozer	Within 40 days
34.4.3	1 No. Pay loader, 1 no JCB with minimum capacity of 1.2 Cum	Within 40 days
34.4.4	Total **approx.**120 Cum/Hr. capacity (one of which shall be minimum 60 cum/hr) of Automatic Batching Plant with Printing facility with required Silo for storing of Cement to be commissioned at Site. However, total numbers of batching plant shall be restricted to 3Nos.	1st Within 45 days 2nd Within 15 days of 1st BP Installation 3rd Within 15 days of 2nd BP installation
34.4.5	Transit Mixers	As per requirement
34.4.6	4 Nos. dumper	2 nos. Within **30**days & balance as per requirement

34.4.7	**2** Nos. self-priming water pump 5HP (diesel / electric)	As per requirement
34.4.8	**1**Nos. self-priming water pump 10 HP or higher (diesel/ electric) for pumping water from source to vendors vat.	As per requirement
34.4.9	1 No. DG set of Minimum capacity 150KVA	Within 45 days.
34.4.10	Concrete compressive strength testing moulds– 100 Nos.	Within 30 days
34.4.11	1 no drinking water tank – 2000 lit.	Within 30 days
34.4.12	Portable fire extinguishers as below: Soda acid – 2 sets. Dry chemical powder – 2 sets CO2 – 2 sets. Water & sand bucket (4 buckets in one stand) – 2 sets. Fire hose with nozzle (50 M length) – 2 sets	Within 30 days
34.5	All the batching plants shall be fine working condition and you shall maintain adequate spares to cater immediate day to day maintenance.	
34.6	T&P shown in the above mentioned list are tentative based on planned progress requirement, construction schedule and material availability at site. It is to be reviewed and mutually agreed with CM, BHEL site periodically from time to time for mobilization of major T&Ps, and the same have to be adhered to. No change will be permitted without written approval of Construction Manager, BHEL site. Further requirement will be reviewed time to time at site and contractor will provide additional T&P/equipment to ensure completion of entire work within schedule time without any financial implication to BHEL. All other T&Ps shall be provided by the contractor without any extra cost to BHEL. Vendor will give advance intimation & certification regarding capacity etc. prior to dispatch of heavy equipment.	
34.7	All T&P and all IMTEs, which are required for successful and timely execution of the work covered within the scope of this tender, shall be arranged and provided by the contractor at his own cost in working condition.	
34.8	In the event of non mobilsation of any T&P by the successful bidder and as a result progress of work suffered, BHEL reserves the right to deduct suitable amount from the dues of the bidder, with assigning reasons thereof on market Rate.	
35.0	**OTHER TERMS**	
35.1	All other term & conditions of this specification shall be governed by the pertinent provisions of GCC and other volumes of this tender, as applicable.	

LIST OF TENTATIVELY APPROVED CEMENT SUPPLIERS PROVIDED HEREUNDER. HOWEVER, IN CASE THE BIDDER PROPOSES TO PROCURE ITEMS FROM OTHER SUPPLIERS, SPECIFIC APPROVAL SHALL BE REQUIRED TO BE TAKEN FROM BHEL/BIFPCL AS PER APPROVED QP. FURTHER BIDDER MAY NOTE THAT LIST CONSISTS OF ONLY TENTATIVELY APPROVED VENDORS. SPECIFIC APPROVAL MUST BE TAKEN FROM BHEL/BIFPCL PRIOR TO EXECUTION AT SITE.

SL. NO.	**PROPOSED CEMENT SUPPLIER**
1	CCI
2	GUJARAT AMBUJA
3	JK LAXMI
4	JAYPEE
5	GRASIM
6	BIRLA
7	LAFARGE
8	ACC
9	SHREE
10	INDIA CEMENT
11	PENNA CEMENT
12	MADRAS CEMENT
13	PTISM
14	ULTRATECH
15	ORIENT
16	MANCHERIAL
17	JSW
18	ANDHRA CEMENT
19	PARASHAKTI
20	SAGAR
21	MAIHAR
22	HOLCIM BD LTD.
23	MANIKGARH
24	HEILDELBERG CEMENT
25	MEGNA CEMENT
26	SHAH CEMENT
27	CROWN CEMENT
28	EMIRATE CEMENT
29	BASUNDHARA CEMENT
30	SEVEN RINGS CEMENT

TECHNICAL SPECIFICATION OF CONCRETE

for

Providing Ready Mix Concrete

for 2x660 MW

Maitree Super Thermal Power Project

at

Moidara Village, RampalUpazila,

Bagerhat District, Bangladesh

BharatHeavyElectricalsLimited
(AGovt.OfIndiaUndertaking)
PowerSector– EasternRegion
Plot–DJ9/1,SectorII,Salt Lake
Kolkata-700091

B9.4.6 Concrete works

B9.4.6.1 General

The concrete works shall be based on applicable approved codes and standards. In general, the concrete for foundations shall be Grade 30. The type of cement to be used shall satisfy the requirements of the relevant international and local Standards or equivalent.

All materials used for concrete and reinforced concrete structures shall be of the best quality and free of defects likely to undermine the strength and shorten the service life of the works. The materials furnished shall comply with the agreed standards with the requirements of the soil investigation report regarding the aggressively of soil and water and with all requirements set out in these Specifications. The high sulphate content according water analysis shall be considered for concrete in contact with sea water.

All materials shall be stored and handled in a manner that will prevent contamination and/or deterioration. Deteriorated and/or contaminated material shall not be used for the concrete and shall be removed from the site at the expense of the Contractor.

All aggregate and sand used in the production of concrete shall be thoroughly tested for silica alkaline reaction, flakiness, aggregate crushing value etc.

The design and execution of the works shall consider a minimum development, the corrosion risks and the durability of the concrete and be based on the latest applicable approved codes and standards as listed in Section B0.

B9.4.6.2 Materials for concrete

Cement

The cement used for concrete, reinforced concrete, mortar, grout and plaster (acid or see water resistant) works shall be conforming to ASTM C150-07 with C3A content 5% to 8 % as specified in type- I unless stated specifically in the Item. The manufacturer's test certificate will normally be accepted as proof of compliance with Specifications but the Employer may order further tests as specified in the relevant standards. The Contractor shall bear all expenses required for the preparation, dispatch, and tests of the samples. The cement content in the mix shall be design as “Minimum requirement as per respective code plus 50 kg. (e.g. if minimum cement requirement for any job is 400 kg based on severe exposure then the design mix cement shall be 400+50= 450 kg/cum) “However final cement content in the mix will be approved by BHEL/BIFCL.

All accepted cement shall be delivered to the site in strong, sealed, waterproof containers unless written approval to the contrary is given. All cement delivered shall be marked in accordance with standards, stating the following particulars: type of cement, strength category, manufacturer, weight, quality control marking, date and transport data.

The cement shall be protected against all impurities and dampness during transportation and storage on the site. Sufficient cement shall be stored on site to ensure continuity of the works and to allow testing of any consignment before it is required for use. All cement shall be fresh when delivered. Cements of different types shall not be mixed one with another. Consignments shall be used in order of delivery.

Cement shall be stored in bags or in unopened containers on a dry, raised platform in a well-ventilated but watertight building.

Cement shall be kept in the store until actually required for use on the works and any cement temporarily placed near the mixer shall be adequately protected. Cement stored on site for a period longer than two months shall be laboratory tested before use.

Water

The water shall be clean and free of salt, oil or acid, organic material or other matter harmful to the finished product and shall be from a source approved by the Employer. The Contractor shall undertake tests to determine the sulfate content and acidity of the water and make adequate arrangements to deliver and store sufficient water at the work site for use in mixing and curing the concrete. Water shall comply with the requirements of BS EN 1008 or equivalent.

Basic parameters for construction water shall be follows:
Permissible limit:

Organic- less than 200mg/Liter
Inorganic - less than 3000mg/Liter
Sulphate (as SO4-)– 400mg/Liter
Chlorides (as Cl-)- less than 500mg/Liter
Suspended Matter - less than 2000mg/Liter
Alkalinity (as CaCO3) – less than 250 mg/ Liter
Total Acidity - less than 44 mg/Liter
pH Value of water shall be greater than 6 (ideal 7)

Aggregates

Materials used as aggregate shall be obtained from a source known to produce aggregate satisfactory for concrete and shall be chemically inert, strong, hard, durable, of limited porosity and free from adhering coats, clay lumps or organic impurities that may impair the strength or durability of the concrete. Aggregate shall comply with and be tested in accordance with the requirements of BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1or equivalent.

Each size of aggregate shall be separately stored in a manner that will prevent contamination, intermixing and/or segregation. The equipment and methods of handling aggregates shall be such as to prevent deterioration and contamination of the stockpiles.

Frequency of testing the aggregates shall be at least as follows:

Frequency of testing

Sl. No.	Test Type	Coarse Aggregate	Fine Aggregate
1	Grading of each aggregates	Daily	Daily
2	Grading of combined aggregates	Daily	Daily
3	Specific gravity	7 days	7 days
4	Magnesium sulphate soundness	30 days	-
5	Clay silt and dust content	Daily	Daily
6	Shape (elongation and flakiness)	Twice a week	-
7	Los Angeles abrasion	Initially only	Initially only
8	Moisture content	2 days	Daily
9	Drying shrinkage	Initially only	Initially only
10	Organic impurities	30 days	30 days

Fine aggregate shall be clean natural sand or sand derived by crushing stone and shall consist of hard, dense, durable uncoated particles. Sand derived from stone unsuitable for coarse aggregate shall not be used as fine aggregate.

The grading of the aggregates shall be such as to produce a concrete of the specified proportions, which will work readily into position without segregation and without the use of excessive water content. Grading shall be controlled throughout the work so that it conforms closely to that used for the preliminary tests.

Washing, screening, classifying and other operations on the fine aggregate required to meet this specification shall be done by the Contractor. Washing is required if the content of salt and other impurities adhering to the aggregates exceed the level given in the standards.

Coarse aggregate shall be crushed or uncrushed gravel or crushed stone and shall be free of decomposed stone, clay, earth or other deleterious substances. The specific gravity of the coarse aggregate shall be not less than 2.5 t/m3. Aggregate of crushed natural stone is deemed adequate if the stone reveals a crushing strength of 1000 kg/cm2 when tested. Friable, flaky and laminated pieces, mica and shale shall only be present in such quantities as not to affect the strength and durability of the concrete.

The grading of coarse aggregate for concrete shall comply with the requirements of BS 882or BS EN 12620:2002+A1:2008 OR ASTM C 33-16E1or equivalent. Samples of aggregates shall be submitted to the Employer, together with a sieve analysis showing the proportion by weight passing sieves. Should it become necessary to change the source or characteristics of the material supplied, this shall only be done after additional tests.

Concrete additives

If necessary, concrete additives of HRWRA (PCE-based Super plasticiser), and Corrosion Inhibitors (Inorganic or Organic formulation), Anti washout Admixture (Acrylic based) approved by the Employer could be used to improve consistency, workability, quality and strength of the concrete.

Waterproof concrete and mortar shall be used where necessary. Waterproofing shall be achieved by an approved brand of additive, which shall be used in accordance with the manufacturer's instructions.

Accelerating and retarding additives shall only be used in case of necessity and after obtaining the written approval of the Employer.

Super plasticizers and air entraining additives

Super plasticizers (PCE-based) and air entrainers are intended to reduce bleeding of free water at the surface. It shall only be used after the written approval of the Employer and in accordance with the manufacturer's instructions.

B9.4.6.3 Concrete mixes

The mix proportions shall be determined by proper mix design based on the requirements for strength, workability and the particular site in which the concrete shall be placed. The design of mixes shall be based on the principles of BS 5328 or equivalent (e.g. DIN 1045) and the British Building Research Station Publication “Design of normal Concrete Mixes”.ACI 211.1-91 (2009) & ACI 318-14 OR BS EN 206:2013+A1:2016.

Before concreting commences, the Contractor shall make trial mixes to determine the mix proportions required to produce the strengths specified for each class of concrete and for each degree of workability required to allow placing transporting and compacting of the concrete. Only materials which the Contractor intends to use for concreting shall be used in the trial mixes.

Test cubes from trial mixes shall be made and tested in accordance with BS1881 or equivalent (e.g. DIN 1048 Part 2).BSEN12390-3:2009

The amount of water used in the concrete shall be adjusted as required to ensure such a consistency that it can be readily transported, placed and compacted without segregation of the materials or bleeding of free water at the surface. Addition of water to compensate for stiffening of the concrete before placing shall not be permitted. Consistency of the concrete shall be checked by slump tests and shall not exceed the values given by BS-5328and BS 1881 or equivalent. ACI 211.1-91 (2009) & ACI 318-14 OR BS EN 206:2013+A1:2016

The cement and aggregate shall be thoroughly mixed in a batch-type pug mill mixer. The capacity of the mixer shall not be less than 1 (one) cubic meter. Partly set or excessively wet concrete shall not be used. No concrete shall be mixed by hand

The Contractor shall establish and maintain a field laboratory on the site and this laboratory shall be available at all times to the Employer. The laboratory shall be adequately equipped to ensure that all necessary testing work can be carried out in compliance with the standards.

B9.4.6.4 Strength of concrete

All test cubes shall be made and tested for compressive strength in accordance with BS 1881 or equivalent.
The compressive strength class of concrete for various structures shall be as follows:

Sl. No.	Description	Grade	Minimum Characteristic cylinder strength N/mm2	Minimum Characteristic cube strength N/mm2
1	Mass concrete filling	C 8/10`	8	10
2	PCC below pilecap/foundations including TG foundations, Fan foundation and all vibratory foundations (75 mm thick)	C 12/15	12	15
3	Pipe encasement	C 16/20	16	20
4	PCC below Paving incl. plinth protection (75 mm thick)	C 12/15	12	15
5	RCC in grade slabs	C 20/25	20	25
6	Boiler/ESP area paving	C 20/25	20	25
7	RCC for superstructure works in structural steel Buildings	C 30/37	30	37
8	RCC in foundation and water retaining structures including piles	C 30/37	30	37
9	RCC in superstructure works in RCC buildings	C 30/37	30	37
10	RCC for dynamic foundation including column/deck (TG,Mill, Fan and BFP)	C 30/37	30	37
11	Precast RCC trench covers	C 40/50	40	50
12	Encasement of Base plate/Steel columns/ Wall beams	C 20/25	20	25
13	Drain / cable trench	C 25/30	25	30

All concrete grade 30/37 or higher as well as special qualities, like waterproof concrete, have to be mixed in accordance with a special design concept, approved by a third party assessment.

B9

Civil Works

B9. Civil Works

This specification covers the design, manufacturing, supply, erection, commissioning and handing over of the complete civil works for the entire specified power plant. The configuration shall cater for all units, with number of units and capacities as specified in **Section B0**. If not mentioned otherwise, the given numbers of equipment is per unit.

It is to be emphasized, that this specification does not enumerate or describe all the materials and equipment to be supplied and all the services to be performed. However, the civil works shall be complete in every respect and shall ensure safe and reliable operation of the Plant. This means, all material and equipment shall be provided as required to make a complete, properly functioning installation and shall conform to the highest standards of engineering design and workmanship.

B9.1 General

This section covers the design, construction and supply of all civil works including building services and fire fighting works of the specified power plant. It is describing quality standards required functions and certain philosophies for the EPC-Contract but is in no case a detailed specification. Therefore the requirements are not limited to the descriptions hereafter, items not mentioned shall be in the same best quality range as for the entire works of the project.

The various buildings and parts of the Project must form an architectural, structural and functional unit. Special attention must be paid, in addition to basic design and construction, to the aspects which are specific to climate and local requirements.

The buildings and structures shall be designed with due respect regarding the need for inspection, maintenance, cleaning and repair and able to operate for long-time periods with a minimum of inspection, adjustment and repair.

All material shall be new and of the best quality suitable for working under the conditions, variations in temperature and load encountered in service without undue distortion or deterioration or the occurrence of undue stresses in any part, such as to affect the efficiency and reliability of the plant.

The Contractor is not allowed to use the works, materials or furniture or parts thereof for temporary purposes without the written consent of the Employer.

Layout
The limits of the power plant are depicted in **Annex C.**

The conceptual and detailed plant configuration of the various components shall be proposed by the Contractor, subject to the approval of the Employer to suit the requirements of the supplied equipment, under consideration of the existing situation, as well as the tie-in points. In doing so, adequate safety clearances, fire compartments, favorable layout of the plant components for monitoring and maintenance and any other requirements of up-to-date power plant construction shall be taken into account.

B9.2 Civil Design Criteria

B9.2.1 Codes and standards

The engineering and execution of all the civil works shall be based on the latest editions and revisions of the applicable codes and standards as listed in **Section B0**.

If any standard contains a provision, which is inconsistent with a provision in another standard, the more stringent in respect of quality shall apply.

B9.2.2 Architecture

Architectural Design and detailing Aspects of all buildings shall be rendered through professional services of an Architect of reputation having experience in similar kind of works and familiar with vernacular architecture of Bangladesh.

The overall architectural character of main plant buildings e.g. Administration Building, Auditorium, Main Gate Complex, Canteen Building and Service Building shall be architecturally treated in such a way that it presents an overall image befitting the image of the Employer as a reputed international Power Company, comparable with international buildings of repute and yet, incorporates a pleasing composition of mass and void with suitable and functionally designed projections and recesses.

All external and internal finishes shall be modern finishes as per international standards and latest construction technology. Buildings shall be designed considering the climatic condition, building orientation, landscape design, interior design, to meet the International Building Code and the vernacular architecture. The overall architectural character shall be in sympathy with the local environment and in harmony with the local culture

Requirements and international fire safety regulations and shall incorporate sustainable Building Design features like energy efficiency, solid waste management, water conservation and recycling etc. Service building, Administration Building, Auditorium and Canteen Building shall be designed as Green Buildings compliant to minimum LEEDs Gold rating.

Buildings shall be suitable for installation of Solar Photovoltaic Panels on roof tops for Renewable Energy Purpose.

All public buildings shall be furnished with reinforced concrete stairs. The minim width of the flight shall be min 1500mm, risers' 150mm and threads 300mm.

All public buildings shall be designed incorporating the provision of barrier free environment for physically disabled persons.

All buildings shall be provided with toilets and drinking water facilities as per international building code requirements.

Buildings shall be designed as Intelligent Buildings with futuristic concepts with Standardized Components and incorporating Building Information Management System (BIMS). Aesthetic Treatment shall be designed with a view to develop responsible structures, acceptable to the Community and visually pleasing for next 25 to 30 years Landscaping shall be designed to take care of rain water harvesting and ground water recharging.

Interiors of the buildings shall be designed based on functional requirements and shall interface smoothly with Mechanical & Electrical Services, so as to have an ergonomically designed and visually stimulating environment.

The Bidder shall submit a convincing architectural concept along with tendering documents, for guideline see **Annex C.**

Detailed working drawings, perspective views, walkthrough views and model (to scale) of the entire plant shall be submitted after contract award.

B9.2.3 Design loads

The following design loads shall be considered for the design of buildings and structures:

- **Dead load**
  Dead load is defined as the weight of all permanent construction including walls, foundations, floors, roofs, ceilings, partitions, stairways, and fixed service equipment and shall be calculated according to BS EN 1991-1-1 or equivalent (e.g. DIN EN 1991-1-1) and the Bangladesh National Building Code, whichever is more stringent.

  For heavy industrial work, this would include equipment, vessels, including internals, pipes, valves, and accessories, electrical and lighting conduits, switchgear, instrumentation, fireproofing, insulation, ladders, platforms, and other similar items. Equipment and piping should be considered empty of product load when calculating dead load. The gravity weight of soil overburden shall be considered as dead load.

- **Erection dead load**
  The erection dead load is the weight of the equipment at time of erection plus the weight of the footing, pedestal and overburden soil.

- **Live load**
  Live load is defined as the weight superimposed by the use and occupancy of the building or other structure, but not permanently attached to it. For industrial design, live load can be defined as the load produced by personnel, moveable equipment, tools, and other items placed on the structure, but not permanently attached to it. Design shall be done for the actual plant live loads or the live loads specified in according to BS EN 1991-1-1, (or equivalent DIN EN 1991-1-1) or the Bangladesh National Building Code, whichever is more stringent. Unless specified otherwise, or required due to erection, operation and maintenance the minimum live load values for floors and roofs given in Table below shall be considered.

The Employer's consent is required in all cases for reductions of load carrying capacities and for exceeding the permissible stresses.

Minimum requirements for live loads [kN/m^2]

	Slabs and secondary supports	Gratings [2])	Main girders	Supports, e.g. columns, walls, brackets, etc.	Foundations
1. Reinforced concrete structures					
1.1 at road level in areas used by large vehicles	15 SLW 30[3])	5	15 SLW 30[3])	10	10
In areas of major assembly work at their access roads	SLW 60[3])		SLW 60[3])		
1.2 Machinery floor for storage of heavy machine parts	30	10	20	20	20
1.3 Heavy intermediate floor slabs	10	5	10	7,5	7,5
1.4 Medium intermediate floor slabs	7,5	5	7,5	5	5
1.5 Light intermediate floor slabs	5	5	5	5	5
1.6 Roofs	1,5		1,5	1,5	0,75
2. Steel structures					
2.1 Heavy platforms	15	10	15	10	10
2.2 Medium platforms	5	5	5	5	5
2.3 Platforms and walkways in Conveyor galleries	5	5	5	5	5
2.4 Light platforms and walkways	2,5	2,5	2,5	2,5	2,5
2.4 Roofs	1,5		1,5		0,75

1) Figures in kN/m²
2) The loads shown are used for determining the load for structural analysis but not for dimensioning the gratings
3) Truck loads according to DIN 1072

Areas designated for different loadings on the same floor shall be clearly and permanently marked.

- **Crane/hoist load**
  Crane/hoist loads shall be considered as live loads. The vertical and horizontal loads from cranes/hoists shall be as per the supplier's loading data. In the absence of specific information, the following minimum horizontal loads shall be considered at the location of each wheel:

  - transverse surge = 20 % of static wheel load
  - ii) longitudinal surge = 10 % of static wheel load.

- **Product load**
  The load shall be defined as the gravity load imposed by liquid, solid, or viscous materials in vessels, tanks, equipment or piping during operation.

- **Test load**
  The test load shall be defined as the gravity load imposed by any method necessary to test vessels, tanks, cranes, equipment or piping.

- **Thermal load**
  Thermal loads shall be defined as forces caused by changes in temperature (ambient temperatures see Section B0). The primary source of thermal loads in an industrial plant is the expansion or contraction of vessels and piping. Another source of thermal loads in a structure is the expansion or contraction of the entire structure or individual structural components.

- **Truck load**
  Structures accessible to trucks shall be designed to withstand the gravity, lateral and impact effects of truck loading. Truck loading shall be SLW 60 or equivalent as per relevant standards or codes.

- **Soil load**
  Soil loads shall consist of lateral earth pressures. Active and passive coefficients for lateral pressures shall be obtained from the project soils report. The weight of soil shall be considered as dead load.

- **Hydrostatic load and buoyancy**
  Hydrostatic load is the load due to water pressure. The design of structures shall include hydrostatic loads when applicable. The buoyancy load is equal to the weight of the volume of displaced water.

- **Wind load**
  The wind load calculation for the buildings and structures shall be as per Bangladesh National Building Code -2012, Part 6, Chapter 2.4.

  Basic wind Speed, V, shall be taken as 73 m/s, Three-second gust at 10 m above ground in exposure C, having a return period of 50 years.

- **Earthquake load**
  All buildings, structures and foundations shall be designed and adopt necessary earthquake design criteria.

  The Project site is exposed to seismic conditions. The area is in Seismic Zone 1 as determined by the Bangladesh National Building Code (BNBC-2012).

  Related to Soil Type as identified to Soil Investigation Report, the effect of local soils on earthquake ground motion shall be determined.

  For site class S1 and S2, as expected for this project, site specific studies shall be carried out to determine Design acceleration response spectrum.

  Values regarding Soil Factor shall be verified during Soil Investigation.

- **Dynamic loads**
  Each structure shall be designed to withstand the effects of vibration and impact to which it may be subjected. Each structure and foundation supporting a compressor, turbine, pump or other machinery having significant dynamic unbalance shall be designed to resist the peak loads specified by the manufacturer. Vibration amplitudes of the supporting structure or foundation shall be kept within acceptable limits for dynamic forces that occur during normal machine operation. In the case of a tall and slender structure, there may be a need to investigate the dynamic effects of wind gusts. The vibration pad for absorbtion of vibration due to rotating or reciprocating machine shall be suitably designed to reach maximum thickness of material required and its complete spreading below entire foundation.

  In the dynamic analysis, the following codes are to be considered: DIN 4024, ISO 1940-1 and ISO-10816. The vibration amplitudes & velocities, if not specified by the manufacturer, shall follow ISO-10816.

- **Impact loads**
  When a structure, structural component or connection is subjected to moving or vibrating loads which do not warrant a dynamic analysis, the following impact loads shall be considered:

1. Elevator machinery:	100% of machinery weight
2. Shaft or motor driven machinery:	20% of machinery weight
3. Reciprocating machinery:	50% of machinery weight
4. Overhead travelling crane:	Crane load shall be considered as live load. When applying this load, the following impact load shall be considered as per BS 6399: Part 1 EN 1991or equivalent

- Vertical force: 25% of maximum wheel loads for cab operated crane
- 10% of maximum wheel loads for pendant operated crane.
- Lateral force: 20% of the weight of trolley and lifted load (but exclusive of other parts of the crane)
- Longitudinal force: 10% of maximum wheel loads

5. Truck loads: Impact effects of truck loading shall be considered according to BS EN 1991-1-7 6399: Part 1 or equivalent (e.g. DIN EN 1991-1-17)
6. Vertical force: 20% of lifted loads.

- **Load combinations**
  Design load combinations shall be generally in accordance with the relevant British Standard or equivalent. The load combinations shall include the erection loads and crane test loads also.

B9.2.4 Deflections

The maximum allowable deflections under the serviceability loads shall be as given below, if not other requirements due to functionality of the structures shall be followed, e.g. for transfer points and trestles of conveyor belt:

a) Structural steel

Cantilevers	L/180
Beams carrying plaster	L/360 or 20 mm, whichever is less
Other beams (except purlins and sheeting rails)	L/200
Top of columns (single floor)	H/300
Top of columns in each floor (more than one floor)	H/300
Crane gantry girders	
Vertical	L/600
Horizontal	L/500
(where L: span/H: Height)	
Purlins and sheeting rails	L/200

b) Concrete structures

L/500 or 20 mm (whichever is less)

B9.2.5 Settlements

Settlements have to be calculated according to BS EN 1997-1 or equivalent and to be monitored.

The following requirements for settlements shall be applied:

- Max. settlement 25 mm,
- Max. differential settlement 1/500 rad.

B9.2.6 Stability

All ground stability analysis should be based on data given in the soil investigation report.
Ground stability of structures has to be calculated according to BS EN 1997 -1 or equivalent.

Embankment stability analysis shall be calculated according to BS 6031 or equivalent.

Stability of masonry wall shall be checked according to BS 5628 or equivalent.

The structures shall be designed and checked using a factor of safety of 1.50 for stability against overturning and sliding under the permanent loads and 1.2 under the temporary loads.

B9.2.7 Miscellaneous metal works

Stairways
Main stairways shall be min. 1250 mm wide.
Riser max. 180, Tread min. 260, and Local stairway shall be min. 1200 wide. The number of steps between a flight shall be limited to 12.

Head clearance min. 3000 mm for air conditioned buildings, and min. 3500mm for non conditioned buildings.

The requirements of the specific local codes of procedures and the Local Authority requirements have to be respected by the Contractor.

Steel ladders other than companion way ladders
Rung: round bars of 20 to 50 mm diameter
Rise: 250 mm
Width: 400 mm

Safety cages shall be provided if height exceeds 2.5 m and the ladder design shall comply with BS 5395: Part 3.

Handrails
Handrails shall be min. 1100mm high. Design to follow BS 5395: Part 3 or equivalent.

Gratings
Gratings shall be hot-dip galvanized and comply with BS 4592: Part 1 & 2 or equivalent.

Chequered plates
Chequered plates shall be minimum 6 mm thick mild steel.

B9.2.8 Drainage systems

General
The drainage systems will consist of open reinforced concrete drains for stormwater and surface drainage and piping for other drainage systems and reinforced concrete culverts for street crossings. In general, drainage systems shall be designed in accordance with BS 6367 or equivalent, the Bangladesh National Building Code 2012 and all relevant Local Authority requirements.

The drainage shall be separated into the following systems:

- storm water and surface drainage
- sanitary sewage reticulation
- oily water drainage
- chemically polluted water drainage.

Rain run-off
Rainwater runoff shall be determined in accordance with the relevant Bangladesh Standards by considering the maximum rainfall intensity of 95 mm/hr for a one hour rainfall with 50 year return period. The maximum surface rainfall shall be considered with 349mm per day.

The water shall be collected in a storm water pond located outside the Plant. The Pond is not in scope of EPC-Contractor. In addition, retention basins for rainwater to be used for spraying the coal stockyard and landscape irrigation, could be provided on the plant area.

Sizing of ditches and pipes shall be determined by using Manning`s formula, using the following Roughness coefficient N for the various types of material:

Type	Roughness efficient N
Concrete pipe	0.014
Plastic pipe	0.013
Vitrified clay pipe	0.013
Smooth concrete channels	0.014

Gradient
Drains shall have the following minimum gradient:

- open ditch for storm water drainage l/250
- sanitary sewage drainage pipes l/150
- oily water drain pipes l/200
- chemically polluted water drains/pipes l/250
- other drainage systems l/400.

However, the sectional shapes have to be determined by the water carrying requirements and must have the most favorable hydraulic qualities so as to remove the drain water in a proper manner without settlements.

Velocity of flow
Minimum velocity 0.80 m/s (to maintain self cleaning)

B9.2.9 Road works

Design of the road and paving courses shall be approved standards and also be based on the results of the geotechnical investigation.

Plant access roadways shall be designed to accommodate AASHTO HS-20 semi-truck loading with impact added. Parking areas for cars and light trucks shall be designed for AASHTO H-10 loading. The roads shall be designed to sustain the maximum loads from the vehicles likely to use them during construction and throughout the life of the facility including articulated vehicles and transporters used for the removal and replacement of major items of equipment during maintenance.

The following minimum requirements shall be met:

- access road (Double Lane) 12m with solidly compacted shoulders of 2.25 m at each side all along
- single lane 3.75 m with solidly compacted shoulders of 1.50 m at each side all along
- double lane 12m with solidly compacted shoulders of 2.25 m at each side all along
- patrol roads 3.75 m with solidly compacted shoulders of 1.50 m at one side all along
- minimum kerb radius at junctions to be 10 m and 4 m at secondary roads
- cross-falls to be 2.5% from one side to the other
- maximum longitudinal slope shall be 1:25.
- The roads and paving shall be laid to falls leading the storm water to gullies and to the discharge system and shall also comply with the Local Authority requirements.

The following road/pavement types shall be adopted:

Type I	Concrete wearing surface
Type II	Interlocking concrete blocks within the Plant area, suitable for heavy traffic.
Type III	Bituminous road (access road)

Road construction shall consider all required measures to avoid different settlements.

B9.3 Scope of Supplies and Services

This section sets out the scope of civil works and installations covered by this specification as well as the requested supplies and services, but without excluding other necessary components and services not mentioned.

B9.3.1 General

The Contractor shall supply and erect all buildings, structures and systems which are necessary to support, to protect and to provide the required environmental conditions for the entire plant including roads, security fencing and any other measures needed for safe and practicable operation of the plant. Social and sanitary rooms in the appropriate size and arrangement for the entire staff needed to operate the plant shall be included.

The following types of works have to be considered, but without excluding other necessary works and services not mentioned:

- all necessary surveys
- all necessary soil investigation required in addition to the investigation works carried out prior to the EPC Contract
- all other investigations and studies necessary for the design and execution of civil works (drainage system, flooding possibility of the site, safety measures, etc.)
- site organization works for the entire project execution phase including but not limited to:
  - arrangements of all temporary and permanent surfaces allocated for the new plant
  - temporary buildings for offices, stores, workshops, sanitary rooms, canteen and kitchen, first aid station, etc. offices for the staff of the Employer, creche, safety centre & field quality assurance lab, prayer room, visitor habitations
  - open area for future maintenance works
  - security installation on the site, including temporary fencing; temporary bridges, etc.
  - access roads and outdoor storage facilities
  - temporary water
  - temporary electricity supply

  - temporary storm water drainage and sewage system
  - final cleaning of the temporary and permanent plant sites to the full satisfaction of the Employer
  - housekeeping and cleaning of the sites during construction and equipment erection/testing works
  - temporary fire fighting facilities for the entire execution phase of the project
  - provision and maintenance of lay-down area including access roads
- site fill on the location of all required buildings and areas
- structural and civil engineering design of all buildings, structures, foundations including the complete structural and dynamical analysis, design, execution and workshop drawing
- Third Party Verification of structural documents, including the complete structural and dynamical analysis, design, execution and workshop drawings
- removal of all debris, underground obstacles (if any) and surplus materials to approved dumping locations
- earthworks, permanent drainage works, soil exchange (if needed), refilling works on the plant site and on the additional areas allocated for temporary works
- all ancillary works and installations necessary for the execution of civil works, such as but not limited to: sheet piling, dewatering, fencing, signs, scaffoldings, etc.
- permanent roads, paved areas, footpaths, etc. on the plant site
- piling works
- execution of complete building, foundations and structures necessary for the installation of the indoor and outdoor equipment of the plant
- execution of all finishing and indoor installation works (such as doors, windows, wall cladding and rooting) painting and coating works, sanitaries, plumbing, ventilation-and air conditioning works, fire fighting, sanitary works, sewage, electrical lighting-and lightning, earthing, etc.
- supply of all necessary furniture, housekeeping small equipment (kitchen, refrigerators, exhaust installations, etc.), laboratory equipment, etc.
- Every working place shall be equipped with a computer, connected to a local network with connection to the plant computer network.
- execution of all necessary outdoor works for water supply, sewage and drainage works, fire fighting, earthing etc.
- all necessary crane and hoist girders, pipe and cable bridges and supports according to the requirements of the electrical and mechanical installations.

B9.3.2 Buildings and structures

B9.3.2.1 Steam turbine building

The steam turbine building shall be sized to accommodate the steam turbine generator(s) together with all associated facilities and ancillary plant installations.

Measures shall be taken to avoid the transmission of vibrations due to equipment and rotating machines (mainly steam turbines, feedwater pumps) to the building structure. These measures shall mainly be separate reinforced concrete foundation to be insulated from the remainder of the structure either by shock absorbing joints or vibration control systems typically consisting of spring elements and viscodampers to prevent the transmission of vibrations.

The building shall be served by overhead traveling crane(s). Capacity and Number of cranes as per requirements of heaviest lift.

At ground floor level access ways for traffic with heavy trucks shall be provided.

At all levels toilets for operation and maintenance staff shall be provided.

Within the Steam Turbine Building the main electrical components of the project shall be accommodated:

- unit switchgear and I&C
- auxiliary switchgear
- central control room.

Next to the Central Control Room additionally to the required technical rooms such as switchgear room, relay rooms for electronic panels battery rooms, relay rooms, computer room, UPS and DC equipment room, DCS engineering rooms, the following rooms have to be provided:

- 1 (one) office
- tea kitchen
- archive/storage room
- engineering diagnostic room
- toilets for operators (male and female).

Description of building:

- structure: steel structure
- floors: Groundfloor with intermediary platforms/levels

- flooring: reinforced concrete with suitable hardener and special oil resistant coating; TG hall granite or heavy duty vitrified tile
- foundations: according to the soil investigation report and Special Technical Requirements of Foundations; special attention has to be paid for the safe transmission of dynamic loads and vibrations to the underground
- external wall: 230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish up to 3.0 m or autoclave aerated concrete blocks from floor level and double skin metal cladding above.
  For architectonical appearance, inside in addition single skin metal cladding from operating floor up to EOT Crane girder
- internal wall: 230 mm thick brick walls or autoclave aerated concrete blocks or autoclave aerated concrete blocks with plaster finish
- roof: double skin metal roofing or as applicable
- doors: self closing sandwich steel doors with insulation
- roller shutters as required
- windows: double glazed aluminum
- entrances: electrical driven roller shutters
- ventilation: natural/mechanical
- louvers: aluminum alloy
- lifting equipment: travelling crane (see mechanical section).

The battery room shall be equipped with:

- cleaning sink minimum size 580 x 450 mm
- emergency shower with eye wash
- acid resistant floor and drain
- sink outlets and floor drains shall be chemical resistant and piped into the chemical drain system.

False floors and suspended ceilings wherever required.

Electrical hoist designed for the transport of the electrical and control panels.

Finishes: The control room shall be of noble appearance. Flooring of the control room shall consider electrostatic problems (suitable earthing mats where required). Powder coated metal false ceiling with noise reduction factor (0.5) shall be implanted. Airlocks of glass or at least with visions shall be provided. The lighting shall be adequate and in accordance with the arrangement of the individual working places.

The design of finishing works will comply with the requirements of the code of procedures with regard to the mirroring effects, lighting of working places, shadowing etc.

The minimum head clearance for the control room shall be 3650 mm. The front towards the operation floor shall be fully glazed.

Turbine Generator foundation shall be finished with chemical resistant, anti-slip, abrasion resistant rubber flooring. Areas considered for maintenance purpose shall be marked permanently including the allowable bearing capacity as per structural calculation. Bearing Capacity shall consider maximum loads as per Operation and Maintenance Concept.

B9.3.2.2 Steam generator and air heater building

The Steam Generator and Air Heater Building may be of open or semi-open installation.

Description of building:

- foundation: according to the soil investigation report and Special Technical Requirements of Foundations
- floors: as required for proper O&M access
- flooring: reinforced concrete in ground floor, metal grating in other floors
- structure: steel structure
- walls: double skin metal cladding (if necessary, else single skin metal cladding)
- roof: double skin metal roofing (if necessary, else single-skin metal casing)
- lift: 1 passenger & goods lift with a minimum capacity of 4,000 kg to the highest accessible platform
- hoist: outdoor hoist arrangement at one side for long items.

B9.3.2.3 Central workshop

General
The area for the workshop shall be about (but not limited to) 3,000 m^2 overall, designed for all maintenance facilities with related services e.g. offices, locker and sanitary rooms. The clear height shall be minimum 6m.

The workshops will allow all required works for daily maintenance and repair, which can be executed at site. The building will have enough capacity for the personnel of the plant which usually is employed in the workshops and for external personnel in case of major inspections or repairs.

Partitioned areas with suitable work benches, equipment and racking shall be provided for:

- mechanical workshops (welding, machine, overhaul)
- electrical workshops
- I & C workshops
- civil workshops (carpenters, etc.)
- air conditioned plant room
- tool rooms
- 1 meeting room 35 m² each,
- 5 offices for technical and admin. personnel (15 m² each)
- Sanitary equipment as below.
- locker rooms
- kitchen.

The complete workshop areas shall be designed for the use of fork lifters with a minimum lifting capacity big enough for the heaviest part to be handled.

Overhead travelling cranes shall be provided in the area of the workshops.

Description of building:

• structure:	steel structure
• floors:	one
• flooring:	reinforced concrete with hard screed topping carborundum type with oil resistant epoxy coating; WCs tiled; offices with PVC flooring,
• foundations:	according to the soil investigation report and Special Technical Requirements of Foundations
• external wall:	double skin metal cladding
• internal wall:	230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
• roof:	double skin metal sheet roof
• doors:	
• main entrance:	folding doors with motor drive
• external:	self closing sandwich steel doors with insulation
• internal:	wooden doors with steel frames
• windows:	double glazed aluminum
• air conditioning:	centralized air conditioning,
• ventilation:	natural/mechanical
• sanitary equipment in the office area:	• showers in changing room • eastern WC with cleaning brush in toilet • western WC with cleaning brush in toilet • bowl urinal in male toilet • wash basins in toilet

Special design criteria
The minimum load bearing capacity of ceilings and floors shall be as defined in BS 6399: Part 1 or equivalent and in Section "General technical requirements" of this Specification.

The live loads for ground floor shall be min. 50 kN/m^2.

B9.3.2.4 Dozer maintenance shed

General
The area for the Dozer Maintenance Shed shall be about (but not limited to) 500 m^2 overall, designed for all routine maintenance on mobile equipment with related services e.g. washing area, storage area locker and sanitary rooms.

The workshops will allow all required works for daily maintenance and repair, which can be executed at site. The building will have enough capacity for the personnel of the plant which usually is employed in the workshops and for external personnel in case of major inspections or repairs.

Description of building:

- structure: steel structure
- floors: one
- flooring: reinforced concrete with hard screed topping carborundum type with oil resistant epoxy coating; WCs tiled; offices with vitrified tile flooring
- foundations: according to the soil investigation report and Special Technical Requirements of Foundations
- external wall: double skin metal cladding
- internal wall: 230 mm thick brick walls or autoclave aerated concrete blocks or autoclave aerated concrete blocks with plaster finish
- roof: double skin metal sheet roof
- doors:
  - main entrance: folding doors with motor drive
  - external: self closing sandwich steel doors with insulation
  - internal: wooden doors with steel frames
- windows: double glazed aluminum
- air conditioning: decentralized air conditioning,
- ventilation: natural/mechanical
- sanitary:
  - showers in changing room
  - eastern WC with cleaning brush in toilet
  - western WC with cleaning brush in toilet
  - bowl urinal in male toilet
  - wash basins in toilet

Special design criteria
The minimum load bearing capacity of ceilings and floors shall be as defined in BS 6399: Part 1 or equivalent and in Section "General technical requirements" of this Specification.

The live loads for ground floor shall be min. 30 kN/m^2.

B9.3.2.5 Operation and maintenance storage building

General
The area for the Operation and Maintenance storage shall be about (but not limited to) 3000 m^2 overall, designed for required storage with related services e.g. locker and sanitary rooms.

Partitioned areas with suitable, equipment and racking shall be provided for:

- small spare parts store
- spare parts pallet store
- large spare parts store
- 2 (two) offices for store keeper (15 m² each)
- sanitary equipment as below
- locker rooms
- tea kitchen.

The dimensions of the building shall be adequate to accommodate all different types of racks for goods and spare parts necessary for the operation of the Plant as specified in **Section B12**.

Heavy material store shall be single storey building, free of columns for easy movements of material. Light material store shall be double storey building. Goods lift with a capacity of 1,000 kg shall be implemented.

A part of light material store shall have facility for storing electronic equipment/instruments.

Lifting devices shall be provided as required for heaviest part.

Description of building:

• structure:	reinforced concrete,
• floors:	one/two floors
• flooring:	reinforced concrete with hard screed topping carborundum type with oil resistant epoxy coating; WCs tiled; offices with PVC flooring
• foundations:	according to the soil investigation report and Special Technical Requirements of Foundations
• external wall:	230 mm thick brick walls or autoclave aerated concrete blocks with metal cladding

- internal wall: 230 mm thick brick walls or autoclave aerated concrete blocks or autoclave aerated concrete blocks with plaster finish
- roof: double skin metal sheet roof
- doors:
- main entrance: folding doors with motor drive
  - external: self closing sandwich steel doors with insulation
  - internal: wooden doors with steel frames
- windows: double glazed aluminum
- air conditioning: centralized air conditioning,
- ventilation: natural/mechanical
- sanitary:
  - showers in changing room
  - eastern WC with cleaning brush in toilet
  - western WC with cleaning brush in toilet
  - bowl urinal in male toilet
  - wash basins in toilet

Special design criteria
The minimum load bearing capacity of ceilings and floors shall be as defined in BS 6399: Part 1 or equivalent and in Section "General technical requirements" of this Specification.

The heavy loads of spare parts shall be considered for the calculation of the pallet racks and for the floor slab.

B9.3.2.6 Administration building

General
The area for the Administration Building shall be about (but not limited to) 5,000 m² overall, designed as 3 to 4 storey building for administration purpose with related services e.g. locker and sanitary rooms.

2 panoramic elevators shall be provided in the building.

The top floor of the building shall be reserved for provision of IT and satellite communication services.

The building shall house:

- a representative entrance and waiting hall and an information desk
- head of plant office (50 m²) incl. restroom and 2 assistant offices (20 m²)
- HOP Conference Hall (50m²)
- 6 Head of Department offices (25 m²) with each 1 assistant offices (10 m²)
- 11 Middle level executive offices (10 m²)
- 84 Workstations/Halls
- meeting rooms at each floor (30 m² each)
- archive (30m²)

- electrical rooms, as required
- library (50 m²)
- print room (20 m²)
- sanitary facilities
- prayer room (30 m²)
- canteen (150 m²)
- recreation room for the number personnel mentioned here above,
- first aid center with medical support facilities (2 rooms 30 m² each).
- gym (35 m²)
- model & exhibition room (70 m²).

Description of building:

• structure:	reinforced concrete
• floors:	3 to 4 floors
• flooring:	see below
• foundations:	according to the soil investigation report and Special Technical Requirements of Foundations
• external wall:	230 mm thick brick wall or autoclave aerated concrete blocks or autoclave aerated concrete blocks with aluminum composite panel cladding
• internal wall:	230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
• access:	internal stairway
• doors:	
• external:	representative double plain door
• internal:	aluminum glazed doors and wooden doors with steel frames
• windows:	double glazed aluminum with internal sun shades
• air conditioning:	centralized air conditioning
• ventilation:	natural/mechanical
• sanitary equipment in the office area:	• showers in changing room • eastern WC with cleaning brush in toilet • western WC with cleaning brush in toilet • bowl urinal in male toilet • wash basins in toilet
• finishes:	For this building prestigious finishes shall be provided. The offices shall have vitrified tile flooring; in the manager`s office carpet flooring, fabric wall coverings, and decorative suspended ceilings with lighting fittings embedded. Floor and walls of the kitchen future and recreation room shall be fully tiled. Entrance hall and stairs with polished granite stone flooring. The shower cabins to have partition walls with doors.

B9.3.2.7 Service building near turbine hall

General
The area for the Administration Building shall be about (but not limited to) 5,500 m² overall, designed as 3 to 4 storey building for administration purpose with related services e.g. locker and sanitary rooms.

2 lifts with 13persons capacity shall be implemented.

A direct connection from Service Building to Turbine Hall shall be provided at Turbine Floor Level.

The building shall house:

- head of O&M (35 m²) incl. restroom and assistant offices (12 m²)
- HOP Conference Hall (50 m²)
- 8 Head of Department offices (25 m²)
- 31 Middle level executive offices (10 m²)
- 109 Workstations/Halls
- meeting rooms at each floor (30 m² each)
- archive (30 m²)
- electrical rooms, as required
- library (50 m²)
- print Room (20 m²)
- drawing hall (30 m²)
- prayer room (30 m²)
- canteen (75 m²)
- recreation room for the number personnel mentioned here
- first aid center with medical support facilities (2 rooms 30 m² each)
- gym (35 m²)
- locker and dressing rooms with showers and toilet rooms for the following personnel (Percentage ladies/men 25%/75%):
  - own personnel: 205
  - foreign personnel: 25
- electrical Laboratory (60 m²)
- C&I Laboratory - pneumatic (40 m²)
- C&I Laboratory - instrument(40 m²)
- 5 Department stores (60 m²).

Description of building:

- structure: reinforced concrete
- floors: 3 - 4 floors
- flooring: see below
- foundations: according to the soil investigation report and Special Technical Requirements of Foundations

- external wall: 230 mm thick brick wall or autoclave aerated concrete blocks with aluminum composite panel cladding
- internal wall: 230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
- access: internal stairway
- doors:
  - external: representative double plain door
  - internal: aluminum glazed doors/wooden doors with steel frames
- windows: double glazed aluminum with internal sun shades
- air conditioning: centralized air conditioning
- ventilation: natural/mechanical,
- sanitary equipment:
  - showers in changing room
  - eastern WC with cleaning brush in toilet
  - western WC with cleaning brush in toilet
  - bowl urinal in male toilet
  - wash basins in toilet
- finishes: The offices shall have vitrified tile flooring covering; in the manager's office carpet flooring, fabric wall coverings, and suspended ceilings with lighting fittings embedded. Floor and walls of the kitchen future and recreation room shall be fully tiled. Entrance hall and stairs with natural stone or ceramic tiling. The shower cabins to have partition walls with doors.

B9.3.2.8 Local service buildings including control room

Service Buildings including Control room shall be provided at the following locations:

- near coal handling unit
- near ash handling unit/jetty
- near FGD/ESP
- near Oil handling plant
- near intake structure
- near water treatment plants
- near cooling tower.

The buildings shall house:

- control room as per functional requirement 2 offices for technical personnel (15 m² each)
- electrical rooms
- locker and dressing rooms with showers and toilet rooms for 10 workers. (Percentage ladies/men 25%/75%).

Description of building:

- structure: reinforced concrete
- floors: one floor
- flooring: see below
- foundations: according to the soil investigation report and Special Technical Requirements of Foundations
- external wall: 230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
- internal wall: 230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
- doors:
  - external: self closing sandwich steel doors with insulation
  - internal: wooden doors with steel frames
- windows: double glazed aluminum with internal sun shades
- air conditioning: centralized air conditioning
- ventilation: natural/mechanical
- sanitary equipment in the social area:
  - showers in changing rooms
  - eastern WC with cleaning brush in toilets
  - western WC with cleaning brush in toilets
  - bowl urinal in male toilets
  - wash basins in toilets
- finishes: The offices shall have vitrified tiling covering; fabric wall coverings, and decorative suspended ceilings with lighting fittings embedded. Floor and walls of the kitchen future and recreation room shall be fully tiled. The shower cabins to have partition walls with doors.

B9.3.2.9 Canteen

The central canteen shall be a building for workers and staff members shall be located suitably in the plant with an area about (but not limited to) 1000 m² overall. The building shall house the restaurant with all kitchen facilities and related services e.g. locker and sanitary rooms.

This building shall be a one storey building with attractive appearance. It consists of a reinforced concrete structure with concrete block walls, reinforced concrete floors and roof.

The following rooms shall be accommodated in this building:

- dining hall with partition for senior executives and others (250 persons in total at a time)
- kitchen approx. 100 m²
- wardrobe
- store
- cooling storage

- locker rooms
- sanitary rooms (toilets, showers)
- air conditioning room
- entrance
- electrical rooms.

Description of building:

• structure:	reinforced concrete
• floors:	one floor
• flooring:	see below
• foundations:	according to the soil investigation report and Special Technical Requirements of Foundations
• external wall:	230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
• internal wall:	230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
• doors:	
• external:	representative double plain door
• internal:	aluminum glazed doors/wooden doors with steel frames
• windows:	double glazed aluminum with internal sun shades
• air conditioning:	centralized air conditioning
• ventilation:	natural/mechanical
• waste water	grease trap
• sanitary equipment in the social area:	• showers in changing rooms • eastern WC with cleaning brush in toilets • western WC with cleaning brush in toilets • bowl urinal in male toilets • wash basins in toilets
• finishes:	The floor finishes shall be cement screed with different top finishes as vitrified tiling (60 cm x 60 cm) with skirting for dining and wardrobe and glazed non-slip vitrified tiles (60 cm x 60 cm) for kitchen and store. Glazed non-slip ceramic tiles (20 cm x 20 cm) for sanitary areas. Entrance with natural stone with skirting.

B9.3.2.10 Auditorium

The area for the Auditorium shall be about (but not limited to) 1,000 m^2 overall, designed for a seating capacity of minimum 250 persons and related services e.g. sanitary rooms.

This building shall be a one storey building with attractive appearance. It consists of a reinforced concrete structure with concrete block walls, reinforced concrete floors and roof.

The following rooms shall be accommodated in this building:

- entrance hall with exhibition area
- information desk
- auditorium (clear headroom of min. 4.00 - 8.00 m, variable) incl. stage
- tea kitchen
- sanitary rooms (toilets)
- air conditioning room, as required
- electrical rooms, as required.

Description of building:

• structure:	reinforced concrete
• floors:	one floor
• flooring:	see below
• foundations:	according to the soil investigation report and Special Technical Requirements of Foundations
• external wall:	230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
• internal wall:	230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
• doors:	
• external:	representative double plain door
• internal:	aluminum glazed doors/wooden doors with steel frames
• windows:	double glazed aluminum with internal sun shades
• air conditioning:	centralized air conditioning
• ventilation:	natural/mechanical
• sanitary equipment in the social area:	• eastern WC with cleaning brush • western WC with cleaning • bowl urinal in male toilet • wash basins
• finishes:	For this building prestigious finishes shall be provided. The floor finishes shall be polished granite stone flooring in entrance hall and exhibition area, non-slip fully vitrified ceramic tiles (20 cm x 20 cm) for toilet, tea kitchen. Auditorium with carpet first quality, false ceiling and wall paneling.

B9.3.2.11 Water and waste water treatment buildings

The buildings accommodate the water and waste water treatment facilities with a laboratory and sanitary facilities.

Description of building:

- structure: steel structure
- floors: one

- flooring: reinforced, water tight concrete, with acid-resistant coating or tiling, as applicable
- foundations: according to the soil investigation report and Special Technical Requirements of Foundations
- external wall: double skin metal cladding
- internal wall: 230 mm thick brick walls or autoclave aerated concrete blocks or autoclave aerated concrete blocks with plaster finish
- roof: double skin metal sheet roof
- doors:
  - external: self closing sandwich steel doors with insulation
  - internal: wooden doors with steel frames
- windows: double glazed aluminum
- air conditioning: decentralized air conditioning,
- ventilation: mechanical

Laboratory with suspended ceiling tiled walls and floor. Laboratory has to be air conditioned and provided with fume extraction hood cabinet

Chemical unloading station (only slab and roof)

- structure: reinforced concrete
- floors: one
- flooring: reinforced, water tight concrete as per applicable codes and standards, with acid-resistant coating or tiling, as applicable
- foundations: according to the soil investigation report and Special Technical Requirements of Foundations
- external wall: none, only reinforced concrete columns
- roof: reinforced concrete

Ring foundations for tanks shall be provided.

Special requirements for R/O building/room regarding HVAC shall be considered as per table below.

Pits, tanks and basins will not require covering.

All wet areas (indoor and outdoor) and acid-alkali prone areas shall be provided with chemical-resistant catchments pits systems connected to the waste water tanks of the process waste water system. Acid resistant coating or tiling shall be provided in the catchments zones, subject to the approval of the Employer.

All water retaining structures shall be constructed as water tight concrete as per applicable codes and standards.

B9.3.2.12 Fire station

This building accommodates the equipment for fire fighting described in the mechanical section.

In addition office, small duty room and maintenance room with window units shall be provided.

Space for fire engine truck and other equipment, such as trailer etc. as required, shall be provided.

Building description:

- structure: reinforced concrete
- floors: one floor
- flooring: reinforced concrete with hard screed topping carborundum type with oil resistant epoxy coating;
- foundations: according to the soil investigation report and Special Technical Requirements of Foundations
- external wall: 230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
- internal wall: 230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
- doors:
  - main entrance: motor driven folding door
  - external: self closing sandwich steel doors with insulation
  - internal: double plain steel door
- windows: double glazed aluminum with internal sun shades
- air conditioning: centralized air conditioning
- ventilation: mechanical/louvers

Next to the fire station a drill tower shall be provided.

B9.3.2.13 Pump houses

The structures of the following pump houses are included under this item:

- fire water pump house
- Fire water booster pump house
- Foam pump house
- portable water pump house
- ash water recirculation pump house
- HCSD pump house
- service water pump house
- Fuel Oil pressurizing pump house
- Fuel Oil unloading pump house
- other specified pump houses not included above
- concrete structure with fill-in blockwork and concrete roof.

Alternatively a structural steel structure, with metal cladding and roofing can be provided.

The building is divided in sections including a local switchgear room, if required.

Pump Houses shall be provided with an overhead crane with the capacity of the heaviest lift.

All requirements to enable Operation and Maintenance shall be considered. Adjacent to pump houses maintenance bay shall be provided.

B9.3.2.14 Chlorination

The chlorination buildings accommodate the chlorination installation for the production of the hypochlorite solution.

Chlorination facilities shall be erected at the plant area and near the Intake structure, if applicable.

Building description:

- structure: reinforced concrete
- floors: one floor
- flooring: reinforced concrete, with acid-resistant coating where required;
- foundations: according to the soil investigation report and Special Technical Requirements of Foundations
- external wall: 230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
- internal wall: 230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
- doors:
  - external: double plain steel doors
  - internal: double plain steel door
- windows: double glazed aluminum
- air conditioning: decentralized air conditioning
- ventilation: mechanical

B9.3.2.15 H2 generation plant building

The H2 Generation Plant building shall accommodate the equipment for the production H2, as described in **Section B12**.

Building description:

- structure: reinforced concrete

- floors: one floor
- flooring: reinforced concrete, with acid-resistant coating where required
- foundations: according to the soil investigation report and Special Technical Requirements of Foundations
- external wall: 230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
- internal wall: 230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
- doors:
  - external: double plain steel doors
  - internal: double plain steel door
- windows: double glazed aluminum
- air conditioning: decentralized air conditioning
- ventilation: mechanical

B9.3.2.16 Compressed air building

The building shall accommodate the equipment as described in **Section B12**.

Building description

- structure: light-weight steel structure
- floors: one
- flooring: reinforced concrete, with acid-resistant coating where required
- external walls/roofs: double skin metal sheet cladding/roofing
- ground floor: reinforced concrete with acid resistant finishing
- doors: double plain steel doors
- windows: double glazed aluminum
- ventilation: mechanical
- air conditioning: decentralized air conditioning.

B9.3.2.17 FGD related building and structures

FGD absorber
According to **Section B3** the absorber shall be made of steel with respective lining. All necessary foundations resting on piles shall be provided as per structural analysis.

The Contractor shall provide a structural steel staircase with an elevator to reach all relevant platforms of the absorber.

FGD pump and blower building
The FGD pumps and blowers shall be housed in a separate building consisting of structural steel with insulated corrugated metal cladding and insulated and water tight roofing.

The various levels shall be created by reinforced concrete slabs with screed of industrial type and suitable epoxy coating.

Limestone silo and unloading facilities
The intermediate limestone silo shall be made of reinforced concrete.

Beneath the silo the crusher and milling systems and the limestone slurry preparation system shall be installed. The area below the silo shall be housed inside a structural steel building with insulated trapezoidal cladding.

The limestone silo shall be constructed on the jetty.

The unloading for the vessels shall be via coal conveying system to limestone storage.

The Contractor shall provide all necessary foundations and related civil works for the lime stone system.

Hydro cyclone and limestone slurry building
This building shall house the hydro cyclone station and the limestone slurry tanks.

The building shall be of a steel structure with insulated metal cladding.
A staircase shall be provided to reach all necessary platforms.

The Contractor shall provide all foundations and related civil works for the building and necessary mechanical and electrical installations.

Gypsum silo
The gypsum will be stored in an intermediate gypsum silo next to the plant, and transported via pipe conveyer to gypsum silo next to jetty.

The gypsum silo shall be a reinforced concrete silo on columns which are arranged such that loading of trucks and ships is possible. The silo shall be provided with all foundations and other structural elements needed for the mechanical installations. The Silo shall be located at the jetty.

The gypsum silo shall be equipped with an elevator of industrial type with a capacity sufficient for all operation and maintenance cases, leading up to the various platforms required for service and up to the top level of the gypsum store.

The gypsum not meeting the requirements shall be stored in an open storage area surrounded by a reinforced concrete wall which is protected by a steel liner in the lower portion against damage by front wheel loaders.

Emergency drain tank
The emergency drain tank shall consist of an enclosed steel structure on foundations according to the structural analysis.

B9.3.2.18 Stack

One chimney with one outer structure (outer shell) of reinforced concrete each designed to be free standing against static and dynamic wind loads for two internal separate flue gas ducts shall be provided, including all necessary foundations, coatings, etc..

The height of the chimneys shall depend on the air dispersion study, which shall be prepared by the Contractor, but shall be minimum 275 m.

The diameter of the chimneys depends on the diameters of the inserted flue gas ducts. In all levels a clear space of at least 1 m between the chimney structure and the flue gas ducts shall be maintained. In this area the lift and staircase shall be integrated.

The design of chimney stack shall be checked & verified by wind tunnel test at a reputed institute.

Reinforced concrete designed in accordance with the recommendations of ACI-307 and CICIND (International Committee on Industrial Chimneys). Standard and strong anti-corrosion protection, UV-resistant and acid and heat resistant paint shall be applied on the outside. Color and selection of bands shall be to the requirements of the relevant authority.

Roof area shall be tiled with acid resistant tiling.

The structure shall be sturdy and well founded to enable it to support both the expected wind and earthquake loads as well as the temperature stresses. Preferably the structural analysis of the system shall be done in one system including outer shell, foundation plate and piles.

All concrete parts below ground level shall be protected outside by a waterproof membrane and protection board as specified.

The lift shall be of industrial type, installed at the inside of the chimney's concrete surface with a nominal carrying capacity of 500 kg. It shall travel from ground floor to each platform for service and maintenance up to the roof.

Inserts shall be provided as required for monitoring the stack gases.

Flue gas monitoring platforms, intermediate duct supporting provisions, landings and maintenance platforms with access shall be provided.

Galvanized steel ladder located in the space between the concrete shel1 and ducts shall be provided from the ground level to the top of the stack. Galvanized steel floor grating landings shall be provided, as required for Maintenance and operation, including a 360 degree landing at the test ports and at aircraft warning lights levels.

Additional external platform at aircraft warning lights levels shall be provided, if required due to operation and maintenance works.

Installations necessary for rescuing persons have to be assured in the whole area of the chimney.

The flue gas pipe can be either be of GRP or alternatively of carbon steel coated externally and with a suitable internal liner (Pennguard System or similar) or Stainless Steel.

In case Bidder will provide GRP flue gas liners, Codes and Standards as mentioned in section B5 shall be followed.

The design shall consider all operating conditions like Design Pressure, Design Temperature, etc.

Liners shall be designed to with stand all internal and external loads.

In case Bidder will provide Flue liner material Austenitic stainless steel of designation UNS 31727, it shall be conforming to ASTM A240/A240M.

Flue gas liners shall be adequately insulated as per requirements **Section B0**.

Expansion joints shall be implemented as per requirement. Construction of joints shall follow international codes and standards.

A stainless steel stack cap and galvanized louvers, doors, and other openings with miscellaneous steel frames shall be provided.

Drainage system for condensates (inside the flues) and rainwater (from the roof top) shall be provided with appropriate treatment.

Aircraft warning lights, earthing, lightning protection, lighting and other electrical installations for maintenance shall be installed. The local regulations and ICAO regulations shall be followed.

Building description

- structure: reinforced concrete structure

• surfaces:	coating and protection painting inside and outside
• foundation:	a reinforced concrete ring beam or block/slab on piles as stipulated by the results of the soil investigations
• floors:	galvanized steel gratings on structural steel, all galvanized and painted
• stairs:	open grid steel flooring mounted on galvanized steel structures inside the concrete structure
• railing:	Along the steel gratings, around the various openings and for the stairs and ladders tubular steel railings of galvanized and painted tubular steel shall be provided.
• access and escape routes:	Access shall be made by galvanized steel ladders with safety cages. For all escape routes the local regulations have to be followed. All ladders and stairs shall be secured by platforms and railings.

B9.3.2.19 Laboratories

Laboratories shall be incorporated in the main buildings as required, such as water treatment building etc. The laboratory rooms shall have suspended ceilings and tiled floors and shall be air conditioned. It shall be furnished with work benches, chemical fumes exhausting systems, acid proof sinks linked with acid collecting tanks- respective connected to neutralization systems and shall have different rooms for different tasks e.g. for tests related to the water and waste water treatment or test related to coal or oil, etc. Secure storage rooms for chemicals and emergency shower facilities are required.

B9.3.2.20 Oil unloading station and forwarding pump house

The fuel unloading station shall accommodate the following: It shall be possible to unload several road tankers at the same time. Final requirements are to be determined by Contractor according **Section B4** and **Section B0**. The unloading pumps shall be installed 45 cm above the road level.

The station shall consist of a reinforced concrete slab (treated against oil leakages) and sunshade of about 6 m height. The sunshade shall be of steel covered with trapezoidal steel sheets. The floor scale shall be provided with retaining and discharge facilities for oil leakages.

The pump house shall be of solid reinforced concrete structure towards the tank yard and lightweight steel structure in the opposite site. The requirements of the valid rules and standards for the design and construction of fuel unloading stations especially with regard to the fuel oil catchment pit and fire protection have to be strictly respected by the Contractor.

B9.3.2.21 400/230 KV GIS control building

The sizes of the control building have to be determined according to the requirements for the electrical and instrumentation/control equipment.

The following rooms shall be accommodated in this building:

- battery room
- offices
- store
- sanitary tea kitchen
- AC/DC-Distribution rooms
- control room
- telecommunication, metering and SCADA rooms
- medium voltage rooms

Description of the building

- structure: reinforced concrete
- floors: one
- flooring: reinforced concrete, vitrified tile flooring
- foundations: according to the soil investigation report and Special Technical Requirements of Foundations
- external wall: 230 mm thick brick walls with metal cladding
- internal wall: 230 mm thick brick walls with plaster finish
- roof: insulated-watertight RC roof
- doors:
  - external: self closing sandwich steel doors with insulation
  - internal: aluminum glazed doors/wooden doors with steel frames
- windows: double glazed aluminum
- finishes: The control room shall be of noble appearance and receive e.g. sound absorbing wall cladding and suspended ceiling.
- air conditioning: centralized air conditioning
- ventilation: natural/mechanical
- sanitary-equipment: toilets for ladies and gents consisting of
  - western type WC with cleaning brush
  - eastern type WC with cleaning brush
  - bowl urinal
  - wash basin
  - hot air hand drier.

The battery room shall be equipped with:

- cleaning sink minimum size 580 x 450 mm
- emergency shower with eye wash
- acid resistant floor and drain

- Sink outlets and floor drains shall be chemical resistant and piped into the chemical drain system.

False floors and suspended ceilings wherever required. The control room(s) shall have windows with sunshades and may be divided with a glass wall into two sections. Flooring of the control room to consider electrostatic problems (to provide suitable earthing mats where required) and the ceiling to be sound absorbing. Airlocks of glass or at least with visions shall be provided.

Electrical hoist designed for the transport of the electrical and control panels.

Finishes: the control room shall be of noble appearance and receive e.g. sound absorbing metal wall cladding. The lighting shall be adequate and in accordance with the arrangement of the individual working places. Windows to be double glazed aluminum PVDF coated.

The design of finishing works will comply with the requirements of the code of procedures with regard to the mirroring effects, lighting of working places, shadowing etc.

B9.3.2.22 400/230 KV GIS building

The GIS buildings shall consist of a steel structure with trapezoidal metal panels for external walls and roofs. The floor shall be a concrete foundation.

Description of the building

- structure: steel structure
- floors: one
- flooring: reinforced concrete
- foundations: according to the soil investigation report and Special Technical Requirements of Foundations
- walls: single skin metal sheet cladding
- roof: single skin metal roofing
- doors:
  - external: self closing sandwich steel doors with insulation
- windows: double glazed aluminum
- ventilation: natural/mechanical.

B9.3.2.23 HCSD - building

The building shall accommodate the equipment for high concentrated slurry disposal, as described in **Section B04**.

Building description

- structure: reinforced concrete
- floors: one floor
- flooring: reinforced concrete
- foundations: according to the soil investigation report and Special Technical Requirements of Foundations
- external wall: 230 mm thick brick walls or autoclave aerated concrete blocks with metal cladding
- internal wall: 230 mm thick brick walls or autoclave aerated concrete blocks or autoclave aerated concrete blocks with plaster finish
- roof: double skin metal sheet roof
- doors:
- main entrance: folding doors with motor drive
  - external: self closing sandwich steel doors with insulation
  - internal: wooden doors with steel frames
- windows: double glazed aluminum
- air conditioning: centralized air conditioning, if required
- ventilation: natural/mechanical

B9.3.2.24 Main gatehouse

The main gatehouse located inside of the plant site serves for control of the entrance. From the working place the gate keeper shall be able to watch the areas in the front and behind the gate house and to release the pedestrian and vehicle gates.

The main gate house symbolizes the entrance of the plant and shall be of a good esthetical appearance.

Electrically operated road barrier/gates are included in the scope.

The following rooms shall be accommodated in this building:

- security staff offices
- time office incl. time machine
- reception area
- lounge
- safety induction center.

Description of building:

- structure: reinforced concrete structure
- floors: one
- flooring: vitrified tiling
- external wall: 230 mm thick brick walls or autoclave aerated concrete blocks with metal cladding
- internal wall: 230 mm thick brick walls or autoclave aerated concrete blocks with plaster
- doors:
  - external: self closing sandwich steel doors with insulation
  - internal: wooden doors with steel frames
- windows: double glazed aluminum
- ventilation: mechanical
- air conditioning: decentralized air conditioning
- sanitary equipment: toilet with 1 WC and 1 wash basin.

B9.3.2.25 Secondary gatehouses

On Plant area secondary Gatehouses shall be located at the following locations:

- near Jetty Area
- near Township
- on additional location for labor entrance.

The gate houses, serves for control of the entrance. From the working place the gate keeper shall be able to watch the areas in the front and behind the gate house and to release the pedestrian and vehicle gates. The building shall be provided with the guard room a small office and a sanitary room. Electrically operated road barrier/Gate is also included in the scope.

Description of building:

- structure: reinforced concrete structure
- floors: one
- flooring: vitrified tiling
- external wall: 230 mm thick brick walls or autoclave aerated concrete blocks with metal cladding
- internal wall: 230 mm thick brick walls or autoclave aerated concrete blocks with plaster
- doors:
  - external: self closing sandwich steel doors with insulation
  - internal: wooden doors with steel frames
- windows: double glazed aluminum
- ventilation: mechanical
- air conditioning: decentralized air conditioning

- sanitary equipment: toilet with 1 WC and 1 wash basin.

B9.3.2.26 Construction sheds

On the plant area 30 small, partly enclosed buildings shall be provided as permanent construction sheds for repair and maintenance issues.

Office and store shall a building structure, whereas the workplace is just a covered area.

The locations shall be:

- 8 pcs near ID-fan - chimney area
- 6 pcs near turbine hall - 0.00 mm
- 2 pcs near cooling water pump house
- 6 pcs near coal handling control room
- 4 pcs near ash handling control room
- 4 pcs near jetty.

The sheds shall consist of:

- office (15 m²)
- store (20 m²)
- workplace (50 m²), only covered.

Description of building:

- structure: reinforced concrete structure
- floors: one
- flooring: PVC tiling or equivalent
- external wall: 230 mm thick brick walls or autoclave aerated concrete blocks with metal cladding
- internal wall: 230 mm thick brick walls or autoclave aerated concrete blocks with plaster finish
- doors: self closing sandwich steel doors with insulation
- windows: double glazed aluminum
- ventilation: mechanical
- air conditioning: window/split air conditioning system
- sanitary equipment in the office area:
  - eastern WC with cleaning brush in toilet
  - western WC with cleaning brush in toilet
  - bowl urinal in male toilet
  - wash basins in toilet

For these structures, pre-engineered structures can be used.

B9.3.2.27 Maintenance workshops

On the plant area Maintenance Workshops shall be provided as permanent construction sheds for repair and maintenance issues.

The locations shall be:

- mill maintenance workshop (70 m² with EOT)
- mill maintenance workshop (with cylinder holding fixtures, sand blasting facility)
- fan maintenance bay (with monorail)
- coal handling plant workshop.

Where applicable, workshops can be combined with other facilities.

Description of building:

- structure: steel structure
- floors: one floor
- flooring: concrete or paving
- walls: double skin steel cladding
- roof: double skin galvanized steel sheet
- doors: sandwich steel doors with insulation
- windows: double glazed
- ventilation: mechanical
- air conditioning: window/split air conditioning system.

B9.3.3 Outdoor foundations and structures

B9.3.3.1 Transformer bays

Oil-filled transformers shall be supported on reinforced concrete foundations.

Provision shall be made for the catchment of oil spillage and fire deluge water. Appropriate measures are to be made to prevent pollution of the environment by leading of ejected oil.

The foundation supporting the transformers shall incorporate transformer rails. Each transformer foundation shall be provided with slope and raised borders, enclosing an oil retention basinpit in which the oil content of the transformer can be carried in the event of an oil leak. The oil retention basin shall be sized to hold the oil capacity of the largest transformer, rainwater and water from fire fighting system. The basin shall be adequately coated Above the oil pit a min. 20 cm thick gravel layer on a steel grating shall be provided. The retention basins shall drain into a central oil separator

conforming to VDE-Standard or equivalent. Water from the separator shall drain to the site drainage (process waste water) system.

A deluge system shall be installed.

The transformer bays shall have reinforced concrete fire walls towards the neighboring buildings and between each other –if applicable- and security fencing on the other sides with personnel gates to the front.

B9.3.3.2 400/230kV GIS

The civil portion of the 400/230kV GIS consists of foundations, transformer foundation, control building, GIS building, Bus duct supports, tower & gantries and equipment support structures etc.

The transformers bays shall be provided, as described above.

The sizes of the control building have to be determined according to the requirements for the electrical and instrumentation/control equipment. It shall be constructed as reinforced concrete and brickwork building.

The GIS buildings shall consist of a steel structure with trapezoidal metal panels for external walls and roofs. The floor shall be a concrete foundation.

Details for tower and gantries and support details of outdoor switchyard equipment will be described in electrical part.

The complete Area shall be fenced off from site. The access shall be from Main Plant. Additional access from outside direct to the 400/230 GIS is not required.

B9.3.3.3 Other outdoor foundations

The following foundations shall be included under this clause:

- for dust filter (electrostatic precipitator or fabric filter plant)
- for flue gas desulphurization plant
- for supporting structures of pipes/cables, etc.
- for outdoor switchgear supports and gantries
- for air condensers and coolers (as applicable)
- for other outdoor structures not explicitly mentioned above.

The foundations shall be of reinforced concrete designed and constructed according to the recommendations of the soil investigation report.

B9.3.3.4 Foundations of various storage tanks

The foundations of the following storage tanks are included under this item:

- potable water storage tanks
- demineralized water storage tanks
- service water tanks
- condensate tanks
- feedwater tanks
- foam storage tanks
- fire fighting water
- neutralization buffer tanks - if applicable
- other specified tanks not included above, e.g. Section B6.

The tanks shall be founded 0.60 m above surrounding level on ring foundations of reinforced concrete and a well compacted layer of fine graded asphalt concrete of 50 mm thickness with max. grain size of 5 mm.

On the ground beside the tanks (other than the potable water storage tanks), concrete slabs with raised borders are to be provided which shall collect all the leakages. These slabs are to be adequately protected against the chemical attack involved.

B9.3.3.5 LFO/HSD storage tank

Care should be taken to ensure that no pollution of groundwater through oil may occur and that all precautions for fire protection are taken. The LFO/HSD storage tank has to be installed as individual tank farm bund. The dewatering system of the oil catchment area of the substation shall be provided with a locking system, which should be activated during the unloading phase at the tanks.

- tank foundations:
  The tank shall be founded 0.40 m above tank yard level on ring foundations of reinforced concrete and a well compacted layer of fine graded asphalt concrete of 50 mm thickness.
- bund of LFO/HSD:
  The bund and floor are to consist of reinforced concrete. The whole tankyard shall be isolated by a non-rotting oil and water-proof foil laid on the soil. The top protection for the insulating foil shall be achieved by concrete slabs. The joints responsible for absolute water and oil tightness between foundations and oil bund must not be endangered by possible settlements.
- In case of storage tank including a double bottom, a double wall (second wall in steel serving as spilling basin) up to the top of the tank and a roof covering the two walls, the bund can be omitted.

- drainage:
  The tank farm floor is to be sloped and provided with drainage channels so that trouble-free drainage of rainwater into the oil separators is possible. No oil should get into the rain water line even when an oil separator is overfilled.

B9.3.3.6 Cable and pipe ducts/pipe bridges

For cables and pipes the Contractor shall provide ducts in such areas where installation above ground is not possible or advisable. Cables and pipes shall be laid in separate ducts. In general, ducts shall be avoided, as appropriate.

Pipe bridges shall be provided for supporting and routing of various pipes and electrical cables between the plant components.

B9.3.3.7 Covered car parks

The following parking provision shall be foreseen:

- in the area of the administration building: min. 75 shaded car parking lots and 75 unshaded car parking lots
- in the area of the service building: min. 75 shaded car parking lots and 100 unshaded car parking lots
- in the area of the central canteen: min. 50 shaded car parking lots and 50 unshaded car parking lots
- in the area of the auditorium: min. 75 shaded car parking lots and 75 unshaded car parking lots (when auditorium is near administration Building, number of car parks can be reduced)
- in the workshop and other areas: min. 50 unshaded car parking lots
- in different areas of the plant: min. 50 shaded motor-bicycle parking lot
- dividing stripes shall be marked.

B9.3.3.8 Open storage area

A free area of min. 2500 m², paved with interlocking blocks (for heavy traffic) shall be arranged in the immediate vicinity of the workshop/store for the future installation of a camp of containers used during the maintenance works of the plant equipment.

The design of the area shall consider the loading and space requirement of minimum 20 standard containers. To the scope of works belong the water, electrical power, telephone as well as sewage facilities necessary for the connection of the above-mentioned container. The area shall be enclosed with chain link fence with pedestrian and vehicle gate.

B9.3.3.9 Underground services

Pipe & cable channels
Channels for pipes and cables shall be of reinforced concrete and must be watertight. Dimensions of the box shape channels shall be such that adequate working access and ventilation could be available to maintenance staff. The ducts shall be designed to comply with the fire protection requirements and shall withstand soil pressure and any live loads that may be imposed on the channels. Particular attention shall be paid to satisfactory expansion and settlement joints.

For drainage purposes the ducts shall be provided with slopes of a minimum 0.3% towards accessible pump sumps. An automatically controlled sump pump shall be permanently installed for any sump which is found to need pumping.

Hot dip galvanized anchor rails at a spacing of 1.5 m shall be provided on the internal walls of the channels to support cable racks. Minimum required distance between power and instrumentation cables and between cables and pipes shall be observed. Heavy duty removable covers shall be provided at access points to the cable channel.

For smaller quantities of cables PVC pipe sleeves shall be placed from one manhole to the next.

Pipe laying under roads
Where it becomes necessary to lay a pipeline across and under a road the Contractor may install a permanent liner at a safe depth.
The liner shall be designed for the likely ultimate loadings and may be of spun concrete or steel. The diameter of the liner shall be adequate for the number of pipelines as required to accommodate and for possible maintenance requirements.

Cable and pipe ducts, trenches, tunnels outside building
Generally cables shall be placed directly below ground buried in a depth of at least 0.8 m below ground. All necessary measures shall be taken at road crossings to protect cables against damage.

The necessity of providing cable and pipe ducts, trenches and/or tunnels and their possible routing are all as outlined in the relevant parts of the specification for electrical and I&C works.

General
For construction of cable and pipe ducts, trenches and/or tunnels the requirements of DIN 1045, DIN 1054 (or equivalent ISO – EN Codes), BS EN 1992-1-1, BS 6031 or approved equivalent standards shall be complied with.

For large numbers of cables and pipes the Contractor shall provide ducts, trenches and/or tunnels in such areas where installation by directly burying or above ground on racks is not possible or advisable. Cables and pipes shall be laid in strictly unit-wise separated ducts, trenches and/or tunnels.

The ducts, trenches and/or tunnels are to be constructed of reinforced concrete according to the requirements of clause "Concrete works" specified herein, and must be watertight and non-buoyant under the prevailing groundwater conditions. Particular attention must be paid to satisfactory expansion and settling joints. The walls and covers of the ducts, trenches and/or tunnels must be designed and reinforced to withstand the prevailing soil & water pressure, the relevant traffic loads and the weight of suspended cables and pipes.

The ducts, trenches and/or tunnels are to be provided internally with hot dip galvanized anchor rails every 1.5 m for the easy attachment of clips and cable racks. Plugging and shooting of fixing devices are permissible only in isolated cases and are subject to the Employer's agreement. All ducts, trenches and/or tunnels covered by removable covers will have to be provided with metal protection angles protecting on one hand the edges of removable covers and on the other hand the edges of the duct walls beside the removable covers. Every attempt shall be made to locate the ducts, trenches and/or tunnels away from roads in order not to disrupt or endanger traffic during subsequent necessary work such as overhauls and repairs. The corners of the duct walls in the vicinity of junctions, inlets and bends must be "rounded-off" so that no damage is suffered by the cables when they are being drawn in – allowing for their minimum bending radii.

If the bottom of slab of a duct, trench or tunnel is below groundwater level, the slab shall have a slope and openings in the slab for natural drainage.

For drainage purposes the cable and pipe ducts, trenches and/or tunnels shall be provided with sumps and slopes (min. slope 0.3%) towards the sumps. Where necessary, pumps with automatic water level control shall be provided within the sump. Sumps which are likely to be dry most of the time may subject to the Employer's approval be designed for pumping by portable pumps to be provided by the Contractor.

If a culvert(s), and/or tunnel(s), trench(s) or any other underground services are crossing streets, the street shall be constructed as a bridge for truck loading without effecting the underground structures.

All open trench concrete covers shall be pre cast (not cast in-situ) using straight moulds. Covers shall be adequately reinforced to withstand the induced loads; with cover to reinforcement not less than 15 mm (reduced concrete cover due to weight constraints). The trench cover soffits shall receive a bituminous seal coat.

Small cable & pipe ducts/trenches
Where approved removable covers may be used for small ducts and trenches. The covers may be chequered plates, gratings internal or precast concrete slabs outside.

Dimensions of cable & pipe ducts trenches
Dimensions of ducts and trenches shall be appropriate to accommodate the installation of the cables and pipes with their required spacing and for the space required for their maintenance. Ducts and trenches with removable covers may not have any access manholes

Covers, trash gratings, climbing irons
Shaft and manhole covers shall be made from cast iron or reinforced concrete, of watertight construction, with or without dirt traps, to suit local requirements. All covers shall be approved for loading as expected from the likely traffic conditions. The dimensions of trash gratings shall be those determined by proper structural design. Trash gratings shall be of cast iron.

The type and choice of climbing irons shall meet the requirements of BS 1247 or other approved standards. Only corrosion protected materials shall be used. Where shafts are constructed of reinforced concrete, the step spacing shall be 330 mm, and for brick shafts as close to that spacing as possible subject to the brick courses. Climbing irons shall be staggered, maintaining a horizontal axial spacing of 300 mm.

B9.3.4 Outdoor facilities and installations

B9.3.4.1 Potable water system

The scope of this section is to supply with potable water all buildings, which require sanitary and potable water, see also **Section B6**.

Foundations for storage tanks shall be provided.

The scope of this system includes all equipment required for the potable water system including piping for hot and cold water lines, water heaters, drinking fountains, valves, insulation and lagging, hungers and supports. Emergency showers and eye wash stations will be provided as required e.g. in the chemical feed area and station battery rooms and shall be supplied with potable water.

B9.3.4.2 Service water system

The scope of this section is to supply with service water to all locations which require service water, see also **Section B6**.

Foundations for storage tanks shall be provided.

The service water tank shall also be designed to serve for the purpose of the fire fighting water needs as described in **Section B12**.

The scope of this system includes all equipment required for the service water system including piping, valves, insulation and lagging, hungers and supports.

B9.3.4.3 Storm water drainage system

For the entire plant, a complete storm water drainage system is required. A substantially maintenance-free and, above all, an operationally safe installation must be guaranteed. The surface water drainage shall include all necessary open channels, gutters, down pipes, gullies, traps, catch pits, manholes, etc. and shall incorporate the plant drainage requirements.

Stormwater shall be drained by gravity. If this is not possible, necessary pumping stations with sand traps are to be provided. For each pumping station the pumps are to be provided with stand-by pump of 100% capacity.

Rainwater run-off from plant area shall be directed through drains, channels and culverts into a storm water collection pond. The size of the storm water collection pond shall be capable for rain water run-off. The volume shall be determined by EPC Contractor.

Any excess rain water during the monsoon season will overflow into the river.

B9.3.4.4 Sanitary sewage drainage system

Sanitary sewage from administration, control, workshop buildings etc. shall be discharged in the sewage drainage system. The wastewater shall be treated in a Sewage Treatment Plant. For further Details see **Section B6**.

B9.3.4.5 Sewage treatment plant

The Sewage treatment Plant shall be provided as described in **Section B6**.

It shall comprise beside the required components also a small building for the pumps and the local electrical panels. The basins will be concrete structures and the building shall be a concrete /block work structure.

The plant shall be designed to ensure that the effluents will have the quality which is required to allow the re-use for irrigation.

For this purpose the water shall be stored in a storage basin of suitable size with overflow to the central effluent monitoring sump CEMS. The water will be removed periodically by means of tank truck.

B9.3.4.6 Fire water retention, if applicable

Spent fire fighting water shall be contained. The required retention volume shall cover the total water amount of the connected systems during defined operation time. This shall be achieved by respective thresholds and other up stands to form a containment of sufficient volume. Furthermore the rain water and fire fighting water retention basin shall be used to collect fire water from the drains of sealed outside areas.

The total fire water retention volume shall be based on the fire fighting water demand and duration according to NFPA 850.

Tanks with flammable or hazardous content shall have a bund structure creating sufficient retention volume. In the assessment of the total fire extinguishing time where such tanks are involved in the fire, account shall be taken of the collecting capacity present in this area including the volume of oil discharged in the event of a leakage.

B9.3.5 Coal and ash handling and storage facilities

B9.3.5.1 Handling facilities

The civil portion of the coal and ash handling facilities consists of foundations. Weather protecting metal roof on steel structures, junction tower, etc., and structures for the hoppers and the like are described in **Section B4**.

B9.3.5.2 Coal yard

Coal storage
The coal storage shall be suitable for coal demand of 90days. The final size shall be determined by EPC-Contractor.

The coal yard shall be constructed for 2 x 660 MW. An area for additional coal yard for further extension shall be reserved in Layout.

Soil replacement and ground improvement shall be carried out for the coal storage area to have the required safe bearing capacity with negligible relative and absolute settlement characteristics. The minimum height of storage shall be considered as 13.00 m.

A coverage for the whole coal storage area has to be considered. The coal yard coverage shall be complete in all respects, including foundations and installation of steel structure and metal roof and sheeting. Sand piles and pre-loading of the entire storage area for a period as required may be the most economical and effective way to achieve the required results. The

ground improvement work shall be started as early as possible to achieve the required results.

The improved sub grade shall be well compacted to the required lines and levels before sealing it with an impermeable layer of high density membrane. At least 300 mm layer of clay of high plasticity index shall be laid on the impermeable membrane. The clay layer shall be covered with a minimum 250 mm layer of well graded gravel sub-base. Perforated high intensity pipes shall be recessed into the gravel layer to form a close grid of drainage system. The drainage system shall be prevented from clogging by using suitable geo textile cover or proven filter criteria according Terzaghi. Finally, the gravel layer shall be covered with a layer of minor quality coal of a minimum 200 mm thickness.

For collecting the storm water and spray water from dust suppression a drainage system shall be provided. The drainage system will drain into trenches around each coal pile thus be connected to drain into a separate coal drainage settling pond. The basin shall be founded on well compacted selected soil after removal of the existing top soil and weak subsoil. Complete with fully sealed reinforced concrete lining, the pond shall be constructed at a level that will be best suited for gravity flow of the drainage water. Slope of drainage lines shall consider long term settlement of coal storage area. Suitable removable type covers of the drains shall be provided.

A water spray system for dust suppression shall be provided.

Coal transfer towers/coal crusher building
The civil works for the coal crusher buildings, the coal sampling units and all corner towers and conveyer bridges shall comprise foundations and drainage systems required.

Where necessary, pile foundations or other deep foundations shall be provided.

The system shall be fully enclosed. Proper access shall be provided.

To prevent any dust accumulation, horizontal surfaces shall be avoided.

Provisions for regularly washing of structures and floors shall be made along with proper drainage.

All civil works for the crusher building and transfer towers shall be provided to meet the requirements of the mechanical and electrical installations and as described in **Section B4**.

Measures shall be taken to avoid the transmission of vibrations due to equipment (mainly crushers) to the building structure. These measures shall mainly be separate reinforced concrete foundation to be insulated from the

remainder of the structure by vibration control systems consisting of spring elements and viscodampers to prevent the transmission of vibrations.

Unbalanced forces due to equipment shall be considered.

Building description:

- structures: structural steel frame
- foundations: piled foundations for steel columns (see also and the results of the geotechnical investigation results)
- base floor: reinforced concrete with slopes to gullies and drainage, coating according to the regulations
- external walls: 230 mm thick brickwall with plaster finish up to 0,9 m or autoclave aerated concrete blocks from floor level and double skin metal cladding above
- roof: galvanized steel structure with metal cladding water proofing.

Coal conveyor
All civil works for the coal conveyors shall be provided to meet the requirements of the mechanical and electrical installations. If for structural reasons required deep foundations shall be taken into account for conveyor belt supports.

The system shall be fully enclosed. Proper access shall be provided.

To prevent any dust accumulation, horizontal surfaces shall be avoided.

Provisions for regularly washing of structures and floors shall be made along with proper drainage.

Coal conveyor bridges
The civil works for the coal conveyer bridges shall comprise foundations, steel structure and drainage systems required.

Where necessary, pile foundations or other deep foundations shall be provided.

The system shall be fully enclosed. Proper access shall be provided.

To prevent any dust accumulation, horizontal surfaces shall be avoided.

Provisions for regularly washing of structures and floors shall be made along with proper drainage.

Structural analysis shall be performed for both conveyors running with 100% loading.

All civil works for the crusher building and transfer towers shall be provided to meet the requirements of the mechanical and electrical installations and as described in **Section B4**.

Building description:

- structures: structural steel frame
- foundations: piled foundations for steel columns (see also and the results of the geotechnical investigation results).
- base floor: reinforced concrete with foundations, coating according to the regulations
- external walls: 230 mm thick brickwall with plaster finish up to 0,9 m or autoclave aerated concrete blocks from floor level and double skin metal cladding above.
- roof: steel structure with metal cladding water proofing.

Coal stacker/reclaimer
The civil works for the coal stacker/reclaimer shall comprise all foundations and civil works required for the equipment described in **Section B4**. Where necessary, pile foundation or other deep foundations shall be provided. Construction shall consider all requirements due to long term settlement, e.g. adjustments of the equipment runway.

Covered coal yard
The coal sheds shall be of structural steel columns and roof trusses with a metal roof and metal sheet siding. Foundations with piled foundations for the steel columns, according to the geotechnical investigation. The profile of the roof shall follow the profile of the coal handling equipment. Each coal pile shall be covered separately. The distance between the steel columns shall be approximately 80 m, the height of the roof at about 40 m (for a coal pile of about 50 m width), the two cantilevers connected with a joint at the highest point must not be symmetrically depending on the size of coal handling equipment used.

Any collision of the stacking and reclaiming machines with the shed must be safely avoided in any operational case.

The take-out of the coal yard shall be considered as option 4.1, see **Section B4**.

B9.3.5.3 Ash pond

An Ash Pond of 25 acre shall be provided for storage of High Concentrated Slurry Disposal (HCSD). The system shall include starter dyke storage lagoons and overflow lagoon dyke construction, ash slurry pipe line, drainage system, ash water recirculation pump house, seepage water pump

house and maintenance roads on top of dyke embankment & all around the outer perimeter of dyke at natural ground.

The average ground level on proposed land is RL=1.0m. The height of the starter dyke shall be approx. 5.60 m. Provisions shall be made for construction of further raising dykes to extend the storage volume of ash. The minimum height of storage shall be considered as 13.00 m in center of ash pond.

The starter dyke shall be constructed in such a way to maximize ash storage and considering seismic influence. Ash dyke embankments can be designed as an earthen dam as per relevant code. Depending on the type of the soil for the embankment construction, it may have either of the following sections:

i. a homogeneous section with internal drainage arrangement of sand chimney and sand blanket
ii. a heterogeneous section consisting of an inner impervious core and outer shell of available soil.

Based on the properties of soil and fill material, the stability and seepage analysis shall be carried out. The design shall be done for ultimate height and the unutilized as to be stored. Soil Improvement shall be considered, if required to minimize settlements of the dyke and inside the pond. The bearing capacity in the area shall be as required, but not less than 100 kN/m².

The ash pond shall be provided with impermeable liner in compliance with legal regulations. The liner may be natural or synthetic depending upon the substrata encountered and the permeability of soil. Toe drain shall be provided all around the periphery of outer dyke, where applicable. An RCC peripheral drain shall be provided to guide the seepage water from toe drain into seepage water sump and the same shall be pumped into Over Flow Lagoon (OFL). Toe drain shall be connected to peripheral RCC drain suitably at regular interval.

Water escape structure for decantation, method of discharge and recirculation of decanted water shall be provided as per requirement. For the escape of excess rain water from storage lagoon, spillway type structures shall be provided. The spillways along with energy dissipating device on downstream side shall be designed to discharge the excess rain water from the OFL and storage lagoon.

Internal drainage arrangement and toe drain around the dyke shall also be provided. Suitable Protection measures from back water of river shall be provided all around the ash dyke.

In addition, on downstream (D/S) slope of the embankment, stone pitching with inverted filter arrangement shall be provided from G.L. to HFL plus 1.0 m height of dyke embankment. Provision shall also be made to protect

the upstream slope of embankment. Rock-toe with toe drain shall be provided at the toe of the embankment all around the ash dyke.

Dust suppression system for ash pond shall be provided, as required to ensure IFC guideline requirements.

The overflow of storm water shall be disposed of properly; reutilization in the power plant shall be encouraged as far as possible.

The Contractor shall provide a simple and effective filling concept, which will allow proper settling effect during all stages of the progressing fill of the pond and which shall keep the exposed ash surface to a minimum at all times. In order to monitor the performance of ash dyke during construction and operation, instruments should be installed at suitable locations.

All pump houses shall be protected for flooding, therefore the finish floor level of pump houses shall be the same as for plant levels.

Weighbridge
A weighbridge for weighing bulk goods to be brought in or out of the plant shall be provided in the area of the main entrance/gatehouse.

The scope of supply includes the design, delivery, installation and commissioning of the mechanical civil and data capturing and transporting system for one weighbridge to be installed at the gate house and consist of the following:

- weighbridge with a length of 12.0 m and 30 tones capacity
- reinforced concrete trough designed to support the weighbridge including drainage provision connected to the sewage system of the plant, all necessary embedded part for anchoring, sleeves, base plates etc.
- accessories including load cells, weigh indicators, arrestors and all devices necessary for proper operation of the weighbridge
- transponder system complete with all accessories
- 2 units of vehicle barriers with all accessories
- outdoor printer complete with printer stand with waybill depository boxes and accessories
- traffic light complete with all accessories
- message sign board to be installed in the gate house
- data processing system and communication equipment complete with computer, data switches and software for the control of weighbridge transactions
- all cabling between the weighbridge and the control desk.

B9.3.6 Roads, paving and surfacing

The road system must be arranged in such a way that free- flowing traffic is guaranteed. Wherever possible, cross roads are to be avoided. The following asphalt roads shall be provided:

Road connections to the different buildings are to be provided.

Sidewalks shall be provided from roads to interconnect all facilities and all building doors. The walkways shall be reinforced concrete and shall be prepared with an adequate depth of compacted base course and shall be at minimum of 1.5 m wide. Walkways will be formed with slopes and/or steps at the correct level to drain storm water.

The area around the buildings and outdoor auxiliary plant, which are used infrequently, the lay down areas for small loads, the footpaths, the parking areas, etc. shall be paved with interlocking concrete blocks.

Entire area from transformer yard to chimney shall be provided with paving in combination with interlocking concrete blocks and high wearing resistant concrete.

Surfaces of unbuilt and remaining areas within the site boundary which are neither built nor paved shall be adequately leveled and covered with topsoil to allow proper landscaping. Road signs, traffic signs, road surface marking and guardrails shall be provided as per authority requirements for traffic in industrial areas.

The works shall include temporary site access roads from the existing outer roads.

After finishing of construction works all temporary site access roads used by the Contractor shall be reinstated to the original standard i.e. the standard after refurbishment.

B9.3.7 Landscaping

There shall be comprehensive landscape development in entire Plant area to create a pleasant and healthy environment. The scope of work for landscape and horticulture work shall include supply and planting of trees, shrubs, hedges/edges/borders, grass lawn around different areas, buffer and peripheral plantation etc. The scope shall also include supply and installation of all landscape furniture i.e. park benches, gazebos, landscape fountain and water bodies, landscape pavers/ tiles etc. and all associated electrical and mechanical works/items and all other work required for completion of landscape development.

The landscape design and drawing shall be developed by competent Landscape Architect. The landscape shall use the suitable plants and trees

preferably local trees, plants, and shrubs. There shall be provision of pathways in and around the landscaped area, with suitable provision for disabled persons.

Around the pathways and roads, trees shall be planted. Rainwater harvesting for the entire Plant Area shall be integrated within the landscape development. There shall be provision of irrigation system for irrigation of landscaped area. Intense landscape with four water body development shall be provided near the following areas:

- main gate complex
- administration building
- service building
- canteen building.

All other open areas of plant, which are not covered by buildings, structures, roads, lay-down areas, graveled areas, etc., shall be planted with shrubs and grass.

Around the coal yard, trees shall be planted in order to limit dust contaminations.

B9.3.8 Main entrance area outside the plant

In the Area of the main Gate a welcome and waiting complex shall be provided.

The area shall consist as a minimum of:

- 3 helipads
- 2 VVP guest houses
- 160 car parks, shaded
- 34 truck & trailor parks
- 6 shops
- prayer hall
- toilet building.

The structures shall fulfill the technical requirements as stated in this specification.

All buildings shall be equipped with electricity, HVAC, telephone connection, etc.

B9.3.9 Employer's and Engineer's office (temporary structure)

A temporary Employer's and Engineer's Office of approx. 2800 m² for minimum 100 engineers, meeting rooms and social rooms for minimum 50 persons, furniture, copy machine, kitchen shall be provided and maintained throughout the construction period.

Offices shall be provided for:

- Site Manager (40 m²)
- Discipline Site managers (25 m²)
- Middle level executive offices (10 m²)
- Workstations/Halls.

Every working place shall be equipped with a computer, connected to a local network with common printer.

These offices shall be separate permanent reinforced concrete structures, according to the civil specifications. The offices shall be ready for occupation latest 8 weeks following the commencement of the works at the site.

Kitchen shall be equipped with cupboard, refrigerator and heating plate, or electric oven, china and tools, dish washer, glasses and coffee machine, etc.

Sun shaded car parks, helicopter Pad septic tank and cesspool shall be included as well as a temporary elevated water tank. AC window units and sufficient power supply shall be included.

The following additional equipment shall be made available in sufficient number:

- automatic telephone exchange (domestic/international lines)
- telephone installed in each room
- telefax machine
- CAD work stations
- colour printer for drawings up to A0 size
- colour printers for documents size A4 & A3
- photocopying machines for A4 & A3
- PC's with related processor, network for data exchange, storage, •internet browser and standard office software.

This equipment shall be state-of-the-art and furniture shall be of 1st class standard; all are subject to approval by the Engineer. The Contractor shall provide the offices with electricity, water, coolers and refrigerators.

All office supplies, operating and maintenance costs for the offices and the installed equipment shall be at the Contractor's expense, for the whole period of contract the full service of the equipment with consumables (toner cartridges, paper, etc.) and the billing cost of telephone, telefax and internet browsing.

B9.3.10 Living accommodation

The Contractor shall construct living accommodation made of reinforced concrete, according to the civil specifications for the Employer's and Engineers site supervision staff. Layout and finishing materials shall be approved by the Engineer.

All accommodation shall be situated close to the construction site and consist of 30 independent houses (each with 3 bedrooms) located near the project site.

These houses shall have fully furnished living and bedrooms, kitchen etc. completely equipped (TV, stereo, stove, refrigerator, dish-washer, washing machine, ironing board and kitchen utensils) and bathrooms.

They shall be supplied with water, electricity, air conditioning and telephone and connected to a drainage system so as to provide immediate utilization.

All running expenses such as water, electricity, telephone, maintenance, cleaning, etc. shall be at the Contractor's expense.

If this accommodation is not available in the specified time, the hotel expenses incurred by the Engineer's representatives during the corresponding period shall be at the Contractor's expense.

These houses shall be for the sole use of the Employer's and the Engineer's representatives up to issue of the last preliminary acceptance certificate of the power and desalination plant.

Ten houses shall remain available during the warranty period plus 3 months extra period.

B9.4 Special Technical Requirements

B9.4.1 Basic requirements for all civil works

- The design of all structures under this contract shall be such that differential and total settlements or other movements shall not exceed acceptable limits and full provision shall be made for all expansion and other joints. The design shall be to the approval of the Employer.
- Structural members subjected to flexure shall be designed to have adequate stiffness to limit deflections or any deformations that affect strength or serviceability of a structure adversely. The maximum allowable deflections of structural members shall be in accordance with the relevant design standards and/or the limits prescribed by the machinery manufacturers.
- The superstructures and foundations subjected to vibrations (the primary source of these vibrations being the unbalanced forces generated by rotating or reciprocating equipment) shall be designed such that vibrations will be neither intolerable to personnel, and will not cause damage to the machine or structure. The natural frequency of the whole of the superstructures and foundations or parts thereof and all structures adjacent thereto shall not coincide with the operating frequency of the vibrating plant.
- The dimensions of all the buildings shall be such as to provide adequate space for the safe installation and proper operation, maintenance and repair of all plant and equipment.
- Throughout the works all floor slabs above rooms containing electrical equipment shall be watertight. No drain pipes or water pipes are permitted to pass through these rooms.
- All materials used in the works shall be of the best quality of their respective kinds as specified herein, obtained from sources and suppliers approved by the Employer.
- The work shall be carried out by competent personnel skilled in their various trades.
- Suitable access to the roofs of the buildings by means of galvanized steel stairs shall be provided for maintenance and fire fighting purpose.
- All rooms with fire hazard shall be provided with suitable emergency exits.

  Proper access roads with footpaths shall be provided to bring in all the equipment and to take it out in case of maintenance. These access roads shall be suitable for the vehicles which will be used (cars, forklifts, trucks/trailers etc.) to reach up to the point of unloading of the equipment.
- Safe, convenient and straight forward accesses and means are to be provided to take equipment in and out of all rooms, at all levels using suitable stair wells and suitable electric hoists. The dimensions of rooms, stairwells, doors, etc. shall be designed to suit the a.m. transport concept.

- An appropriate serviceable and functional master key system for the whole plant shall be supplied and installed.
- Before starting of design works, the Contractor shall submit to the Employer for approval a **project design manual** containing the design data, the design criteria and the standards for all civil works. All loadings considered in the design shall be justified with supporting details.

B9.4.2 Site organization and preparatory works

B9.4.2.1 Site services during construction and testing phases

Contractor's temporary site buildings & accommodation
All buildings and equipment provided in accordance with this requirement shall be made available within 8 weeks following the commencement of the works at the site and must not be removed without the prior approval of the Employer.

All temporary buildings, structures, and equipment must be removed from the site to the Employer's approval and the site returned to its original state. All resulting debris shall be removed to an approved dumping area to the Employer's satisfaction.

The Contractor shall propose an area to the approval by the Employer for his site organization in the limits allocated for this purpose, for the storage of plant, equipment and materials during the execution of the Contract. The Contractor shall be responsible for the off-loading, transporting and handling of all the plant and equipment and materials needed for the purpose of the Contract.

Within the proposed area the Contractor shall provide and maintain an office appropriate to the efficient management and control of the project by his own staff.

The Contractor is to provide a site first aid station including an ambulance fitted with all essential facilities and the needed medical and paramedical personnel. The station shall be made available for the use of all personnel who shall be employed on the site for overall project works.

Site fire protection
See section Fire Fighting

Temporary latrines and ablutions
The temporary toilets and ablutions shall be provided for the use of the Contractor and his subcontractors.

The Contractor shall also include in his Contract the disposal of the sewage resulting from all temporary toilet and ablution facilities.

Temporary electricity and water supplies
The Employer will provide an interface for electricity demand for the Contract works. The Contractor shall provide the cables and equipment for construction power at Site, together with the supply to the Employer's and Engineer's site office.

Base case:
Power supply for construction purposes will be provided at 33 kV voltage (2 no. of lines). The same will be extended to the Contractor for him to develop 33/11 kV sub-stations and construction power supply comprising of:

- Two (2) 5 MVA, 33/11 kV step-down transformers,
- Two (2) 11 kV switchgears,
- 11 kV main ring, design according to plant layout, construction requirement and schedule,
- 11kV/415 V step-down transformers (number and sizes as required according to plant layout, construction requirement),
- Two (2) 11 kV feeders (minimum 630 A), for usage of the Employer.

For improved reliability these feeders shall be connected to separate 11 kV bus systems at 33/11 kV sub-stations.

The electricity prices/power tariffs for the case of 33 kV voltage level are defined in the **Annex C**.

Further preliminary details regarding provided construction power system are shown in **Annex C**.

Supply of construction water is in the scope of Contractor. It is not allowed to use ground water. For construction water shall be used only river water suitably treated for his purposes.

Security fencing including gates and barriers
Main plant and Township Boundary wall will be constructed by Employer. It consists of 3m high, plastered brick work with barbed wire on top. Location and Details are shown in **Annex C**.

All facilities, which are erected outside of the boundary wall, e.g. jetty area, ash pond, etc shall be enclosed by a boundary wall including access gates. The standard shall comply with boundary wall as provided by Employer.

Fencing round Contractors material storage etc. shall be done by Contractor as required.

Site visit
Site visits by the bidder are mandatory to.

- get sufficient knowledge about the conditions at the site

- get sufficient knowledge about the reachability of the site
- determine the effort of site investigation to be done by the bidder.

Site visits have to be announced at least two days before targeted visit at BIFPCL. Transport to the site has to be organized by the bidder.

Site preparatory works
Site was filled up to RL +5.50m in 2014. The surface of filling is uneven (more than +/- 10 cm). Swampy areas at the surface or below may be found. The contractor has to replace the swampy, soft soil with filling material (less than 5% silt).

Consolidation of soft soil/clay and settlement of soil has not finished yet. Required works in respect of leveling, filling, drainage, preloading, etc. shall be considered by Contractor in his work program.

Area of ash pond will not be filled by contractor. After checking the suitability the site the area shall be leveled and compacted by filling and cutting to a final level to be established upon a site survey.

Survey works
The coordinates of the envisaged site location are stated in **Annex C**.

The Contractor shall carry out close grid survey of the site to set up Plant Datum.

Plant elevation shall be defined as follows:

- finished ground level of the plant + 5.00 M above MSL
- plant level (turbine hall plinth level) + 5.60 M above MSL
- final level of road + 5.15 M above MSL
- final level of landscaping + 5.00 M above MSL
- final level of paving of power house block + 5.00 M above MSL.

Finished floors of the power island buildings at ground level shall be fixed at 0.00 m Plant Datum (PD), subject to optimization by the Contractor, and this PD being at least 0.60 m above ground level.

The Employer will furnish to the Contractor site investigations performed prior to the EPC Contract.

Nevertheless the Contractor shall carry out the necessary topographical survey works in order to obtain the following information:

- location of the plant site relative to the existing bench marks of the area
- establishment of site boundaries with site levels
- installation of site bench marks

- preparation of a site survey report, with the description of survey works, methods applied and survey map(s) on scale 1:500, showing the results with the location of bench marks
  The levels have to be given in an adequate scaled grid line system.

Moreover the Contractor shall carry out a bathymetric survey and all investigations required for the intake and outfall structures.

The full responsibility of the investigations to be carried out lies with the Contractor.

Geotechnical investigations
Geotechnical investigation at the site of the works has been carried out for the Employer (see **Annex C**). The investigation comprised boreholes with soil sampling, SPT testing in the main areas of the plant.

Geotechnical investigation data available as of now is of preliminary nature.

The existing information about subsoil conditions, quality of filling, water levels in the ground etc. are for information only, and is not binding during execution phase.

In case the Bidder needs more information for proper calculation of works during bidding process, additional investigations can be performed on his own expense. There are no restrictions about the investigations.

The Bidder is responsible for any matter of subsoil, filling and water in the ground.

In general the subsoil conditions can be described as follows: top layer filled sand (with unknown silt content), underlying layers of clay, underlaying fine sand.

Hence, contractor has to carry out detail geotechnical investigation at his own cost. Methodology and Specification of investigation is subject to approval by the Employer Special attention should be paid to Seismic Parameters. Related to Soil Type as identified to Soil Investigation Report, the effect of local soils on earthquake ground motion shall be determined.

For site class S1 and S2, as expected for this project, site specific studies shall be carried out to determine Design acceleration response spectrum.

Seismic Study
The seismic study shall be performed by an accredited consultant with adequate references and experiences in equivalent projects.

Study area
The study area is defined with a radius of 200 km (incl. safe distance) around the power plant location at Mongla.

Geological structure model

The following data shall be obtained for the model:

- large-scale plate tectonic exposure for the study area
- small-scale micro plates are to be described or excluded
- existing faults, dislocations, drops and lineaments in the deeper and shallower subsurface
- lithological as well as stratigraphic structures for the deep subsurface layers up to Holocene boundary.

Based on the information, a litho-stratigraphic 3D model of the subsurface shall be developed up to the Holocene boundary.

Earthquake
All documented earthquakes in the study area shall be listed with their magnitude-height. A differentiation between the respective focal depth and the location of the epicenter (shallow or deep tremor) shall be considered. From the available seismic data, the energy values of the shear waves (maximum and average values) at the construction site shall be derived. Furthermore, the wave intervals between 4.0 s up to 10 min must be taken into account. Subsequently the thus obtained values must be transferred to the soil parameters.

Soil parameters
The grain size distribution, density and water content for the depth profiles of the boreholes and / or soundings shall be described in order to assess the possibility of a tendency to liquefaction of the soil. The soil must be tested for its damping characteristics in the laboratory. Transformations in the geotechnical characteristics must be documented.

All test results have to be evaluated for every individual building component of the proposed power plant complex according to the British Standard or the DIN EN ISO 1998 sheets 1- 6. Based on this evaluation recommendations for the construction of the individual components have to be given.

B9.4.3 Earthworks

General
This section applies to all earthwork required for the construction of buildings, structures, pavements, road works, landscaping and burying service lines in the ground.

The Contractor shall satisfy himself as to the ground conditions on the site including the nature of the strata to be excavated, obstructions, possibilities

of flooding and such like and shall allow for all provisions necessary to carry out the work in the most suitable manner.

Furthermore, this division applies to excavation works in connection with pavement, roadwork and landscaping.

Fill materials
The fill materials used are to be examined and approved. Excavated materials can be used if they fulfill the requirements.

- **Select fill**
  Select fill shall have the following properties:
  Well graded, non-cohesive and nearly silt free (silt content not greater than 5%; up to 10% tolerated, except below footings of structures), soils free of organic matter (limit 2%). Decomposing or compressible materials shall not be used.
  The material shall be of such nature and character that it can be compacted to the specified densities. It shall be free of highly plastic clays, of all materials subject to decay, decomposition or dissolution and of cinders or other materials which will corrode piping or other metal.
  The intention is to use select fill below structures, roads, parking areas etc.

- **Ordinary fill**
  Ordinary fill shall have the following properties:
  Natural inorganic soils: Organic matter less than 3%. For other properties see under 'Select fill'.
  The intention is to use ordinary fill for non-built areas.

- **Special fill**
  Special fill material shall be gravel or crushed rock.
  The intention is to use special fill e.g. as sub-base material for tanks, roads and switchyard areas.

Execution
The works shall be excavated either by hand or by use of excavating plant and tools acceptable to the Employer.

Safety precaution
The Contractor shall be responsible for all necessary safety measures. Proper strutting, sheeting and bracing, stabilization and protection of slopes, methods of excavation to reduce risks of slides, etc. shall be to the Contractor's debt.

Over excavation
If somewhere, and for any reason, excavation is executed beyond the established lines and without the Employer's previous approval, the Contractor shall at his own expenses backfill with approved material (including required compaction) or with lean concrete.

Stockpiles and disposal
Excavated material from the Works selected by the Employer for re-use shall be placed immediately in its final position, if possible, or otherwise may be stockpiled or deposited on Site as directed by the Employer.

Preparation of foundations
All surfaces on which or against which concrete is to be poured shall be carefully cleaned and roughened and shall be free of any detrimental impurities, organic matter or unsuitable material to the Employer's satisfaction.
The surface shall be free of oil, stagnant or running water, mud, loose rock, residue and impurities or any other improper material.
Immediately after excavation, all such surfaces shall be moistened and treated as directed by the Employer and then protected by means of a lean concrete layer, 5 cm in thickness. No concrete is to be poured until formation is inspected and approved by the Employer.

Backfilling
Foundations and structures shall be backfilled with approved material compacted in layers by suitable equipment until optimum stability has been obtained to the satisfaction of the Employer. Compacting shall be carried out by means of pneumatic or mechanical rollers or other compactors of a type previously approved by the Employer.
Density requirements shall be as follows:

• under buildings and structure foundations and slabs • under roadways and parking areas • under transformers and other major foundations	85% relative density (ASTM D-4253 and D-4254) for free draining soils containing less than 15% by weight finer than 75 micron sieve non plastic material or 98% of the maximum density as determined by ASTM D-1557 for soils containing more than 15% material passing the 75 micron sieve.
• embankment	80% relative density (ASTM D-4253 and D-4254) for free draining soils containing less than 15% by weight finer than 75 micron sieve non plastic material or 95% of the maximum density as determined by ASTM D-1557 for soils containing more than 15% material passing the 75 micron sieve.

The thickness of fill layers, number of passes and type of equipment to be used shall be proposed to the Employer after compaction tests have been made.

Backfilling of foundation work shall be carried out only after foundations have been inspected by the Employer.

Soil replacement
The material to be used for replacement of soil shall not contain soluble or swelling components such as clays, or organic matters. Sand gravel mixtures of favorable grain size distribution shall be used in exchange.

Prior to the commencement of work, samples shall be taken from the anticipated borrow area and tested in respect of Proctor density, optimum moisture content, grain size distribution and content of soluble matters.

The fill material shall be placed in horizontal layers of no more than 25 cm in compacted thickness. The fill moisture content shall be controlled and adjusted in order to achieve a maximum of compaction.

The fill material shall be compacted by vibratory roller (min. weight 20 t).

Tests and properties
The Control of working and tests operations shall be carried out by the Contractor according to the respective standards in the presence of the Employer.

B9.4.4 Foundations

General
Foundation design shall be based on approved geotechnical investigation report. The Contractor shall submit a detailed design for the foundation to the Employer for approval. The bid price for the piling shall be lump sum and shall remain firm irrespective of the type design.

Once the final plant layout has been established by the Contractor, he shall carry out a more detailed geotechnical investigation. The scheme of geotechnical investigation shall be prepared by the Contractor and will be subject to the Employer's review and approval

Information from the soil investigation performed in the year 2014 at this site is provided to the bidders for information. Bidder may note the presence of thick deposit of soft clay as revealed through borelogs attached. The onus of correct assessment/ interpretation and understanding of the existing subsoil condition/data is on the Bidder. The Bidder should note that nothing extra whatsoever on account of variation between soil data collected by Employer and that found by the Bidder during additional soil investigation or during execution of works, shall be payable.

A study of soil liquefaction potential shall be performed using parameters from the geotechnical investigation performed by the Contractor and subject to the Employer's review and approval.

Special measures have to be taken if the results of soil and laboratory tests prove chemical aggressive conditions.

The soil conditions met during the foundation works are to be checked by the Contractor's soil engineer, recorded and compared with previous results. If essential differences occur, the Contractor has to inform the Employer and to propose further measures.

Immediately prior to concreting, the Contractor has to verify the specified soil conditions below the foundation level by a sounding.

Design of the foundations shall be in accordance with the latest DIN/Euro codes and/or other approved standards and codes of practice including the following:

- DIN 1054 — Subsoil: Permissible loading of subsoil; Load Testing of Piles (2005-01, Section 8).
- DIN 1626 — Welded circular steel tubes subject to special requirements, technical delivery conditions.
- DIN 1629 — Seamless circular steel tubes subject to special requirements, technical delivery conditions
- DIN 4014 — Part 1: Bored piles: construction procedure, design and bearing behaviour
  Part 2: Bored piles: large bored piles: construction procedure, design and bearing behaviour
- DIN 4026 — Driven piles: Construction procedure, design and bearing behaviour.

Furthermore, the ICE Specification for Piling and Embedded Retaining Walls (latest edition) shall be observed**.**

From the detailed study of the sub-surface ground conditions, the type of foundations required for each location shall be determined to suit the loads imposed.

The foundation/soil improvement could include any of the following:

- shallow foundations on existing ground/improved ground
- sand piles
- bored cast-in-place concrete piles
- driven piles
- vacuum consolidation.

The Contractor may propose any other type of foundation and ground improvement as required provided the proposal is based on proven engineering and acceptable standards and codes of practice. As a part of the design of the works and after fully detailed ground investigations, the Contractor shall submit for the Employer's approval a comprehensive foundation plan for the works proposing the type of foundation for each part of the works.

The turbine/generator pedestal foundations shall be independent of the enclosing turbine building foundations.

All large tanks shall be dimensioned so that their aspect ratio (height/diameter) is less than about 0.4. The tanks can then be supported on ring type foundation under perimeter walls. The Contractor shall demonstrate the adequacy of the ring beam foundation, without piles, from total and differential settlement and will be subject to Employer's review and approval.

Dewatering
During the foundation works the excavated areas, foundation levels and pits are to be kept free of water down to at least 1.0 m below the foundation level.

Damp proof course and Waterproofing
All foundations, footings and slabs in contact with ground water shall be of water tight concrete in accordance with DIN 1045 or equivalent approved standards and shall be protected against water action and rising damp in accordance with:

- DIN 18195
- DIN 18336.

All foundations, footings and slabs in contact with ground shall receive a bituminous coating.

Damp proof course (DPC) thickness shall be applied to brick and block walls at about 300 mm above ground level to check rising damp. The DPC shall be in accordance with DIN 18195 or equivalent approved standards.

Pitwall stability
The excavated pit sides, walls or slopes have to be stable and established with respect to safety regulations.

Settlement and expansion joints
Joints are to be arranged in such a way that stresses and strains caused by settlements, temperature, differential settlement, etc. do not adversely affect the structures. The settlement joints shall run through the complete structure down to foundation level, the expansion joints however shall stop on the top level of foundations.

The joint width shall be at least 2 cm.

Settlements of all relevant structures shall be measured, recorded and shown in diagrams according to BS EN 1997-1 or other equivalent standards.

Foundations at different depths
Foundations at different levels should be based beyond a load spread angle of 30° (against the horizontal).

Safety against uplift
For all parts of the structures extending into the ground water, safety against uplift has to be guaranteed during all execution stages.

Soil replacement
If unsuitable soils are encountered below the foundation level or basement floor, they are to be replaced by suitable layer-wise compacted material down to the bearing soil.

B9.4.5 Piling works

These specifications cover the requirements for the materials, the installation and the realization of bored cast-in-place concrete piles with grouting at the base, if required, and driven piles.

The piling works and design shall be in accordance with BS EN 1997-1 or equivalent.

Two types of piles foundation can be proposed and quoted by the Contractor: driven piles or cast-in-place bored piles.

The net vertical pile capacity computed from the soil investigation report is used to determine the maximum test load in case of piles testing.

Bored cast-in-place piles
The piles are drilled up to the depth indicated by the pile drawing submitted by the Contractor and approved by the Employer. For each pile, the Contractor draws up the geo-technical profile of the drilling with description of the strata and samples taken for each stratum as mentioned in the piling record item of these specifications. A representative sample from each stratum will be kept in tight packing until the end of the works.

A suitable type of drilling equipment shall be provided in order to penetrate obstacles (e.g. boulders) which may be met during the execution of the piles.

Generally drilling operations shall be carried out in such a way as to avoid any disturbance of the surrounding soil. A temporary casing shall be installed to the full depth of the borehole. The bottom of the casing shall

always be kept sufficiently below the excavated borehole bottom, in order to prevent inflow or loosening of the adjacent soil.

When drilling below the groundwater table inside the casing shall always be maintained above the natural groundwater level by at least 1.5 m, i.e. water has to be added accordingly.

Just before reinforcing and start of concreting the pile foot is to be cleaned out so that no disturbed, loose or weak soil remains below the pile tip.

Driven piles
The weight of the falling mass must always be adequate to take down the piles at the depth defined at the project.

In case of damages to the adjacent piles, for example observation of concrete raising in the neighboring piles, the Contractor must alter the driving sequence.

The pile driving is carried out following a sequence in order to avoid, as much as possible, an increasing of the driving resistance for the last piles. Each pile has to be driven continuously until the specified depth has been reached.

The Contractor immediately informs the Employer in case any unexpected change in driving characteristics occurs and proposes methods to solve the problem. A detailed record of the driving resistance over the full length of the nearest available pile will be taken if required by the Employer.

The Contractor gives adequate notice and provides all facilities to enable the Employer to check driving resistances; a set of blows recordings is taken only in the presence of the Employer unless otherwise approved.

The final set of blows has to be recorded for each pile either as the penetration in millimeters per 10 blows or as the number of blows required to produce a penetration of 25 mm (see item on piling record of these specifications).

Staking out-tolerances
The landmarks to be used for the implementation of the piles must be effective, solid and well protected.

The method of location of the piles is a duty of the Contractor. The setting out has to be carried out from the main grid lines of the respective structures.
The maximum allowed deviation of the piles center from the theoretical location shown on the setting out drawing is 50 mm in any direction. The maximum permitted deviation of the completed pile from the vertical is 20 mm per meter (2.0%).

Cut-off
The piles are to be concreted up to a minimum of 60 cm above the cut-off level. The cut-off must eliminate all polluted or poor characteristics concrete at the top of the pile and should be carried 10 cm into sound concrete.

The concreting of the raft may start only after the cut-off of the pile and after obtaining a satisfactory resistance of the pile concrete.

The cut-off must be carefully performed according to a method approved by the Employer. The concrete in the head of the pile shall be carefully broken away from the reinforcement, which shall then be cleaned and bent as shown on the drawings or as directed. The concrete surface at the cut-off level shall be horizontal, plane and free from all loose aggregate.

Piling Records
For each pile, a piling record book giving the main checked values during execution shall be drawn up and updated by the Contractor with all the work hazards and incidents. That record book shall be submitted daily to the approval of the Engineer as the execution proceeds.

This record book shall include for each pile details on:

- location, reference number (corresponding to the number fixed on the drawing), type and diameter of the pile;
- length of the temporary casing;
- date and hour of start and end of each operation drilling, reinforcement setting, concreting;
- level from which the pile is bored or driven (platform level);
- level at the pile base;
- top level of the concreted pile before the cut-off operation;
- used materials (driving or drilling tools, concreting equipment);
- cleaning results of the bottom of the hole before putting down the reinforcement cage and before concreting;
- nature and description of the encountered soils;
- poured concrete volume and theoretical volume (measured concrete curves);
- behavior, workability, fluidity of concrete, results of the compression tests;
- water level within the hole before concreting;
- for driven piles, the refusals corresponding to the three last sets of blows (10 hammer blows) shall be noted for each pile; for one pile from each 20 piles, a driving diagram shall be drown up;
- type of boring-chisel, lengths of piles where chisel has been used.

Records shall be submitted in duplicate to the Engineer every following working day until 9 a.m.

The Contractor shall submit to the approval of the Employer/Engineer a proposal of piling record sheets including all the details mentioned above.

Pile tests
The Contractor shall carry out pile tests on a minimum of 0.5% of total no. of working piles of each type. The piles to be tested shall be to the approval of the Employer.

The tests shall include as minimum:

- compression load test at piles
- lateral load test at pedestal piles.

In addition, at least one Test Pile for each of the main structures shall be tested and approved before the commencement of the working piles for that structure.

The maximum test load shall be 2.5 times the working load for Test Piles and 1.5 times the working load for tests on working piles.

The loading materials and equipment, the measurement devices and procedures shall all be to the approval of the Employer. All tests shall be carried out only under the supervision of an experienced and qualified supervisor familiar with the test equipment and test procedure. All personnel operating the test equipment will have been trained in that field. The number of increments of load shall be a maximum of 25% of the design load,, with a decreasing of load down to zero after each increment.

In the case of a test failing to meet the set criteria, the Contractor shall propose for the approval of the Employer his plan for the necessary changes in the pile design without any cost implication to the Employer.

B9.4.6 Concrete works

B9.4.6.1 General

The concrete works shall be based on applicable approved codes and standards.

In general, the concrete for foundations shall be Grade 30. The type of cement to be used shall satisfy the requirements of the relevant international and local Standards or equivalent.

All materials used for concrete and reinforced concrete structures shall be of the best quality and free of defects likely to undermine the strength and shorten the service life of the works. The materials furnished shall comply with the agreed standards with the requirements of the soil investigation report

regarding the aggressively of soil and water and with all requirements set out in these Specifications. The high sulfate content according water analysis shall be considered for concrete in contact with sea water.

All materials shall be stored and handled in a manner that will prevent contamination and/or deterioration. Deteriorated and/or contaminated material shall not be used for the concrete and shall be removed from the site at the expense of the Contractor.
All aggregate and sand used in the production of concrete shall be thoroughly tested for silica alkaline reaction, flakiness, aggregate crushing value etc.

The design and execution of the works shall consider a minimum development, the corrosion risks and the durability of the concrete and be based on the latest applicable approved codes and standards as listed in **Section B0**.

B9.4.6.2 Materials for concrete

Cement
The cement used for concrete, reinforced concrete, mortar, grout and plaster (acid or see water resistant) works shall be Ordinary Portland Cement, if no special quality is requested by the soil investigation reports. The cement shall comply with EN 197-1. The manufacturer's test certificate will normally be accepted as proof of compliance with Specifications but the Employer may order further tests as specified in the relevant standards. The Contractor shall bear all expenses required for the preparation, dispatch, and tests of the samples.

All accepted cement shall be delivered to the site in strong, sealed, waterproof containers unless written approval to the contrary is given. All cement delivered shall be marked in accordance with standards, stating the following particulars: type of cement, strength category, manufacturer, weight, quality control marking, date and transport data.

The cement shall be protected against all impurities and dampness during transportation and storage on the site. Sufficient cement shall be stored on site to ensure continuity of the works and to allow testing of any consignment before it is required for use. All cement shall be fresh when delivered. Cements of different types shall not be mixed one with another. Consignments shall be used in order of delivery.

Cement shall be stored in bags or in unopened containers on a dry, raised platform in a well ventilated but watertight building.

Cement shall be kept in the store until actually required for use on the works and any cement temporarily placed near the mixer shall be adequately protected. Cement stored on site for a period longer than two months shall be laboratory tested before use.

Water
The water shall be clean and free of salt, oil or acid, organic material or other matter harmful to the finished product and shall be from a source approved by the Employer. The Contractor shall undertake tests to determine the sulfate content and acidity of the water and make adequate arrangements to deliver and store sufficient water at the work site for use in mixing and curing the concrete. Water shall comply with the requirements of BS EN 1008 or equivalent.

Aggregates
Materials used as aggregate shall be obtained from a source known to produce aggregate satisfactory for concrete and shall be chemically inert, strong, hard, durable, of limited porosity and free from adhering coats, clay lumps or organic impurities that may impair the strength or durability of the concrete. Aggregate shall comply with and be tested in accordance with the requirements of BS 812, BS 882, BS 1199 and BS 1200 or equivalent.

Each size of aggregate shall be separately stored in a manner that will prevent contamination, intermixing and/or segregation. The equipment and methods of handling aggregates shall be such as to prevent deterioration and contamination of the stockpiles.

Frequency of testing the aggregates shall be at least as follows:

Frequency of testing

Test Type	Coarse Aggregate	Fine Aggregate
Grading of each	Daily	Daily
Grading of combined aggregates	Daily	Daily
Specific gravity	7 days	7 days
Magnesium sulphate soundness	30 days	-
Clay silt and dust content	Daily	Daily
Shape (elongation and flakiness)	Twice a week	-
Los Angeles abrasion	Initially only	Initially only
Moisture content	2 days	Daily
Drying shrinkage	Initially only	Initially only
Organic impurities	30 days	30 days

Fine aggregate shall be clean natural sand or sand derived by crushing stone and shall consist of hard, dense, durable uncoated particles. Sand derived from stone unsuitable for coarse aggregate shall not be used as fine aggregate.

The grading of the aggregates shall be such as to produce a concrete of the specified proportions, which will work readily into position without segregation and without the use of excessive water content. Grading shall be controlled throughout the work so that it conforms closely to that used for the preliminary tests.

Washing, screening, classifying and other operations on the fine aggregate required to meet this specification shall be done by the Contractor. Washing is required if the content of salt and other impurities adhering to the aggregates exceed the level given in the standards.

Coarse aggregate shall be crushed or uncrushed gravel or crushed stone and shall be free of decomposed stone, clay, earth or other deleterious substances. The specific gravity of the coarse aggregate shall be not less than 2.5 t/m^3. Aggregate of crushed natural stone is deemed adequate if the stone reveals a crushing strength of 1000 kg/cm^2 when tested. Friable, flaky and laminated pieces, mica and shale shall only be present in such quantities as not to affect the strength and durability of the concrete.

The grading of coarse aggregate for concrete shall comply with the requirements of BS 882 or equivalent. Samples of aggregates shall be submitted to the Employer, together with a sieve analysis showing the proportion by weight passing sieves. Should it become necessary to change the source or characteristics of the material supplied, this shall only be done after additional tests.

Concrete additives
If necessary, concrete additives approved by the Employer could be used to improve consistency, workability, quality and strength of the concrete. Waterproof concrete and mortar shall be used where necessary. Waterproofing shall be achieved by an approved brand of additive, which shall be used in accordance with the manufacturer's instructions.

Accelerating and retarding additives shall only be used in case of necessity and after obtaining the written approval of the Employer.

Plasticizers and air entraining additives
Plasticizers and air entrainers are intended to reduce bleeding of free water at the surface. It shall only be used after the written approval of the Employer and in accordance with the manufacturer's instructions.

B9.4.6.3 Concrete mixes

The mix proportions shall be determined by proper mix design based on the requirements for strength, workability and the particular site in which the concrete shall be placed. The design of mixes shall be based on the principles of BS 5328 or equivalent (e.g. DIN 1045) and the British Building Research Station Publication: "Design of Normal Concrete Mixes".

Before concreting commences, the Contractor shall make trial mixes to determine the mix proportions required to produce the strengths specified for each class of concrete and for each degree of workability required to allow placing transporting and compacting of the concrete. Only materials which the Contractor intends to use for concreting shall be used in the trial mixes.

Test cubes from trial mixes shall be made and tested in accordance with BS 1881 or equivalent (e.g. DIN 1048 Part 2).

The amount of water used in the concrete shall be adjusted as required to ensure such a consistency that it can be readily transported, placed and compacted without segregation of the materials or bleeding of free water at the surface. Addition of water to compensate for stiffening of the concrete before placing shall not be permitted. Consistency of the concrete shall be checked by slump tests and shall not exceed the values given by BS 5328 and BS 1881 or equivalent.

The cement and aggregate shall be thoroughly mixed in a batch-type pug mill mixer. The capacity of the mixer shall not be less than 1 (one) cubic meter. Partly set or excessively wet concrete shall not be used. No concrete shall be mixed by hand except some small quantities approved by the Employer, the proportion of cement in this case being increased by 10%.

The Contractor shall establish and maintain a field laboratory on the site and this laboratory shall be available at all times to the Employer. The laboratory shall be adequately equipped to ensure that all necessary testing work can be carried out in compliance with the standards.

B9.4.6.4 Strength of concrete

All test cubes shall be made and tested for compressive strength in accordance with BS 1881 or equivalent.

The minimum required strength for different classes of concrete is as follows:

Grade	Characteristic strength N/mm^2	Lowest grade for compliance with appropriate use
7	7.0	lean concrete
10	10.0	plain mass concrete
15	15.0	reinforced concrete with lightweight aggregate
25	25.0	reinforced concrete with dense aggregate
30	30.0	reinforced concrete with dense aggregate (in contact with seawater, waste water and below ground level)
35	35.0	reinforced concrete with dense aggregate (Turbine Foundation, Boiler feed Pump Foundation)
30	30.0	pre-stressed concrete with post-tensioned tendons
40	40.0	pre-stressed concrete with pre-tensioned tendons
50	50.0	precast concrete members

The characteristic strength shall be determined from test cubes of 150 mm nominal size at an age of 28 days.

B9.4.6.5 Transport of concrete

Immediately after mixing, the concrete shall be conveyed to the place of use as rapidly as possible using methods, which will prevent the segregation, loss or contamination of materials. The concrete shall be placed and compacted within 30 minutes of the addition of water to the mix. Any concrete left unplaced after this time shall be rejected and removed from the site.

The concrete shall be transported in clean metal buckets, barrows, dumpers, or trucks. Before using concrete pumps, placer pipelines, chutes or spouts it is necessary to have the written approval of the Employer.

B9.4.6.6 Concreting operations

All concreting methods shall be subject to the approval of the Employer.

Concrete placing shall not be started until the Employer has approved all preparation of forms, reinforcement, joints and all mixing, conveying, spreading, curing, finishing and protection equipment.

Concrete shall be placed in the forms as close as possible to its final position in a single operation to the full thickness of slabs and beams and shall be placed in horizontal layers, not exceeding 2.5 m height in a single pour in walls, columns and similar members.

The Contractor shall organize the pouring of concrete in such a manner that once concreting of a section has started the operation shall be continuous and each operation shall be completed prior to a stoppage.

Where specified on the drawings, construction, expansion or contraction joints shall be provided and the concrete shall be poured continuously between two adjacent joints. No other joints than shown on the drawings shall be permitted. Stoppage (cold) joints formed between two concreting operations separated by more than six hours time shall be subject to the same treatment as the construction joints.

Concrete which has partially hardened shall not be exposed to injurious vibration or shock, except for controlled re-vibration where specified. When concreting of a certain large structural element is specified strictly as to be poured continuously, then the concreting operations shall be organized for day and night working, in long shifts, as necessary.

As concrete is being placed it shall be compacted by mechanical vibrators, to obtain a dense material free from honeycombing and without water or air holes.

The Contractor shall ensure that the vibrators are used in such reinforcement is not displaced, the formwork not damaged and no segregation caused, but complete compaction of the concrete is achieved.

The concrete face shall have the finishes indicated on the drawings or in the present Specifications. The finished surface of the concrete shall be sound, solid and free from honeycombing, protuberances, air holes or exposed aggregate. No plastering, cement wash, mortar or paint shall be applied to cover defective concrete surfaces.

Construction, expansion and contraction joints
The number of construction joints shall be kept as low as possible consistent with reasonable precautions against shrinkage. Concreting shall be carried out continuously up to construction joints.

Where it is necessary to introduce construction joints, careful consideration shall be given to their exact location, which shall be indicated on the drawings. Alternatively, the location of joints shall be subject to agreement between the Employer and the Contractor before any work commences.

Immediately prior to recommencement of concreting on a joint, the surface of the concrete against which new concrete will be cast shall be free from laitance and be roughened to the extent that the largest aggregate is exposed but not disturbed. Care shall be taken that the joint surface is clean immediately before the fresh concrete is placed against it.

Expansion joints, contraction joints and otherwise permanent structure joints shall be provided at positions shown in the drawings. Joints shall be straight and vertical, except where otherwise specified and concrete surfaces on both sides of the joint shall be flush. Where necessary, water stops of a type approved by the Employer shall be embedded in the concrete. To ensure a good tightness with or without movement of the joints, the water stop shall be provided with anchor parts.

Concreting at night
When approval is given to carry out concreting operations at night or in places where daylight is excluded, the Contractor shall provide adequate lighting at all points of mixing, transportation and placing of concrete.

Concreting in high ambient temperature
For concreting in high ambient temperatures the "ACI Standard 305 – Concreting in Hot Weather" shall apply.

The Contractor shall take special measures in the mixing, placing and curing of concrete; alternatively all pouring and finishing works shall be done at night. These measures shall include the shading of aggregates, spraying of aggregates with water, cooling of the mix constituents (introduction of ice to the mixing water) and reduction of transportation time to the minimum.

During pouring suitable measures shall be provided to prevent setting of concrete placed in contact with hot surfaces. All concreting areas, formwork and reinforcement shall be shielded from the direct sun rays and sprayed with water when necessary.

Concrete subject to chemical attack
Concrete with increased resistance to chemical attack shall meet the provisions of DIN 1045 or equivalent. Liquids, soils and vapours aggressive to concrete should be judged in accordance with DIN 4030 and be classified according to 'mild', 'severe' and 'very severe' attacks.

The resistance of concrete to chemical attack depends on its imperviousness. The concrete must be at least sufficiently dense to ensure that the maximum depth of water penetration tested according to DIN 1048, does not exceed 6 mm in the case of mild attack nor 3 mm when exposed to severe attack.

Concrete, which is likely to be exposed to severe chemical attack for a prolonged period shall be suitably protected by an adequate coating system, and this shall be subject to the Employer's approval.

All vertical concrete surfaces in contact with soil shall receive two coats of bituminous coating. Soffit and side of foundations shall be protected by means of suitable membrane installation. For basements of buildings and water tight basins protection of concrete surfaces below ground level shall consist of an approved self-adhesive pressure sensitive membrane. The membrane shall adhere to all concrete surfaces, including undersides of structures and other surfaces where concrete is cast in contact with the membrane. The membranes shall be installed strictly to the manufacturer's instructions. The membranes shall extend 150 mm above ground level.

All exposed concrete surfaces above ground (foundations, superstructures, etc.) shall be protected by epoxy coating with a compatible primer penetrating into the concrete. The epoxy coating must be able to bridge the maximum allowable crack width. The minimum thickness of this coating shall be 300 microns.

Alternatively, where appropriate the concrete surfaces shall be protected with approved tiles. In case any structural parts of concrete are likely to be exposed to chemical attack, crack width for such structural parts shall be designed not to exceed the dimension prescribed by the coating manufacturer.

Concreting under water
Underwater placing of concrete may be allowed for un-reinforced components, or as approved by the Employer. The placing being performed exclusively with stationary tremies and shall be in accordance with the requirements of relevant standards.

The min. cement content shall be increased by 50 kg/m^3 for underwater concrete.

Underwater concrete is to be placed continuously without interruption. The concrete is to be placed in such a way that is does not fall freely through the water. The tremies must at all times dip sufficiently far into the freshly placed concrete to ensure that the concrete emerging from the tremie does not come into contact with the water. All work connected with the placing of concrete under water shall be designed, directed and inspected with due regard to local circumstances and purposes. Work shall not proceed until all phases and methods to be used in the placing operations have been approved by the Employer.

Protective measures for concrete
In general the cover of rebars shall be as per BS EN 1992-1-1 or equivalent taking into account the site conditions (high temperature, humidity).

Immediately after the compaction of the concrete has been finished, the Contractor shall ensure adequate protection from the weather. Excessive drying can lead to crack formation as a result of plastic contraction. The concrete surface shall be covered with a layer of sacking, canvas, straw mats or similar absorbent material, special protection sprays or a layer of sand kept constantly moist for at least 14 days.

Curing compounds or other methods of preventing evaporation may be used if approved by the Employer.

Where large sections of concrete are poured, special precautions subject to the approval of the Employer shall be taken to reduce and dissipate the heat generated by setting and hardening of the concrete.

Repair of damaged or defective concrete
Concrete which has completed its final setting shall be inspected by the Employer and any cracks, honeycomb areas, segregations, etc. shall be marked. No repairs shall be carried out until so directed by the Employer.

Dimensional tolerances
The permissible tolerances shall comply with the BS 5606 and BS EN 1992-1-1 or equivalent.

B9.4.6.7 Finishing of concrete surfaces

The concrete face shall have the finish indicated on the drawings or in the specifications.

All surfaces, which may come into contact with oil or oily water, will have to be adequately protected (paint, etc.). The finished surface of all concrete work shall be sound and free of defects. No plastering, cement wash or mortar shall be applied to cover defective concrete faces.

The fairfaced concrete placed against shuttering shall be rubbed down with a carborundum stone immediately upon removal of the shuttering to remove fins or other irregularities. The face of the concrete for which shuttering is not provided, other than slabs, shall be smoothed with a wooden flat to give a finish equal to that of the rubbed down face where shuttering is provided. The cavities left by formwork fixing devices shall be made good closing the hole with plastic plugs and epoxy mortar. In watertight concrete structures the formwork fixing devices shall be of such a design as not to leave any holes after removing the shuttering.

All exterior corners of reinforced concrete shall be chamfered at least 25 mm x 25 mm, at stair treads 10 mm x 10 mm.

The top or final surface of all concrete works shall be finished by screeding, or floating, or trowelling or grinding, or tooling as approved by the Employer.

Dry cement or cement and sand shall not be used to dry excess water on the concrete surface.

Floors and slabs, which are required to be finished smooth, shall be trowelled just before the setting of the concrete.

Screeding:	This shall be executed by moving a straight edge or template by hand or by mechanical means immediately after compaction of the concrete.
Floating:	This shall follow screeding, but shall not be started until some stiffening of the concrete has taken place.
Trowelling:	Where specified as necessary, floating shall be followed by finishing until a smooth surface free from defects is obtained.
Grinding and tooling:	Where specified, the methods to produce the desired surface shall be approved by the Employer. Grinding and/or tooling shall not start until the concrete has hardened sufficiently to prevent dislodgment of the aggregate.
Chiseling:	Wherever possible all chiseling works shall be carried out with mechanical devices. Manual chiseling may be required at difficult points.

Exposed concrete surface treatment

Exposed concrete surface of a structure shall be coated with an approved clear silicone water repellent suitable for application on the concrete.

B9.4.6.8 Formwork

Design and construction
For the proof of stability and for the type of formwork and support framing used, BS 3809 or equivalent shall be used.

The formwork and the supporting structure shall be so dimensioned as to be able to withstand all vertical and horizontal forces safely shall be sufficiently rigid to maintain the forms in their correct position and to be true to shape and dimensions so that the final concrete is within the limits of the dimensional tolerances specified in Clause "Dimensional tolerances" herein.

The Contractor shall submit for the approval of the Employer the calculations, designs and details of the methods adopted and materials proposed for the formwork.

Forms shall be constructed from steel or from sound timber well seasoned and free from shakes. Plywood lining for forms shall be of timber, which is resin bonded and water repellent. Formwork surfaces in contact with concrete shall be free from adhering grout, projecting nails, splits or other defects.

Joints shall be sufficiently tight to prevent the leakage of cement grout.

Before concrete is placed, all formwork shall be inspected to see if it is built according to the approved plans and to see if it has been cleaned and is free of sawdust, shavings, dust, mud, earth or other contamination and properly oiled. Contact surfaces of panels shall be treated with a suitable release agent (e.g. non staining mineral oil) where applicable. Surfaces, which are not oiled, shall be wetted thoroughly to prevent warping.

If the formwork for columns is erected to the full height of the columns, one side shall be provided with openings for concreting in order to guarantee a proper compaction of the poured concrete.

Formwork for walls and elsewhere shall be arranged for a as large as possible concreting height of one floor level in a single pour. Where necessary, panel openings shall be provided in the forms for cleaning, inspection, access of vibrators, etc.

Before placing of concrete, bolts, ties and fixings shall be positioned and all devices used for forming openings, holes, pockets, chases, recesses, etc. shall be fixed to the formwork carefully.

Where concrete surfaces will be exposed to view (permanently exposed surfaces) the formwork shall be such as to produce a completely true, smooth surface, free from perceptible irregularities or to show clearly the

desired texture. Such formwork shall be marked on drawings as "Fair-faced Formwork".

Internal spacers and ties, if any, shall be so arranged that after removing of the forms no holes shall extend through the concrete, in the case of watertight concrete or be closed by plastic plugs and epoxy mortar in all other cases. All formwork will be inspected and approved by the Employer before concrete placing commences but this shall not relieve the Contractor of any of his responsibilities under the contract.

Formwork shall not be removed until the concrete has sufficient strength to carry its own weight plus any constructional or design loads which it is likely to be subjected to it with a normal factor of safety. It shall be removed in such a manner that no shock or damage shall result to the concrete.

Before removal of the formwork the concrete shall be examined and removal shall proceed only on the instructions and under the supervision of a competent person.

The minimum period for striking the formwork (cast-in-situ concrete made with Ordinary Portland Cement) under specified conditions may be taken as follows:

- soffit formwork to slabs 4 days (*)
- soffit formwork to beams 10 days (*)
- vertical formwork to columns, walls and large beams 1 day
- props to slabs 10 days
- props to beams 14 days
- (*) props left under

Extreme care shall be taken to avoid chipping of corners during removal of formwork.

B9.4.6.9 Reinforcing steel

Reinforcing steel used in reinforced concrete shall comply with DIN 488-2 and 488-4 or equivalent.

All reinforcement shall be hammered free of scale, scraped and wire brushed free of all loose rust and after such treatment shall be within the margins allowed by the Standards. The reinforcing steel shall be free of oil, grease or preservative coatings.

The Contractor shall supply the Employer with the manufacturer's certificate stating the process of manufacture and a test sheet giving the results of each of the materials purchased and, when required, the chemical analysis and all tests as specified in the relevant standards.

In particular it shall be possible to derive the following data from the stress-deformation curves:

- ultimate tensile strength
- guaranteed yield stress
- permissible stress
- elongation.

Reinforcing bars shall be transported and stored so that they remain clean, straight, undamaged and free of corrosion, rust or scale.

Reinforcement shall be cut and/or bent in accordance with BS 8666 or equivalent standards.

Reinforcement shall be accurately fixed and secured against displacement in the position shown in the drawings by means of spacers, chairs or other supports in order to maintain the reinforcement in its correct position, within a tolerance of 3 mm. For the distance between the bars (horizontal and vertical distances), the requirements according applicable standards shall be observed.

Jointing of reinforcement bars by welding on site shall be avoided if possible, but where necessary the requirements of BS EN 1992-1-1 or equivalent standards have to be observed.

Where reinforcement is to remain exposed to the weather for a prolonged period, a thick cement grout shall be applied to the bars.

Grounding of reinforcement
Reinforcement shall be grounded according to the requirements laid down in other parts of these specifications.

B9.4.6.10 Durability of concrete

All measures necessary in the design and selection of materials including the following shall be taken to ensure the required durability of concrete for the various concrete elements:

- Maximum crack width in the design of all reinforced concrete for structures in contact with water or chemicals and for major structures shall be kept below 0.20 mm. This value might have to be varied depending of the required coating system (e.g. stack).
- Maximum crack width in the design of all reinforced concrete for all normal structures shall be kept below 0.30 mm.
- In general, reinforcement for cast-in-place concrete shall have a minimum cover of 40 mm. For concrete in contact with the ground or sea water, the minimum cover shall be 75 mm.
- specify clearly location of expansion and construction joints and their surface preparation

- specify foundation surface coating and of concrete surfaces above ground
- specify type of cement appropriate for the ground water, the soil conditions and ambient temperatures
- use smaller size reinforcing bars well distributed in the tensile zone
- limit the tensile stress in reinforcement
- ensure adequate slope for concrete surfaces likely to receive rainwater or chemicals
- provide chamfers at all concrete edges
- provide strict measures for concrete curing to prevent plastic shrinkage and thermal gradients resulting from early age heat of hydration of the fresh concrete.

B9.4.7 Structural steel works

B9.4.7.1 Materials

All ferrous materials, their dimensions, forms, weights, tolerances, chemical and mechanical properties, shall be the best of their kind, complying with relevant international Standards.

All structural steel material shall be minimum S235 for rolled steel shapes, angles, tees, plates, etc. having a minimum yield stress of 235 N/mm².

In the case of structural steel work, care shall be taken that all parts in the assembly fit accurately together and corresponding parts shall preferably be interchangeable.

The Contractor shall submit to the Employer for approval the country of origin and manufacturer of the steel he proposes to supply.

The structural steelwork and testing shall comply with the relevant clauses of BS 4, BS EN 10162, BS 4360 and BS 6323 or equivalent standards.

Each steel part shall be marked with the manufacturer's name or trademark.

The steelwork shall be manufactured by a specialist firm approved beforehand by the Employer. As much of the work of manufacturing of the steelwork as is reasonably and technically practicable shall be executed in the manufacturer's works, and facilities for inspection by the Employer shall be provided.

All steelwork before and after manufacturing shall be smooth, undeformed, straight and free of cracks, twist and burrs. All steelwork shall be cut and fabricated to a tolerance of ± 1.5 mm in its length. All plates shall be truly at right angles to the longitudinal axis of the section. No work shall be painted, packed or dispatched from the manufacturer's works until it has been inspected and complies with or has been certified to comply with all the

tests and requirements of the standard applicable to the material specified and until it has been inspected and approved.

Tests
The manufacturer's test certificate for all steelwork shall be supplied to the Employer. The certificates shall state the manufacturing process and shall include a test sheet giving the results of the mechanical tests and the chemical composition. The Contractor shall provide free of charge any supplementary tests reasonably required by the Employer. Steel which do not conform to the specified standards shall be rejected at the expense of the Contractor. No steelwork shall be delivered from the manufacturer's works until it has been tested and the results comply with the requirements of the relevant standards.

B9.4.7.2 Workmanship

Tolerances
Care shall be taken to ensure that the tolerances specified on the drawings or the relevant standards are worked to. The erection tolerance for cleated ends of members connecting steel shall be not greater than 2 mm at each end. No work shall be painted, packed or dispatched from the manufacturer's works until it has been tested and complies with all requirements of the standards.

Cutting
Cutting may be by shearing, cropping, sawing or machine flame cutting. Hand flame cutting shall be avoided. If rolled products for steel structures under predominantly static loading are cut by flame-cutting or shearing there will generally be no need for a finishing operation if the cut surface is free of defects.

Bolting
The threaded portion of each bolt shall project through the nut by at least one thread. Approved high strength friction grip bolts, preferably the type with indicated load, shall be used where specified and shall be tightened strictly in accordance with the manufacturer's instructions and the relevant regulations. The surfaces in contact shall not be painted and shall be free of oil, dirt, loose rust, burrs and other defects, which would prevent proper seating of the parts or interfere with the development of friction between them.

When connections are made using high strength friction grip bolts the relevant standards shall be observed.

Welding
The execution and testing of welding shall be in accordance with BS EN 1011-1, BS EN 1011-2 or equivalent standards.

All welds, unless otherwise stated shall be continuous minimum 6 mm fillet weld and shall be dressed smooth, free of porosity, cracks, holes and finished to match adjacent surfaces. When welding operations are

completed, all welding flux shall be removed without delay. Cooling of welds shall not be accelerated by any special measures.

Site welding shall be restricted to the absolute minimum. Site welding is subject to approval by Employer. The examination of welded work and the inspection of welds during and after manufacture shall be carried out by responsible specialist welding engineers. Welding shall be carried out by expert trades men and in strict accordance with the current code of practice.

Painting
Surface treatment and painting before and after delivery to site shall be in accordance with Section B0.

Parts to be encased in concrete shall not be painted or oiled. Surfaces inaccessible after shop assembly shall receive the full-specified protective treatment before assembly.

Erection
The Contractor shall supply all suitable plant, hoisting gears and tackles for the erection of the steelwork and shall provide all temporary baulks, struts, shores, etc.

Steelwork damaged due to inadequate precautions being taken during the storage, transport and erection of the steelwork shall be made good to the satisfaction of the Employer at the Contractor's expense.

All shop connections shall be made by electric welding. All site connections shall be bolted unless otherwise specified in drawings or directed by the Employer.

Encased steelwork and steel in foundations shall be solidly encased in concrete with a minimum cover of 100 mm. Anchors of the required structural strength shall be used as holding down anchors in concrete foundations for columns. Sole plate of the column shall be grouted with low shrinkage grout of 50 mm nominal thickness.

The grout shall be shaped with an inclination of 45°from the lower edge of the sole plate to avoid stagnant water.

Rejection
Any steelwork, which in the opinion of the Employer is not in accordance with the requirements of the standards or with the specifications, shall be mandatory rejected and removed from the site at the Contractor's expense.

B9.4.7.3 Small non-structural steel parts

General
This Clause refers to the specifications covering the provision of all materials and labor in relation to supply and manufacture on site of articles made of steel or cast iron.

All steel structures and parts specified under this clause shall be hot dip galvanized and painted according to **Section B0.**

The list of small items to be furnished shall contain but not be limited to the following:

- steel sections, bent plate sections and square bars for construction of:
  - metallic stairs, platforms and walkways
  - railing for stairs, platforms, walkways and protective around floor openings
  - corner and edge protection for concrete steps and concrete
  - structural parts such as columns, beams, removable cover slabs, etc.
  - support of any equipment foundation
  - joint covers
  - anchors, ties, hangers, inserts, slots, embedded steel parts, etc.
- steel pipes and plain round bars for making guardrails and ladders
- steel plates, chequered and/or flat, for fabrication of removable covers
- open steel grating for metal steps, platforms, and walkways.

Materials
The requirements for materials of structural steel specified herein are applicable to all steel sections, bars, plates, pipes and any sections as far as their quality, source, dimensions, mechanical characteristics and their delivery, handling, storage and tests on site are concerned.

B9.4.8 Roof and wall cladding

Metal cladding
The insulated sandwich roof and wall construction shall consist of a double skin construction, rear ventilated and comprising the following:
Internal liner profile: trapezoidal profile min. 0.75 mm thick.

Insulation core: 60 mm (minimum) thick non-combustible material like glass wool or similar of density not less than 16 kg/m^3.

External weathering profile: trapezoidal profile min. 0.75 mm thick
The sheeting unit shall be a multilayer, protected metal system consisting of a trapezoidal galvanized steel substrate, heavy epoxy base coat and a high build weather coat of polyurethane as follows:

Substrate
Hot-dipped galvanized steel substrate, with a minimum zinc coating weight of 275 g/m^2 total both sides. The steel substrate shall be min. 0.75 mm thick.

Pre-treatment
After cleaning, a "chemical conversion" of the zinc coating to a non-metallic surface with corrosion inhibiting and adhesion additives shall be applied.

Primer
Nominal 8-micron thick anti-corrosive pigmented epoxy primer applied to both sides of the sheet.

Epoxy barrier coat
Nominal 70-micron thick TF Epoxy Barrier coat with special flexibilizer compounds applied to both sides of the sheet and baked to a hard corrosion resistant finish.

External weather coat
Nominal 40 micron thick urethane exterior coating pigmented in one of the standard colors of the manufacturer's color range.

Internal decorative coat of the interior profiled liner
Nominal 20 micron stoving polyester decorative finish.

Requirements for walls
These requirements apply to all walls (not only for wall cladding).
External walls are to be constructed that, taking into account the climatic conditions and any air conditioning plant installed in the rooms as well as the manner of use of the rooms, no damp will penetrate the walls. All external walls must have a minimum sound-absorbing index of 20 dB (A) and a heat transmission coefficient of 0.75 W/m^2 K. Appropriate insulation materials will have to be used to achieve the above mentioned figures.

The walls shall not allow the passage of rain or moisture into the building. The walls shall be provided with all necessary horizontal and vertical damp-proof courses and flashings.

Requirements for roofs
These requirements apply to all roofs (not only for roof cladding).

The roof construction is to be such that, with due allowance for the climatic conditions and any air conditioning plant installed in the rooms, and with the intended use of the rooms taken into account, no damp will penetrate into the materials used.

All roofs must have a minimum sound absorbing index of 20 dB (A) and a maximum heat transmission coefficient of 0.45 W/m^2K. Appropriate insulation materials will have to be used to achieve the a.m. figures.

Roof surfaces are to be designed with a min. slope of 3% for concrete roofs and 5% for metal roofing.

All roofs shall be suitable constructed to serve for PV-Modules. The roofs shall be able to mount the supporting structure and provide sufficient arrangements for operation and maintenance.

B9.4.9 Finishing works

Floor and wall finishes
The finishing works to be applied for the buildings and structures of the plant are listed below. Buildings or rooms not included, or special items, must be agreed with the Employer.

Floor finishes (typical)

Room	Floor Finishes
Switchgear and rooms	Epoxy screed (trowel applied minimum 5 mm thick) and epoxy seal coat
Rest room, toilets, kitchen mess room	Glazed non-slip fully vitrified ceramic tiles.
Offices	Heavy duty PVC sheeting
Corridors, stairs, landings	Vitrified ceramic tiles (floor tiles with epoxy grout)
Battery rooms	Acid resistant ceramic tiles
Control room, relay rooms, electrical equipment	Heavy duty PVC sheeting on false floor
A/C Plant rooms	Carborundum
Instrument/electrical workrooms	Heavy duty PVC / rubber backed tiles
Stores workshop, mechanical work room and store room	3 mm self-leveling oil resistant epoxy screed with non-slip granule finish; see also the specification of buildings.
Transformer pits	Oil-proof hard-wearing epoxy coating

Internal wall finishes (typical)
Plaster (or similar approved) and paint:
Control rooms, MV/LV switchgear rooms, LVAC rooms, computer rooms, restroom, administration areas, offices and similar rooms, corridors, instrument and electrical workrooms, mechanical workroom and storeroom.

Skirting shall be provided in same material as floor finish.

Fair faced block work, cement wash, paint
Switchgear rooms, HVAC mechanical plant rooms, stores and workshop.

Glazed ceramic tiles, plaster and paint above
Glazed ceramic tiles up to a level of 2.3 m and plaster and paint above this level shall be applied in toilets, washrooms, locker rooms, kitchen, etc.

Acid/lye resistant tiles, plaster and acid/lye resistant paint
Acid/Lye resistant tiles, (plaster and acid/lye resistant paint) up to a level of 1.2 m shall be applied in battery room, waste treatment plant, laboratory, rooms where any chemicals and stored, handled or prepared. Plaster and acid/lye resistant paint to remaining walls and ceilings. Suitably approved skirting shall be provided at the base of all tiled or plaster finished walls.

B9.4.10 Sanitary installations

The Western WCs closet seats and covers are to be of plastic of a color to match the tiles. The WCs shall be provided with hand spray with angle valve and hand trigger, 100 cm long hose, toilet roll holders made of chromium-plated brass to be fitted within convenient reach.

The Asian Squatting WCs are to be white ceramic plates (500 x 400 mm approx.) with raised treads for flush installation at floor level. The WCs shall be provided with hand spray with angle valve and hand trigger, 100cm long hose, toilet roll holders made of chromium-plated brass to be fitted within convenient reach.

Washbasins, minimum size 58 x 45 cm, are to be provided with a mixing tap. Above each washbasin is to be provided one mirror, minimum size 70 x 50 cm and one soap dispenser for fluid soap.

Bowl urinals are to be fitted with flushing devices.

Each toilet is to be equipped with one push button operated hot air hand dryer provided with overheating protection.

All rooms where leakages of liquids may occur (pump rooms, wash rooms, toilets, shower rooms, battery rooms, etc.) are to be provided with adequate floor drains, even if this does not result from the relevant civil drawings and/or from the written part of the specification.

B9.4.11 Doors

Metal doors
All internal and exterior and safety doors shall be made of double steel sheet walls, insulated with glazing. Minimum nominal dimensions of doors shall be as follows:

- Single leaf doors: width 1.01 m x height 2.135 m
- double doors to rooms housing valves pumps and similar equipment: width 2.20 m x height 2.135 m
- double doors to rooms housing electrical equipment: width 2.20 m x height 2.50 m.

Steel parts of the doors shall be protected in accordance with the relevant section of the specification for coating of steel surfaces. All doors shall be fitted with approved locks and self closing mechanism.

Fire rated doors shall be all in accordance with the applicable regulations and standards and shall have glazing panel of the same fire resistance as that of the door: G30 or G90 to match T30 or T90.

All doors and gates shall be installed such that rain water penetration is avoided.

Roller-shutter doors
Large openings to buildings shall be fitted with electrically operated rolling shutters as appropriate. An escape door shall be provided next to each rolling shutter. The shutters shall be of double walled hollow sections of galvanized steel protected with coating in accordance with the **Section B0**.

Hand crank with continuous chain reel shall be fitted to operate the door by hand in case of emergency.

B9.4.12 Windows

All windows shall be aluminum with double glazing which meet the requirements of the applicable standards. Each window shall have side and bottom sash fitting and shall safely absorb an impact force of at least 7.5 kN. Scissor type stay shall be designed to prevent the sash from dropping in case of malfunctioning.

The windows shall be resistant to pelting rain. Approved sunshade system shall be provided for windows facing east, west and south.

Window sill shall be of aluminum matching in color with that of the window on the outside and with the color of the room on the inside.

Fastening devices for safety harness shall be provided on the exterior of the building for windows which cannot be cleaned from inside the building or from the floor outside.

B9.4.13 Aviation warning lights

Aviation warning lights shall be provided for the stack and on all tall buildings and structures in accordance with the aviation safety requirements.

B9.4.14 Earthing and lightning protection

All buildings and structures shall be provided with an adequate earthing and lightning protection system (see **Section B7**).

B9.4.15 Roads and surfacing

General
The actual thickness of road-courses shall be calculated based on the results of the soil investigation, loads, intensity of traffic, design life, etc. the thickness of road-courses shall be in no case less than those of the existing roads in the zone of the plant.

The design of all pavements shall conform to the requirements of the American Association of State Highway and Transportation Officials (AASHTO), and Local Highway Requirements or local standards whichever is more stringent.

Foundation bed
The requirements for the particular road type and the recommendations of the soil investigation report have to be observed.

Wearing course
The requirements for the particular road type have to be observed as per the local standards and codes.

Compaction of sub-grade
The area for the roads shall be cleared of any material or obstructions, which in the opinion of the Employer might adversely affect the stability of the fill or pavement, and the top layer removed to a depth of 300 mm (or more if the design so required).

Any ruts or soft areas caused by improper drainage conditions, hauling or any other cause shall be corrected and rolled to the required compaction before sub-base is placed thereon.

The formation shall be compacted to a dry density of at least 95% of the maximum dry density.

Tests for sub-grade
The sub-grade compaction test and in-situ dry density tests on each layer of compacted material shall be carried out at an average of not less than 2 per 100 m length of carriageway.

Sub-base
Sub-base material shall be crushed rock or other approved local material having suitable properties and confirming to the following grading:

Sieve [mm]	Percentage by Weight Passing
75	100
37.5	85 - 100
10	45 - 100
5	25 - 85
0.6	8 - 45

Sieve [mm]	Percentage by Weight Passing
0.075	0 - 10

The material shall be spread evenly on the preceding material in layers not exceeding 150 mm compacted thickness.

The sub-base shall be compacted by approved plant to a dry density, which shall not be less than 98% relative compaction until movement of the surface ceases and the surface is closed. The CBR value shall be at least 30% at the optimum moisture content.

Wet mix road base

Wet Mix road base material shall consist of crushed gravel or crushed rock and shall be suitably proportioned to confirm to the following grading as approved by the Employer:

BS Sieve Size [mm]	Percentage by Weight Passing
50	100
37.5	90 - 100
20	60 - 80
10	40 - 60
5.00	25 - 40
2.36	15 - 30
0.600	8 - 22
0.075	0 - 8

The final surface shall be shaped and finished true to line and level within a tolerance of $\pm$ 10 mm to the levels shown on the drawings.

Placing of road base

The compaction procedure and plant shall be proved by trials at the commencement of the Works.

Road base material shall be placed and spread evenly, without delay, using a paving machine or spreader box, operated with a mechanism which level off the material at an even depth and it shall be spread in layers not exceeding 150 mm compacted thickness. Segregation shall be avoided during transport and placing and any segregation evident after compaction shall be corrected by vibrating in non-plastic fines or made good by removing and replacing with properly graded material.

The road base shall achieve a minimum dry density of 98.1% of the maximum laboratory dry density.

Before placing the next construction layer or applying prime coat, the road base shall be mechanically swept, then cleaned with compressed air to remove loose material. As soon as possible after cleaning of the surface, the road base shall be sealed by the application of a prime coat as specified.

Chlorides and sulphates
The level of chlorides and sulphates in the sub-base and wet mix road base shall be within the following limits:

	Maximum by weight	
	Sub-base	**wet-mix road base**
Acid soluble chloride (NaCl)	3.5%	0.5%
Acid soluble sulphate (SO_3)	2.0%	0.5%

Hard shoulders
The material used for any hard shoulders shall comply with the specification for wet-mix road base.

Segmental Concrete Paving Block Surface
For the stipulated requirements of the laying of the segmented concrete paving block surface, it is assumed that the sub-grade or sub-base has been properly constructed, that there are no soft or unstable areas and that the sub-grade or sub-base has been trimmed to within ±10mm of the specified level.

Laying Pattern
Unless otherwise approved, all blocks shall be laid in herringbone pattern. The blocks shall be laid against the edge restraint shown on the plans in order to prevent the outward migration of blocks. Areas against kerbs, manholes, etc. requiring infilling and which exceed 25% of a full block unit shall be filled with units cut to size using a mechanical or hydraulic guillotine, bolster or angle grinder. Infill areas constituting less than 25% of a full block area and of 25 mm minimum dimension shall be filled with 25 MPa concrete. Smaller areas shall be filled with cement mortar having proportions of 1 sack cement to 130 litre of good quality mortar sand.

Bedding Sand
Except for mine sand, sand for the bedding layer shall comply with the following grading limits:

SIEVE SIZE (mm)	% PASSING
9,52	100
4,75	95 -100
2,36	80 - 100
1,18	50 - 85
0,600	25 - 60
0,300	10 - 30
0,150	5 - 15
0,075	0 - 10

Mine sand may be used where experience has shown it to be satisfactory. The moisture content of the sand shall be 5 - 8%. Bedding sand shall be maintained in a loose condition and protected against pre-compaction. Any pre-compacted areas shall be removed and replaced. The loose sand-bedding layer shall be evenly laid and shall not be used to fill hollows in an uneven subgrade or subbase surface. The compacted sand layer shall have a thickness of not less than 15 mm and not more than 35 mm.

Block Laying
All blocks shall be laid true to line and level. Full blocks shall be laid first, care being taken that joint lines are straight and square. Disturbance of laid blocks shall be prevented and any areas distorted or damaged shall be lifted and re-laid by the Contractor. The maximum joint width shall be limited to 5 mm.

Compaction of Blocks
After laying the blocks, a mechanical flat plate vibrator shall be applied to the surface of the blocks to bed them. For block thicknesses up to and including 80 mm the vibrator shall be capable of producing a centrifugal force of approximately 7 to 16 kN at a frequency of approximately 75 - 100 Hz, the plate area being between 0,2 m² and 0,4 m². For greater thicknesses the required centrifugal force shall be 16 - 20 kN at a frequency of approximately 75 - 100 Hz, the plate are being between 0,35 and 0,5 m². Compaction of blocks shall follow block laying as closely as possible, but shall not be attempted within 1 m of the laying face. At the end of each day compaction must be completed up to within 1 m of the working face. All blocks damaged during the compaction process shall be removed and replaced. Sufficient passes shall be made to compact the block pavement fully and to produce an even surface. The number of passes shall, however, not be less than two.

Jointing Sand
Joints between blocks shall be filled with a 50-50 sand-cement mixture. The jointing sand shall pass a 1,18 mm sieve and contain 10 - 50% material passing the 75 µm sieve. The sand shall be free of soluble salts or contaminants likely to cause efflorescence or staining. After initial vibration, joint filling sand shall be uniformly distributed over the surface of the pavement and brushed into the joints. Further passes of the plate vibrator shall be made to fill the joints, more sand being spread over the surface if required.

Excess sand shall be removed before the pavement is opened to traffic.

Surface Tolerances
Surface tolerances on the finished paving are based on the layer directly below the bedding sand complying with:

a) maximum deviation in surface level from the true surface level to be ±10 mm;

b) maximum deviation from a 3 m straight edge placed on the surface to be 10 mm, except where vertical curves necessitate a greater deviation;
c) the finished paving shall be so laid as to create a regular and smooth appearance.
d) Surface tolerances shall be as follows:
   - maximum deviation in surface level from the true surface level to be ±10 mm, except immediately adjacent to gullies, where the tolerance shall be +3 mm and 0 mm
   - maximum deviation from a 3 m straight edge placed on the surface to be 10 mm, except where vertical curves necessitate a greater deviation
   - levels of adjacent blocks shall not differ by more than 3 mm
   - the line of the pattern shall not deviate more than 15 mm from a 3 m straightedge.

Site Clearance
Before the pavement is opened to traffic the area shall be cleared of all debris and other waste and left in a tidy condition.

Weed/Ant Poison
An weed and ant poison approved by the Employer, shall be applied to the sand layer strictly in compliance with the manufacturer's specification prior to block laying.

Gravel Wearing Course Surface
For this type of road surface, the road base shall be of an approved Gypsum gravel with a grading complying with a G4 quality natural gravel, the finished surface of which acts as the wearing course surface.

New and existing pavement joints
Where new bituminous pavement is required to join into existing road construction, each layer of existing bituminous course shall be cut back to a clean vertical face and coated with hot bitumen of a grade suitable for the purpose immediately before laying the new bituminous material.

The existing pavement layers shall be cut back to form a stepped pattern. The lower layers of bituminous courses shall be prepared to receive the new covering coats by removal of dust and deleterious materials by air jetting or other approved means, and shall be coated with bituminous tack coat.

Exposed existing road base surfaces shall be scarified then re-compacted and sealed with bituminous prime coat in accordance with road base specification.

Bitumen macadam
Aggregate shall be hard, clean, durable crushed rock or gravel, and sand and shall be obtained from approved source which shall not include quarries containing significant proportions of weather bed, decomposed or extensively fractured materials.

Coarse aggregate is defined as that fraction retained on a 3.5 mm sieve. It shall have physical properties, which do not exceed the following test values:

	Wearing course	Base course
Aggregate crushing value	20%	25%
Flakiness index	25%	30%
Elongation index	25%	30%
Water absorption	2%	2%

Separate coarse and fine aggregate fractions shall be tested for soundness.

Wearing course shall be of min. 40 mm finished thickness; the aggregate grading shall be as follows:

Test Sieve [mm]	Grading (20mm nominal size) % by weight passing
28	100
20	95 - 100
14	70 - 90
10	55 - 75
6.3	40 - 60
3.35	25 - 40
1.18	15 - 30
0.075	2 -6

Composition of bitumen macadam
Mixes shall be submitted for approval and proved by means of laboratory, plant and field trials.

The designed mixes shall comply with the following:

	Binder Course	Wearing Course
Voids in mix [%]	7 - 10	5 - 8
Voids in mixed aggregate [%]	14 - 20	14 - 20
Minimum stability [kg]	750	1000
Flow (mm)	2 - 4	2 - 4
Minimum stability flow ratio [kg/niTn]	270	320
Bitumen content [% of total mix]	3.3 - 4.0	3.5 - 4.2
Voids filled with Bitumen [%]	48 - 60	48 - 60

Mixing and laying
The aggregate and bitumen shall be mixed in an approved plant of the batch type. Constituents shall be proportioned by weight; the bitumen may be proportioned by a metering pump.

Bitumen and aggregates shall not be heated to above 150°C and 170°C, respectively, and the temperature difference between them at the time of

mixing shall not exceed 15°C. The mixing temperature shall be established from the bitumen viscosity/temperature graph. Approved facilities for continuous measurement of temperatures shall be provided.

Bitumen macadam shall be transported in clean vehicles. Dust, coated dust, oil or water may be used on vehicle bodies to facilitate discharge, but the amounts shall be kept to a minimum and any excess shall be removed by tipping or brushing.

Immediately after arrival at the site, the macadam shall be supplied continuously to the paver and placed without delay.

Joints in wearing course shall be offset by at least 300 mm from parallel joints in the layer beneath.

A priming coat of petroleum/bitumen shall be applied to the road base at the rate of 0.55 to 7 l/m², before placing macadam. The binder course shall not be laid until the priming coat has been cured.

The binder course shall be prepared to receive the wearing course by removal of dust and deleterious materials by air jetting or other approved means.

Interlocking paving blocks

Footpaths and areas to be paved with interlocking concrete blocks shall be excavated and placed with 300 mm depth of compacted material at the exact levels and falls required for the finished work.

If parts of the base are found to be unstable the Contractor shall excavate further to a firm bed and fill with layers of fine crushed rock or aggregate, thoroughly compacted. The upper surface of the base shall reflect the exact profile, fall or contour of the final paving, irregularities shall not be compensated by varying the depth of sand bedding.

Compaction of formation and base for interlocking concrete slabs shall be as Clauses (Compaction of Sub-Grade), (Road Base), (Tests on Sub-Base and Road Base).

A stable edge shall be provided to retain the paving units and sand bedding by means of pre-cast concrete edging unit or kerbs set in-situ concrete. The sand bedding shall be a fine, well graded sand in a dry to moist condition and laid to an uncompacted thickness of 50 mm.

The mix for paving blocks shall contain a water-repelling additive.

The paving blocks shall be laid in accordance with the manufacturer's instructions and shall be compacted at completion of each day's work. The interlocking block shall be a minimum of 80 mm thick and the concrete quality must be approved by the Employer.

Site surfacing
The area of site not covered by buildings, structures, roads and paving, plants, etc. shall be leveled and covered by a single layer of drainage geotextile membrane topped by a layer of 30 mm uniform gauge gravel of minimum 15 cm thickness after compaction.

Kerbs
All roads shall be provided with kerbs.
Kerbs, channels, edgings and quadrants shall be cast generally to BS EN 1343 or equivalent. They shall be cast to the required radius for all curves not less than 10 meters.

Raised kerbs shall be laid with a 6 mm gap and pointed with I to 3 polymer modified cement mortar above road level only. Concrete bedding and backing to kerbs shall be cast in-situ to the dimensions shown on the drawings.

Flush kerbs shall be similarly laid and jointed or may be cast in-situ. The outside comer of the kerbs shall be chambered.

Marginal strips and kerbs shall be protected against covering or splashing with bitumen or cement. Kerbs and manhole frames shall be primed before bituminous macadam is laid.

All raised kerbs shall be alternately painted black and white in the plant area and at junctions.

Traffic signs
Traffic signs shall be reflectorized and shall comply with the latest revision of the latest Bangladesh standard.

Number, type and position of the signs have to be as agreed with the Employer.

Mounting posts shall be of circular hollow steel section structural steel. Single post signs will generally be cast directly into a concrete base.

Guardrails
Guardrails shall be provided where the occupants of a vehicle or passers-by can be endangered by a vehicle leaving the road.

Guardrails are to be used also to protect pipes and structures located at traffic areas and are to be designed to withstand impact forces in accordance to the traffic type and speed.

Railings shall be of galvanized steel, which shall be epoxy-painted in addition. Plastic guideposts with glass reflector elements shall be used where required.

Road drainage system
The drainage system of the roads shall comply with the respective standards.

The arrangement of the drain lines discharge collectors shall suit the traffic requirements, simplicity and reliability, having maintenance facilities to make sure that the system is working properly.

B9.4.16 Fences and gates

The following fences shall be provided:

- internal fences around different plant components (open storage area, switch yard, etc.).

Internal fences
Chain link fences shall be constructed of plastic coated galvanized steel wire and shall be of such manufacture that when any one segment is cut remaining segments within the pattern retain their rigidity.

Overall height of the fencing shall be 2.4 meters above ground level. All mesh shall be of plastic coated galvanized steel wire. Line wires shall be of plastic coated galvanized steel wire of the same gauge to adequately support the mesh rigidly. Line wires shall be provided at the top and bottom of the mesh and at two evenly spaced intermediate levels. The line wires shall be attached to the supporting posts. The top wire shall be doubled, making five line wires in all. Mesh and line wires shall comply with BS 4102 or equivalent standards.

Supporting posts and struts shall be of reinforced concrete to the same approved standard as above, unless otherwise approved by the Employer. The posts shall be set in concrete in the ground. The posts shall have cranked tops set at 45° outward to the posts, to which shall be attached three strands of galvanized barbed wire. Droppers shall be fitted at the center of each bay of fencing, to prevent the wires bunched together. Intermediate posts shall be provided at centers not exceeding 3 meters. Corner posts and struts shall be provided at all changes in direction.

The fences shall be connected to the earthing system.

Gates
Along the internal fences mentioned above an adequate number of single-leaf pedestrian gates and double-leaf hinged gates shall be provided.
The height of these gates shall correspond to the height of the adjacent perimeter fences.

Gates shall comply with BS 1722 or equivalent standards and shall be constructed of plastic coated galvanized chain link mesh on a plastic coated

galvanized RHS or tubular steel frame, with three strands of barbed wire across the top on cranked galvanized extension arms.

Gateposts shall be made of plastic coated galvanized RHS section and set in concrete in the ground. Gate hinges (pivots) shall be heavily galvanized and plastic coated.

All gates shall be provided with locks.

Also the gates shall be connected to the earthing system.

B9.4.17 Intake and pump houses

See **Section B5**.

B9.4.18 Outdoor facilities

B9.4.18.1 Potable water system

Drinking water pipelines shall be constructed to BS 8558, BS EN 806 or equivalent.

For water piping the material listed in the following may be used.

For the water storage tank reinforced concrete, galvanized steel or glass-fibre reinforced polyethylene may be used providing the materials satisfy the requirements of the appropriate standards. Any material used shall meet the requirements of the World Health Authority with regard to harmful influences on the drinking water. They shall not promote the formation of algae or the growth of bacteria in water.

The materials used shall be UV-resistant and withstand any climatic conditions to which they are exposed.

The tank shall be covered and provided with sun protection as well as a visible outside water level gauge and automatic float control.

Glass-fibre reinforced material shall meet the requirements laid down in the "Voluntary Product Standard" of the National Bureau of Standards (US Department of Commerce) or other relevant internationally recognized standards.

B9.4.18.2 Storm water drainage

Storm water drainage shall be supplied for all buildings, roads, paved areas etc. in accordance with the local rainfall conditions. If possible by gravity only, lifting or pumping stations shall be avoided.

All storm water and fire-fighting water has to discharge over sand traps to be collected in a retention basin, whether it is polluted or not and send to external disposal or sent to the stormwater pond.

B9.4.18.3 Oily water drainage/separators

The tank farm, the transformer enclosures and the workshop have to have provisions to collect oily water and to treat it in one or more oil separators.

B9.4.18.4 Chemical drainage

The drainage from battery rooms and similar shall not be connected to the storm water systems, but to the chemical drainage system, connected to the neutralization tank tank or to the waste water tanks.

B9.4.18.5 Manholes

Manholes shall be provided for the above-described drainage systems, at each change in gradient or direction, and at maximum intervals of 50 m. The diameter of manhole shall be chosen as a function of the pipe cross section. Either prefabricated or cast-in-situ concrete manholes may be used.

Shaft and manhole covers shall be made from cast iron and reinforced concrete, of watertight construction, to suit local requirements. Shaft and pit covers shall have a test load suited to the traffic conditions. Trash gratings shall be of cast steel.

B9.4.18.6 Piping material for outdoor systems

General

- Tubes and fittings of other materials shall be used only if they are in conformity with local regulations and with the approval of the Employer.
- All materials shall comply with the regulations regarding quality and dimensions and shall be adequate for the required work.
- Materials and structural parts not standardized shall be subject to the approval of the Employer's Engineer prior to use.
- All pipes and joints shall be marked indelibly immediately after taking from the moulds.
- The marking shall include:
  - name of manufacturer
  - date of manufacturing and serial number
  - nominal diameter and pipe class.

Unplasticized Polyvinyl Chloride (UPVC) pipes
UPVC pipes can be used for water supply, storm water and sewerage purposes. Pipes couplings and pipe fittings of UPVC shall have a uniform dark gray color throughout.

Vitrified clay pipes
Vitrified clay pipes can be used for domestic sewerage, oily water system and chemical contaminated water drains.

Galvanized steel pipes
May be used for water supply

Cast iron pipes
May be used for water supply

Glass-fibre reinforced pipes
May be used for main pressure lines and fittings for water supply and all kind of drainage systems and shall be in accordance with BS EN 1976, BS EN 14364 or equivalent

Copper tubes
Conforming to BS EN 1057 or equivalent may be used for water supply inside buildings.

B9.4.19 Pipe and cable ducts

The ducts are to be constructed of reinforced concrete and must be watertight. Particular attention must be paid to satisfactory expansion and settling joints. The walls and covers of the ducts must be designed and reinforced to withstand the soil pressure and the relevant traffic loads. The ducts are to be provided internally with hot dip galvanized anchor rails every 1.5 m for the easy attachment of clips and cable racks. All ducts covered by removable covers will have to be provided with metal protection angles.

Pipe ducts shall be big enough for maintenance. Trench and cover shall be designed for the relevant traffic loads.

For drainage purposes the cable and pipe ducts shall be provided with slopes (min. slope 0.3%) towards accessible pump sumps. The pump sumps in which will be frequently water will have to be provided with permanently installed automatic pumps.

B9.4.20 Pipe bridges

Structure of pipe bridges shall be of galvanized steel and shall consider reasonable heights for under passing and impact loads due to traffic. Floors and stairs shall be galvanized steel grating. Along the pipe bridge, around the various openings and for the stairs tubular steel railings of galvanized steel shall be provided.

Access shall be made by steel stairs and/or from the various plant items. For escape purposes a clear width of min. 1.00 m and minimum headroom of 2.20 m shall be provided along the pipe bridge. All fittings, apparatus and parts requiring maintenance must be easily accessible via stairs (only in exception cases via ladders) and must be secured by platforms and railings. Minimum headroom of 2.20 m and a clear width of min. 1.00 m must be assured everywhere and no dangerous objects must protrude into the accessible areas. When are crossed, care must be taken to ensure a clear headroom of min. 8.00 m for the main access roads, 6.00 m for any other road and a clear width not less than the road width.

The structure must be sturdy and well founded to enable it to support both, the pipe loads as well as the horizontal and vertical pressures and tensile stresses at the fixed points. Sliding bearings must ensure an adequately long travel without jamming. The settlements of pipe bridges must be kept to a minimum in order to avoid unacceptable stresses in the pipes.

B9.4.21 Synthetic filter fabrics

Where filter membranes or geo-textiles are required, only non-woven needle-punched fabrics shall be used. In this process discrete long fibre is mechanically interlocked by a barbed needle-punching operation. The filter fabrics shall be installed permanently as required.

B9.4.21.1 General requirements

Resistance to chemical attack
The material shall experience no significant change in its physical, chemical or engineering properties under the influence of oil, sulphates, chlorides, acids and alkalis in the forms and concentrations, which are present in soils, brackish water and groundwater to be found at the site.

Resistance to biological attack
The material shall be resistant to bacterial attack, fungus, insects and vermin etc.

Stability under ultraviolet light
The material shall incorporate sufficient resistance to ultraviolet light that its physical properties shall satisfy the specification after exposure for a period of up to 30 days of full sunlight in summer at the site.

The Contractor shall propose for review methods of storage and laying of the material which will ensure that exposure is not more than half of the manufacturer's recommended maximum exposure period for conditions at site.

Drinking water suitability
The material shall be of such quality that drinking water is not affected.

Supply
Filter fabrics shall be supplied in rolls of at least 3.5 m width and shall be jointed in accordance with the manufacturer's specification. Roll length of each fabric shall be such as to lay one strip complete in one operation, without jointing, each of the various separate sloping and horizontal lengths involved (e.g. for the shoreline protection, placing direction vertical to the coastline). Rolls of adequate standard lengths shall be supplied for this purpose.

Material approval
The Contractor shall demonstrate before use that the proposed materials, from all the proposed sources of supply, meet the specification. Such demonstrations (laboratory tests) shall be performed or stated by an approved official laboratory for materials testing. The results shall be summarized and interpreted in a report and presented to the Employer for approval.

Filtration properties and pore size distribution
Filter fabrics shall be permeable and have a mean pore size not greater than 0.3 mm and a pore size for a fraction of 90% not greater than 1.0 mm, retaining at least 50% of material with a particle size in the range of 0.06 mm to 0.2 mm. The pore size distribution shall be determined by appropriate methods in accordance with good engineering practice.

Permeability
The transverse filter fabric permeability range shall be k = 5 x 10 - 4 m/s and 5 x 10 - 3 m/s at a loading of 0.5 bar (50 kN/m^2).

Mechanical and hydraulic filter stability
3 samples shall be taken from the filter fabrics used for every kind of soil to be tested. The fabric shall be fastened as the bottom of at least 15 cm diameter and 10 cm high PVC-cylinders where these tools are filled with 1500 g of dry soil to be tested each. These cylinders shall be submerged 40 cm into water and lifted up reciprocally every 30 seconds for 34 hours. The sand penetrated through the fabric shall be measured after 4, 9, 24, 29 and 34 hours where the penetrated sand shall be not more than 2.5 g in the last 10 hours. The water volume passing the above sample shall also be

measured at above intervals. After the end of the test, two fabric samples shall be taken from each cylinder and their reduced permeability shall be measured which might be caused by soil particles penetrated into the fabric. This permeability still shall be more than of the natural soil.

Weight
In respect of hydrodynamic reversing flow conditions the fabric weight shall be equal or greater than l000 g/m^2 (at 20° C and 65 percent humidity) for shoreline protection and scour protection.

B9.4.21.2 Tensile properties of filter fabrics

The tensile strength of the filter fabric shall be verified in any direction (longitudinal and cross) under a uniformly applied load. The following laboratory tests shall be performed on wet samples, which have been fully submerged in water for a period of 48 hours before testing.

Plain strain test
This test shall be carried out according to ISO 13934 but with a 20 cm by 20 cm fabric sample, restrained from reduction in width by laths on the two tensioned sides of fabric with steel pins penetrating fabric. The tensile strength of the material shall not be less than 1.2/1.6 KN over a 200 mm width and the breaking strain shall exceed 50/70%.

"Grab" tensile test
The 25 mm '"grab" tensile strength shall be not less than 1.0 KN. Tests shall be carried out in accordance with ISO 13934.

B9.4.21.3 Testing frequency

The thickness, weight, permeability and tensile properties (plain strain test) shall be carried out once at start of works and then on every 5000 m^2 of each material used. The samples shall be taken from the material at the site and tested by a specialized official institution to be approved by the Employer. More tests may be required if above tests fail or there are doubts about fabric quality.

B9.5 Technical schedules

The following technical schedules constitute part of the specification. The data and requirements specified in the respective forms are to be adhered to and the required data of the forms are to be completely filled in. The completed technical schedules are to be submitted with the Bid:

B9 TS Technical Schedules

Annexure-1

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.

वरिष्ठ अभियन्ता (क्रय) / Sr. Engineer (PUR
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

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

उज्ज्वल हाउलादार / Ujjwal Howlader
वरिष्ठ अभियन्ता (क्रय) / Sr. Engineer (PUR)
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

(Office Seal)

Place----------

Date----------

Witness:_____

(Name & Address) AVIJIT PAN

अभिजीत पान / AVIJIT PAN
उप महाप्रबंधक (क्रय) / Dy. General Manager (PUR)
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

For & On behalf of the Bidder/

Contractor

(Office Seal)

Witness:_____

(Name & Address) _____

_____

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

Pradip Ghosh

Digitally signed by Pradip Ghosh
DN: cn=Pradip Ghosh, o=BHEL, ou=HSE-PSER, email=pradipg@bhelpser.co.in, c=IN
Date: 2017.05.06 13:31:44 +05'30'

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.

INDEX

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

Power Sector HSE Policy

We, at BHEL Power Sector, reaffirm our belief that the Health and Safety of our stakeholders and conservation of Environment is of utmost importance and takes precedence in all our business decisions. In pursuit of this belief and commitment, we strive to:

- ✓ **Ensure total compliance with applicable legislation, regulations and other requirements concerning Occupational Health, Safety and Environment.**
- ✓ **Ensure continual improvement in the Occupational Health, Safety and Environment Management System performance.**
- ✓ **Enhance Occupational Health, Safety and Environment awareness amongst employees, customers and suppliers by proactive communication and training.**
- ✓ **Review periodically and improve Occupational Health, Safety and Environment Management System to ensure its continuing suitability, adequacy and effectiveness in a continuously changing business environment.**
- ✓ **Develop a culture of safety through active leadership and provide appropriate training at all levels to enable employees to fulfill their Health, Safety and Environmental obligations.**
- ✓ **Incorporate appropriate Occupational Health, Safety and Environmental criteria into business decisions for selection of plant, technology and services as well as appointment of key personnel.**
- ✓ **Ensure availability at all times of appropriate resources to fully implement the Occupational Health, Safety and Environmental policy of the company.**

This policy will be communicated to all employees and made available to interested parties.

Sd/-

Director (Power)

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.

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.

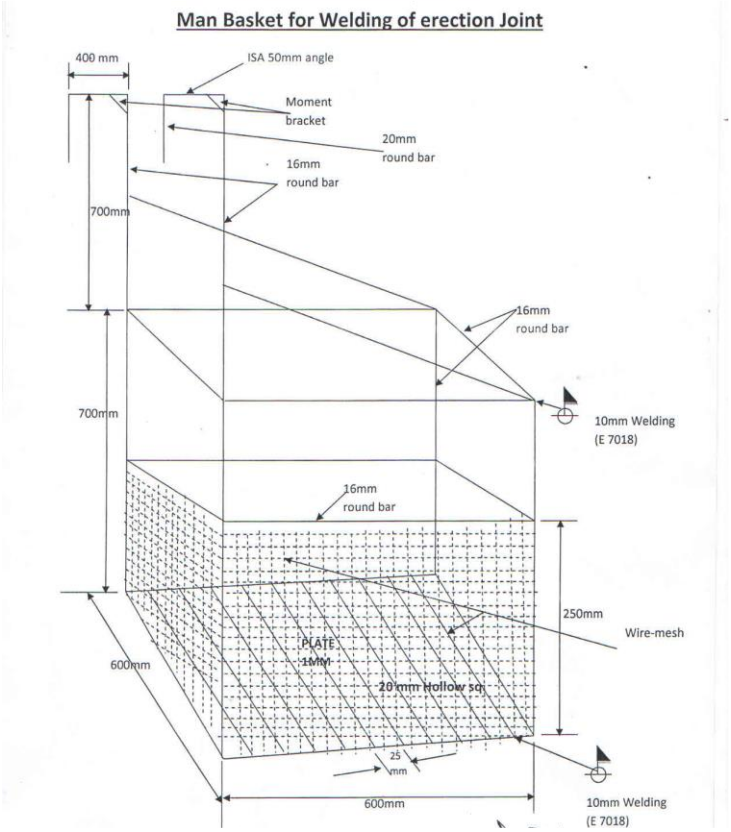
11.0 Lifting Operations:

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:

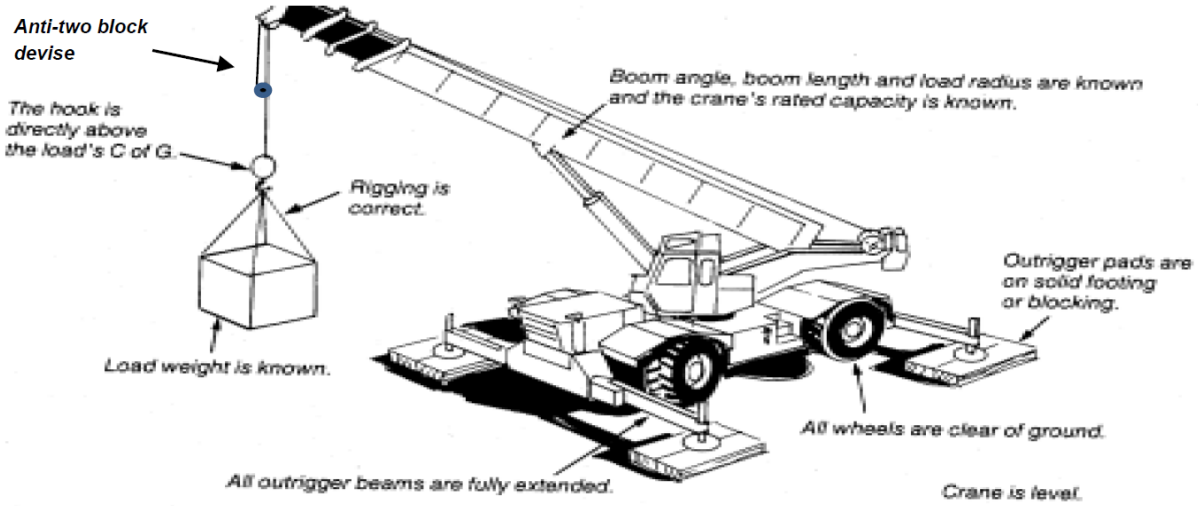
This procedure provides the guidelines to ensure proper rigging and lifting activities are accomplished safely and in accordance with applicable specifications, codes, and regulations.

- 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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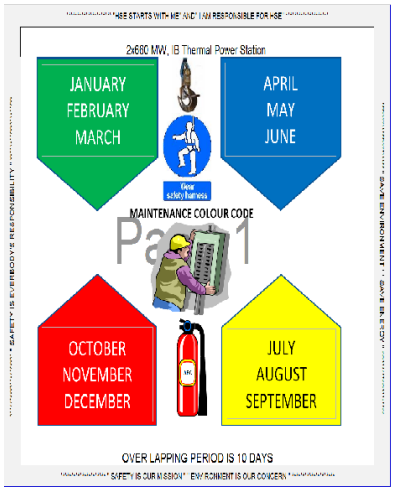
-
- The cycle of colors shall be Quarterly. The color code tape / Sticker shall be clearly visible to designate the period for which the inspections and tests were conducted.
- Following the initial inspection the equipment must be color-coded quarterly as per color-coding instructions that will be issued 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 -**

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.

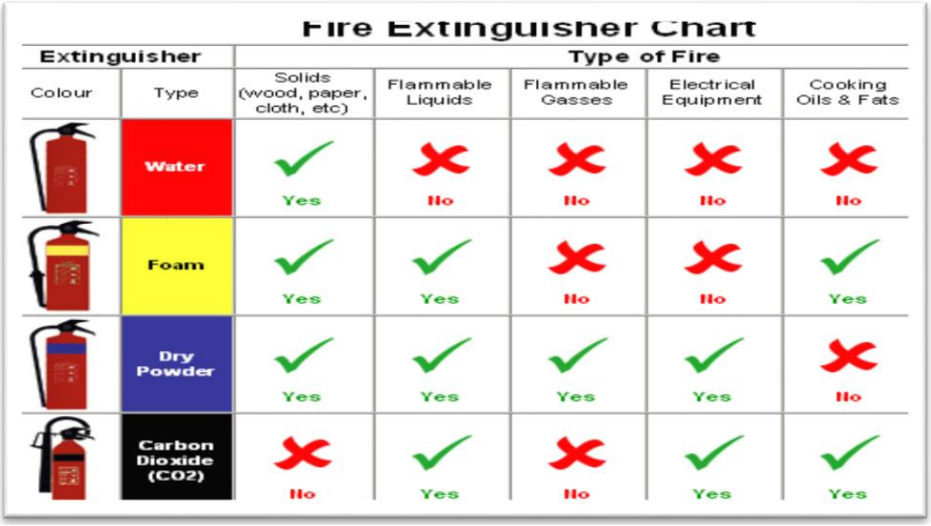
- Area where Hot work activities are carried out (Gas cutting / Welding/ any other spark producing work) above a working spot, a GI / fire-resistant non-asbestos sheet or suitable material shall be placed to prevent the fall of hot sparks. A bucket of water shall be kept nearby while doing hot work

- 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 supervior & 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

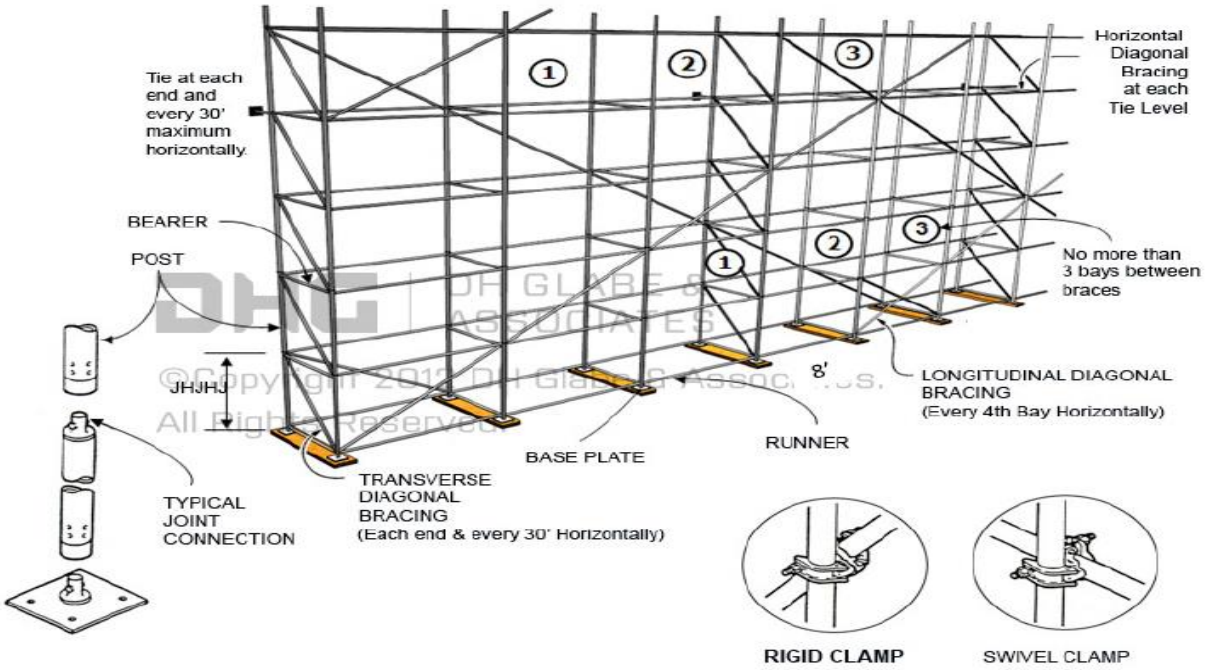
- Suspended scaffolds are platforms suspended by ropes, or other non-rigid means, from an overhead structure.
- Requirements for use are to be preapproved by HSE Head, under a specific Permit to Work.

Rolling Scaffolds

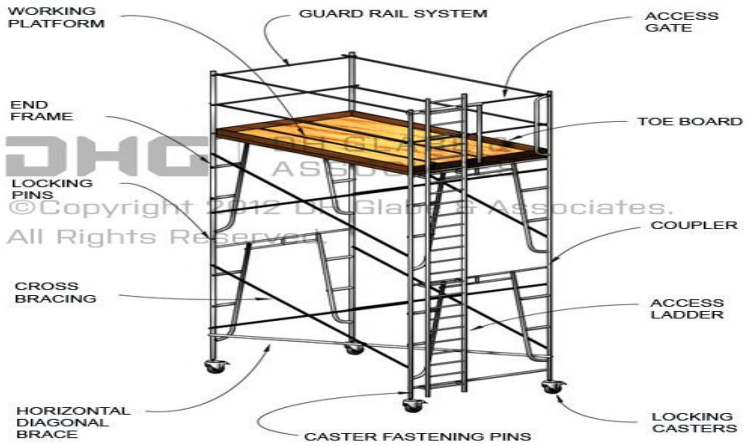
- The height of rolling scaffolds shall not exceed three times the minimum base dimension.
- The minimum base dimension of rolling scaffold will be 1.25 meters (4 feet).
- Adequate help must be provided when moving a rolling scaffold.
- Secure or remove all loose materials, equipment and tools before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



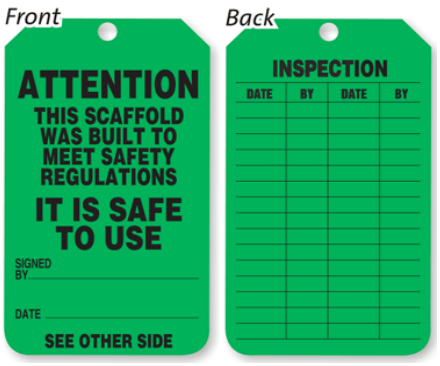
Scaffold Tagging:

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:



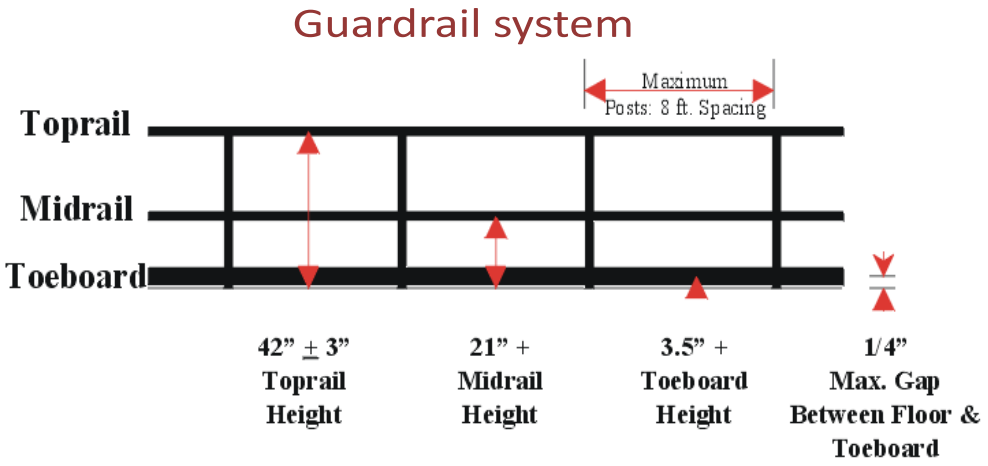
18.1SAFE USE OF LADDERS.

- ❖ 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.

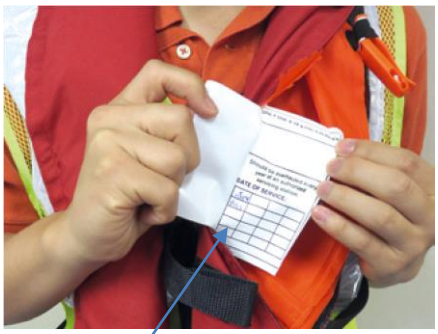
19.0 SAFETY IN JETTY CONSTRUCTION:

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:

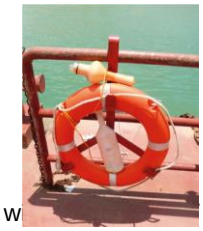
- Lifejackets/buoyancy aids should be provided to and worn by workers with risk of falling into water.
- Lifejackets/buoyancy aids should conform to BS EN ISO 12402-1, 2, 3 or 4, or other equivalent international standards according to working conditions
- Lifejackets should be thoroughly checked by 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 comminsioning 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

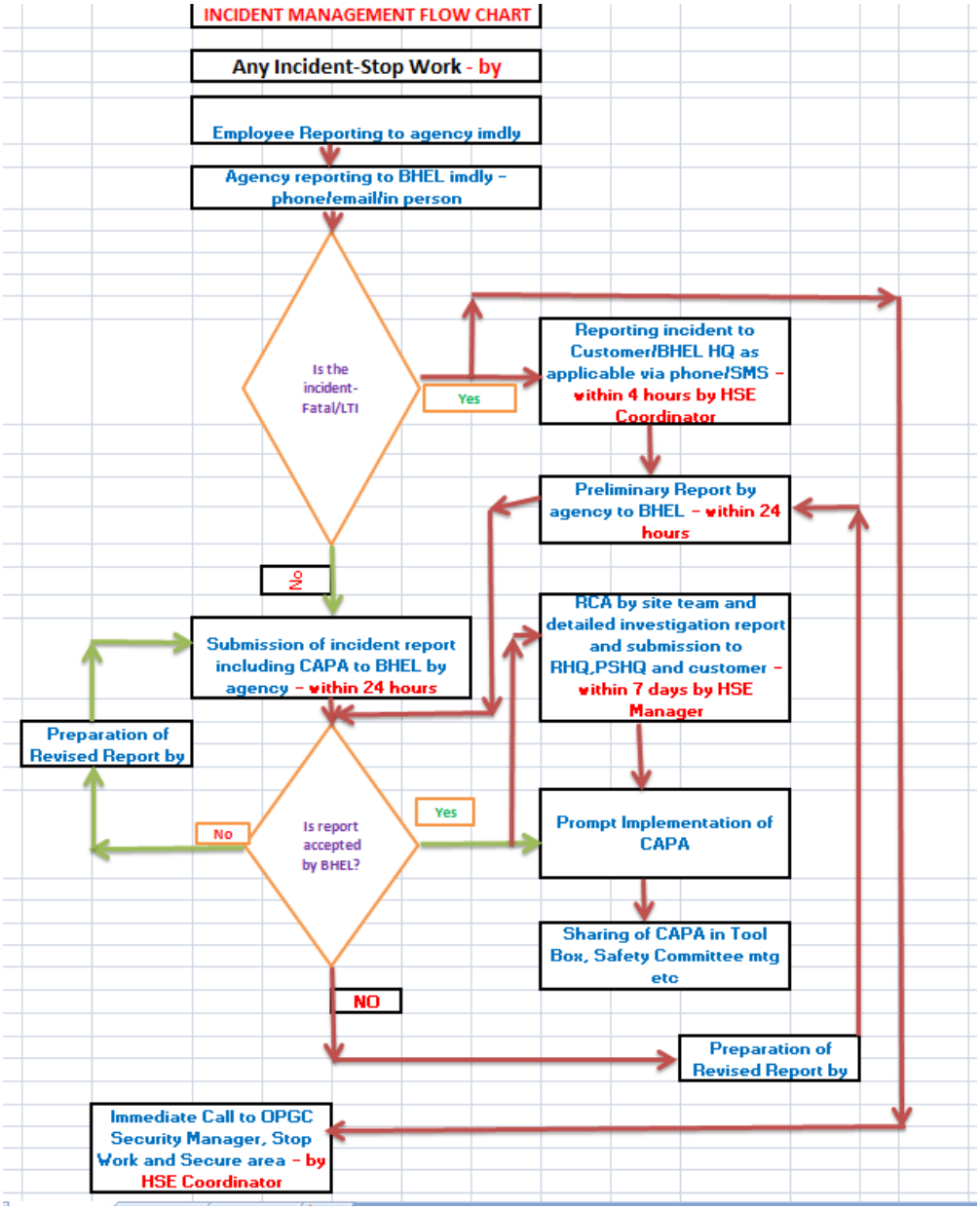
An important key to effective emergency response is an effective communication system. At BHEL, site telephone, mobile and radios will be used for communication during emergency.

- 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

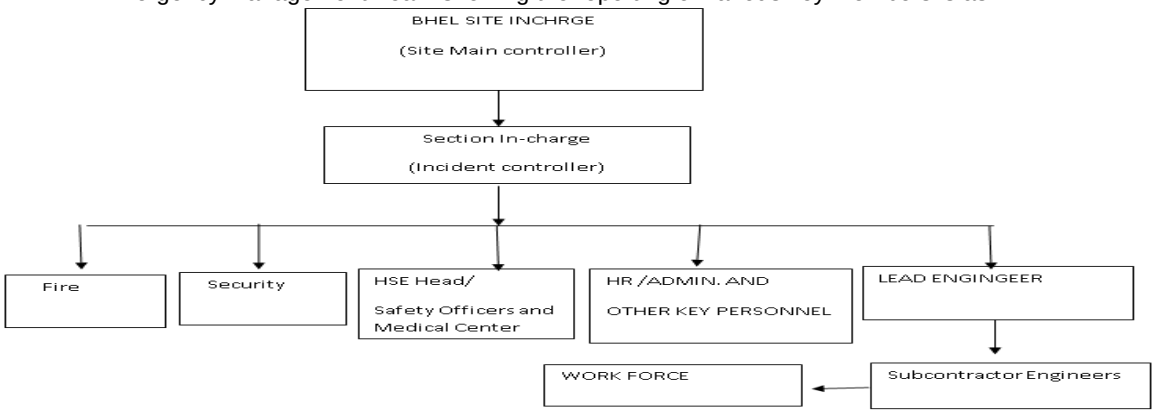
- BHEL Section In-charge will confirm the information with emergency services and also inform the Regional Manager as well as sub-contractors Site In-charge.

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 Rs.	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

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.				

Bharat Heavy Electricals Ltd **HSEP:13-F04**
Power Sector- Eastern Region **Date:**
PROJECT:_____
(TO BE SUBMITTED IN TRIPLICATES)

EXCAVATION WORK PERMIT

Sl No:

I. Name of the work:
II. Name of Contractor:
III. Exact location of work and item for excavation:
IV. Duration of work: From to
V. Type of excavation: Manual/ by Excavator
VI. Dimension of excavation:

The following items have been checked and compliance shall be ensured during the currency of the permit:

item	**Done**
1. Checked for underground pipe/power cable	
2. Proper illumination provided (for night work)	
3. Plan/drawing available and checked (sloping, shoring provided). Safety of any adjacent structure taken care of.	
4. Access/Egress ensured (in case of manual)	
5. Equipment operator skill checked	

6. Area cordoned off, signage put up	
7. Appropriate PPEs provided	

The following persons are permitted to work for the duration mentioned herein:

Date		No of persons allowed	Time Duration	
From	To		From	To

List of persons to be maintained by contractor separately

Sign of Initiator (Sub-contractor)

Sign of Recommender

Sign of Approver

Work completed/stopped/area cleared at _____on__

The permit stands closed on_____

Sign of BHEL HSE team

Bharat Heavy Electricals Ltd **HSEP:13-F05**
Power Sector- Eastern Region **Date:**
PROJECT:_____
(TO BE SUBMITTED IN TRIPLICATES)

RADIATION WORK PERMIT

Sl No:

I. Name of the work:
II. Name of Contractor:
III. Exact location of work and item for radiography:
IV. Duration of work: From to
V. Name of Radiography agency and its authorised supervisor:

The following items have been checked and compliance shall be ensured during the currency of the permit:

item	**Done**
1. Safety regulations as per BARC/AERB ensured while source in use/transit/stores	
2. Proper illumination provided	
3. Area cordoned off	
4. Appropriate PPEs provided	

The following persons are permitted to work for the duration mentioned herein:

Date		No of persons allowed	Time Duration	
From	To		From	To

List of persons to be maintained by contractor separately

Sign of Initiator (Sub-contractor)

Sign of Recommender

Sign of Approver

Work completed/stopped/area cleared at _____on__

The permit stands closed on_____

Sign of BHEL HSE team

Bharat Heavy Electricals Ltd **HSEP:13-F06**
Power Sector- Eastern Region **Date:**
PROJECT:_____
(TO BE SUBMITTED IN TRIPLICATES)

CONFINED SPACE WORK PERMIT

Sl No:

I. **Name of the work:**

II. **Name of Contractor:**

III. **Exact location of work:**

1. **Condition check of target space**:

Condition	**Y/N**	**NR**
8. Isolated from air/ water/ steam/ gas/ power/radiation source		
9. Thoroughly cleaned/washed		
10. Adequately cooled		
11. Proper illumination provided		
12. Manways open & ventilated		

2. **Protection measures:**

Measure	**Y/N**	**NR**
1. Handlamp is of 24V		
2. Operators wearing recommended PPEs- gloves/ clothing/ear plug/ muff/ safety harness/lifeline/ goggles /face shield		

3. Operators wearing special devices – dust/gas/airline mask, communication equipment, personal gas alarm		
4. Attendant with SCBA/Air mask		
5. Rescue equipment/ team deployed		
6. Fire fighting equipment close-by		

The following persons are permitted to enter the confined space to work for the duration mentioned herein:

Date(s)	No of persons allowed	Name of persons allowed	Duration	
			From	To

Sign of Initiator (Sub-contractor)

Sign of Recommender

Sign of Approver

Work completed/stopped/area cleared at _____on__

The permit stands closed on_____

Sign of BHEL HSE team

Bharat Heavy Electricals Ltd **HSEP:13-F07**
Power Sector- Eastern Region **Date:**
PROJECT:_____
(TO BE SUBMITTED IN TRIPLICATES)

WORK-AT-HEIGHT PERMIT

Sl No:

I. **Name of the work:**
II. **Name of Contractor:**
III. **Exact location of work:**

Sl.	Description of the point to be checked	Pl tick (√) if it is OK
1.	Whether the manpower of the Gang engaged is having adequate number and skill required for the said activity?	
2.	Whether Supervisor has been engaged for this activity?	
3.	Whether following PPEs have been provided to all workers?	
	Full body Harness, Safety Shoe, Helmet	
4.	Whether Lifelines tied with solid anchorage above 1 M level from the job?	
5.	Whether Tool-Box meeting carried out and Hazard related to the said job and safety precaution to be taken told to workers?	
6.	Whether Fall arrestor fixed where staircase is not available for access to job?	
7.	Whether Scaffold/Platform/Place for job is strong enough, has easy access and is safe for the job? Is the Space sufficient for doing work? Whether Safety Net has been fixed?	
8.	Whether all Lifting T&Ps and Tackles have valid Fitness Certificates? Whether Lubrication is Ok? Whether these are free from any defect when visually checked before use?	
9.	Pl ensure that none of the workers of the Gang has Vertigo or High or Very Low Blood Pressure. (Health register to be referred)	

The following persons are permitted to work for the duration mentioned herein:

Date		No of persons allowed	Time Duration	
From	To		From	To

List of persons to be maintained by contractor separately

Sign of Initiator (Sub-contractor)

Sign of Recommender

Sign of Approver

Work completed/stopped/area cleared at _____on__

The permit stands closed on_____

Sign of BHEL HSE team

HSEP:13-F09

Bharat Heavy Electricals Limited
Power Sector Eastern Region

INCIDENT (PERSONAL INJURY / PROPERTY DAMAGE) REPORT

(This report is to be sent within 24 hours directly to GM/Q &S/PS-HQ, , Noida with copy to MR(HSE)/PSER in respect of all incidents in addition to immediate Fax / Telegraphic intimation of fatalities and major damages including fires.)

1	NAME OF SITE		3	ACTIVITY AREA	
2	SCOPE OF WORK		4	NAME OF CONTRACTOR	
			5	NAME & DESIGNATION OF BHEL ACTIVITY I/C	
6	DATE & TIME OF INCIDENT		7	DATE RESUMED	
8	NO. OF WORK-DAYS LOST BY VICTIM (If duty not resumed, give estimated figure)				
9	NO. OF MANHOURS LOST BY OTHERS				
10	PERSONAL DETAILS OF INJURED AND / OR DETAILS OF MATERIALS / EQUIPMENT / PROPERTY DAMAGED				

NAME				NAME OF MATERIAL / EQUIPMENT / PROPERTY	
PERIOD OF EMPLOYMENT					
AGE	YRS	SEX	MALE/ FEMALE	ESTIMATED COST	ACTUAL COST
MARITAL STATUS		SINGLE / MARRIED			
OCCUPATION				NATURE OF DAMAGE	
PART OF BODY INJURED					
NATURE OF INJURY					
AGENCY (OBJECT / EQUIPMENT / SUBSTANCE) MOST RESPONSIBLE FOR CAUSING INCIDENT / INJURY / DAMAGE					
12	PERSON (NAME & DESIGNATION) WITH MOST CONTROL OVER AGENCY (OBJECT / EQUIPMENT / SUBSTANCE) CAUSING INCIDENT INJURY / DAMAGE				
13	DESCRIBE CLEARLY HOW THE INCIDENT OCCURRED AND IF THE VICTIM WAS WEARING THE APPROPRIATE PPEs. (USE ADDL SHEET, IF REQUIRED).				

ANALYSIS		
14	**WHAT ACTS AND / OR CONDITIONS CONTRIBUTED MOST DIRECTLY TO THIS INCIDENT**	
15	**WHAT ARE THE BASIC REASON FOR THE EXISTENCE OF THESE ACTS AND / OR CONDITION ?**	
16	**WHAT CORRECTIVE ACTIONS HAVE BEEN TAKEN TO PREVENT INCIDENT RECURRENCE ?**	
	DATE :	**SIGNATURE OF SITE HSE COORDINATOR**
17	**COMMENTS OF HEAD / SOX**	
	DATE:	**SIGNATURE OF HEAD/SOX**

BHARAT HEAVY ELECTRICALS LIMITED HSEP:13-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:13-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