



BHARAT HEAVY ELECTRICALS LIMITED
Centre of Excellence (CoE), Karkhiyaon, Varanasi

Name Of Work:
Construction of Propulsion Manufacturing Block
Foundation and Miscellaneous Enabling Works at
BHEL CoE, Karkhiyaon, Varanasi

Tender Enquiry No. : COE/VNS/CVL/2023/001

Volume-1

Technical Bid

Contents:

Volume – 1 : Technical Bid

- Volume – 1A : Notice Inviting Tender (NIT)
- Volume – 1B : Technical Conditions of Contract (TCC)
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- Volume – 1D : General Conditions of Contract (GCC)
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- Volume – 1F : Tender Drawings

Volume – 2 : Price Bid (Price Schedule with Bill of Quantities)

BIDDER
(Signature with Name, Designation and Date)

Name Of Work:
**Construction of Propulsion Manufacturing Block
Foundation and Miscellaneous Enabling Works at
BHEL CoE, Karkhiyaon, Varanasi**

Tender Enquiry No. : COE/VNS/CVL/2023/001

VOLUME-1A

NOTICE INVITING TENDER (NIT)

(NOTE: BIDDER MAY DOWNLOAD FROM WEBSITE)

BIDDER

(Signature with Name, Designation and Date)

NOTICE INVITING TENDER (NIT)

Sealed offers in two part bid system (National competitive bidding (NCB) are invited from reputed & experienced bidders (meeting PRE QUALIFICATION CRITERIA as mentioned in **Annexure-1**) for the subject job by the undersigned on the behalf of BHARAT HEAVY ELECTRICALS LIMITED as per the tender document. Following points relevant to the tender may please be noted and complied with.

1.0 Salient Features of NIT

SL NO	ISSUE	DESCRIPTION
i	TENDER NUMBER	COE/VNS/CVL/2023/001
ii	Broad Scope of job	Construction of Propulsion Manufacturing Block Foundation and Miscellaneous Enabling Works at BHEL CoE, Karkhiyaon, Varanasi.
iii	DETAILS OF TENDER DOCUMENT	
a	Volume-1A	Notice Inviting Tender (NIT) Applicable
b	Volume-1B	Technical Conditions of Contract (TCC) Applicable
c	Volume-1C	Special Conditions of Contract (SCC) Applicable
d	Volume-1D	General Conditions of Contract (GCC) Applicable
e	Volume-1E	Forms and Procedures Applicable
f	Volume-1F	Tender Drawings Applicable
g	Volume-2	Price Schedule (Absolute value) with Bill of Quantities Applicable
iv	ISSUE OF TENDER DOCUMENTS	Tender documents will be available for downloading from BHEL website (www.bhel.com) or e-procurement portal (https://eprocurebhel.co.in) till due date of submission Brief information of the tenders shall also be available at BHEL website (www.bhel.com) Applicable
v	DUE DATE & TIME OF OFFER SUBMISSION	Date : 14th Dec'2023 , Time : 3 PM Applicable
vi	OPENING OF TENDER	Date : 14th Dec'2023 , Time : 4 PM Notes: (1) In case the due date of opening of tender becomes a non-working day, then the due date & time of offer submission and opening of tenders get extended to the next working day. (2) Bidder may depute representative to witness the opening of tender. For e-Tender,-Bidder may witness the opening of tender through e-Procurement portal only. Applicable

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vii	EMD AMOUNT	Rs.20,00,000/-	Applicable
viii	COST OF TENDER	Free	
ix	LAST DATE FOR SEEKING CLARIFICATION	Date: 12th Dec'2023 Along with soft version also, addressing to undersigned & to others as per contact address given below: i) Name: Girish Chand Designation: Sr DGM Deptt: CoE Address: BHEL, HERP, Varanasi Phone: +91 9810828511 Email: girish@bhel.in ii) Name: Nitesh Priyadarshi Designation: Manager Deptt: CoE Address: BHEL, HERP, Varanasi Phone: +91 9540063321 Email: nitesh@bhel.in	Applicable
x	SCHEDULE OF Pre Bid Discussion (PBD)	12th Dec'2023, Time : 3 PM	Applicable
xi	INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM)	Please refer clause no. 12.	Applicable
xii	Latest updates	Latest updates on the important dates, Amendments, Correspondences, Corrigenda, Clarifications, Changes, Errata, Modifications, Revisions, etc. to Tender Specifications will be hosted in BHEL webpage (www.bhel.com -->Tender Notifications →View Corrigendums), Central Public Procurement portal (https://eprocure.gov.in/epublish/app) & on e-tender portal (link to be added) and not in the newspapers. Bidders to keep themselves updated with all such information.	

2.0 The offer shall be submitted as per the instructions of tender document and as detailed in this NIT. Bidders to note specifically that all pages of tender document, including these NIT pages of this particular tender together with subsequent correspondences shall be submitted by them, duly signed digitally using Class III DSC & uploaded in E-Procurement Portal, as part of offer. **Rates/Price including discounts/rebates, if any, mentioned anywhere/in any form in the techno-commercial offer other than the Price Bid, shall not be entertained.**

3.0 Bidder shall deposit EMD as per clause 1.9 of General Conditions of Contract (GCC).

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'One Time EMD' will not be considered for this tender. All the bidders who have 'One Time EMD' with BHEL and want to participate in this tender, would also submit the requisite amount of EMD as mentioned in Clause No. 1, Salient Features of NIT, Sl. No. (vii) above.

For Electronic Fund Transfer the details are as below:-

a) **Name of the Beneficiary** -: Bharat Heavy Electricals Limited

b) **Bank Particulars**:-

Bank Name	State Bank of India
Bank Telephone No. (with STD code)	0542-2503210
Branch Address	Main Branch, Near Kachahari, Varanasi
Bank Fax No. (with STD code)	0542-2508280
Branch Code	0201
9 Digit MICR Code of the Bank Branch	221002002
Bank Account Number	11103264820
Bank Account Type	Current Account
Digit IFSC Code of Beneficiary Branch	SBIN0000201

(Note: In case of E-Tenders, proof of remittance of EMD should be uploaded in the E-Procurement Portal and originals, as applicable, shall be sent to the officer inviting tender within a reasonable time, failing which the offer is liable to be rejected.)

4.0 **Procedure for Submission of Tenders**: 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.

Documents Comprising the e-Tender

The tender shall be submitted online ONLY EXCEPT EMD (in physical form) as mentioned below:

a. **Technical Tender (Un- priced Tender)**:

All Technical details (e.g. Eligibility Criteria requested (as mentioned below)) should be attached in e-tendering module, failing which the tender stands invalid & may be REJECTED. Bidders shall furnish the following information along with technical tender (preferably in pdf format):

- (i) Earnest Money Deposit (EMD) furnished in accordance with NIT Clause 3.0.
- (ii) Technical Bid (without indicating any prices).

b. **Price Bid**:

- (i) Prices are to be quoted in the attached Price Bid format online on e-tender portal.
- (ii) The price should be quoted for the accounting unit indicated in the e-tender document.
- (iii) It is the responsibility of tenderer to go through the Tender document to ensure furnishing all required documents in addition to above, if any. Any deviation would result in REJECTION of tender and would not be considered at a later stage at any cost by BHEL.

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- (iv) A person signing (manually or digitally) the tender form or any documents forming part of the contract on behalf of another shall be deemed to warrant that he has authority to bind such other persons and if, on enquiry, it appears that the persons so signing had no authority to do so, the purchaser may, without prejudice to other civil and criminal remedies, cancel the contract and hold the signatory liable for all cost and damages.
- (v) A tender, which does not fulfil any of the above requirements and/or gives evasive information/reply against any such requirement, shall be liable to be ignored and rejected.

DO NOT'S

Bidders are requested NOT to submit the hard copy of the Bid. In case offer is sent through hard copy/fax/telex/cable/electronically in place of e-tender, the same shall not be considered. **Also, uploading of the price bid in prequalification bid or technical bid may RESULT IN REJECTION of the tender.**

Digital Signing of e-Tender:

Tenders shall be uploaded with all relevant PDF/zip format. The relevant tender documents should be uploaded by an authorized person having Class 3- SHA2- 2048 BIT- SIGNING & ENCRYPTION digital signature certificate (DSC).

The Requirement:

1. A PC with Internet connectivity &
2. DSC (Digital Signature Certificate) (Class 3- SHA2- 2048 BIT- SIGNING & ENCRYPTION)

The process of utilizing e-procurement necessitates usage of **DSC (Digital Signature Certificate) (Class 3- SHA2- 2048 BIT- SIGNING & ENCRYPTION)** and you are requested to procure the same immediately, if not presently available with you. Please note that only with DSC, you will be able to login the e-procurement secured site and take part in the tendering process.

The details of the DSC Certifying Authority as given below:

Sl. No.	Name	Website Link
1	GNFC	www.ncodesolutions.com
2	e-Mudhra	http://www.e-Mudhra.com
3	Safescrypt	www.safescrypt.com

Vendors are also requested to go through seller manual available on (<https://eprocurebhel.co.in>).

- 5.0 **Deviation with respect to tender clauses and additional clauses/suggestions in Techno-commercial bid / Price bid shall NOT be considered by BHEL. Bidders are requested to positively comply with the same. Bidders are requested to positively comply with the same. BHEL reserve the right to accept or not to accept any deviation without assigning any reason.**
- 6.0 BHEL reserves the right to accept or reject any or all Offers without assigning any reasons thereof. BHEL also reserves the right to cancel the Tender wholly or partly without assigning any reason thereof. Also BHEL shall not entertain any correspondence from bidders in this matter (except for the refund of EMD).
- 7.0 Since the job shall be executed at site, bidders must visit site/ work area and study the job content, facilities available, availability of materials, prevailing site conditions including law & order situation, applicable wage structure, wage rules, etc. before quoting for this tender. They may also consult

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

- 8.0 For any clarification on the tender document, the bidder may seek the same in writing or through e-mail and/or through e-procurement portal, as per specified format, within the scheduled date for seeking clarification, from the office of the undersigned. BHEL shall not be responsible for receipt of queries after due date of seeking clarification due to postal delay or any other delays. Any clarification / query received after last date for seeking clarification may not be normally entertained by BHEL and no time extension will be given.
- 9.0 BHEL may decide holding of pre-bid discussion [PBD] with all intending bidders as per date indicated in the NIT. The bidder shall ensure participation for the same at the appointed time, date and place as may be decided by BHEL. Bidders shall plan their visit accordingly. The outcome of pre-bid discussion (PBD) shall also form part of tender.
- 10.0 In the event of any conflict between requirement of any clause of this specification/ documents/drawings/data sheets etc. or requirements of different codes/standards specified, the same to be brought to the knowledge of BHEL in writing for clarification before due date of seeking clarification (whichever is applicable), otherwise, interpretation by BHEL shall prevail. Any typing error/missing pages/ other clerical errors in the tender documents, noticed must be pointed out before pre-bid meeting/submission of offer, else BHEL's interpretation shall prevail.
- 11.0 Unless specifically mentioned otherwise, bidder's quoted price shall deemed to be in compliance with tender including PBD.
- 12.0 Bidders shall submit Integrity Pact Agreement (Duly signed by authorized signatory who signs in the offer), along with techno-commercial bid. This pact shall be considered as a preliminary qualification for further participation.

"Integrity Pact (IP)"

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

Sl. No.	IEM	Email
1.	Shri Otem Dai, IAS (Retd.)	iem1@bhel.in
2.	Shri Bishwamitra Pandey, IRAS (Retd.)	iem2@bhel.in
3.	Shri Mukesh Mittal, IRS (Retd.)	iem3@bhel.in

- (b) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (Part-I, in case of two/ three part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.
- (c) Please refer Section-8 of IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to any of the above IEM(s). All correspondence with the IEMs shall be done through email only.

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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 at Clause No.1.0 – Salient Feature of NIT, Sl.No.(ix) above.

- 13.0 The Bidder has to satisfy the Pre-Qualifying Requirements stipulated for this Tender in order to be qualified. The Price Bids of only those bidders will be opened who will be qualified for the subject job on the basis of satisfying the Pre-Qualification Criteria specified in this NIT as per Annexure-I (as applicable), past performance etc. and date of opening of price bids shall be intimated to only such bidders. BHEL reserves the right not to consider offers of parties under HOLD.
- 14.0 In case BHEL decides on a 'Public Opening', the date & time of opening of the sealed PRICE BID shall be intimated to the qualified bidders and in such a case, bidder may depute one authorized representative to witness the price bid opening. BHEL reserves the right to open 'in-camera' the 'PRICE BID' of any or all Unsuccessful/Disqualified bidders under intimation to the respective bidders.
- 15.0 Validity of the offer shall be for 6 **(six months)** from the latest due date of offer submission (including extension, if any) unless specified otherwise.
- 16.0 (a) BHEL reserves the right to go for Reverse Auction (RA) (Guidelines as available on www.bhel.com) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. Bidders to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.
- (b) Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'Process compliance form' (to the designated service provider) as well as 'Online sealed bid' in the Reverse Auction. Non-submission of 'Process compliance form' or 'Online sealed bid' by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).
- (c) The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer. The envelope sealed price bid of successful L1 bidder in RA, if conducted, shall also be opened after RA and the order will be placed on lower of the two bids (RA closing price & envelope sealed price) thus obtained. The bidder having submitted this offer specifically agrees to this condition and undertakes to execute the contract on thus awarded rates.
- (d) If it is found that L1 bidder has quoted higher in online sealed bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).
- (e) If reverse auction process is unsuccessful, sealed envelope price bids of all the techno-commercially qualified bidders shall be opened and the tender shall be processed accordingly. However, the envelope sealed bid(s) of techno-commercially acceptable bidder(s) who had agreed to participate in the RA and had failed to submit the online sealed bid shall not be opened. On

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

- 17.0 On submission of offer, further consideration will be subject to compliance to tender & qualifying requirement and customer's acceptance, as applicable.
- 18.0 In case the bidder is an "Indian Agent of Foreign Principals", 'Agency agreement has to be submitted along with Bid, detailing the role of the agent along with the terms of payment for agency commission in INR, along with supporting documents.
- 19.0 The bidders shall not enter into any undisclosed M.O.U. or any understanding amongst themselves with respect to tender.
- 20.0 The bidder shall submit documents in support of possession of 'Qualifying Requirements' duly self-certified and stamped by the authorized signatory, indexed and properly linked in the format for PQR. In case BHEL requires any other documents/proofs, these shall be submitted immediately.
- 21.0 The bidder may have to produce original document for verification if so decided by BHEL.
- 22.0 The consultant/ firm (and any of its affiliates) shall not be eligible to participate in tender(s) for the related works or services for the same project, if they were engaged for the consultancy services.
- 23.0 Guidelines/rules in respect of Suspension of Business dealings, Vendor evaluation format, Quality, Safety & HSE guidelines, Experience Certificate, etc. may undergo change from time to time and the latest one shall be followed. The abridged version of extant 'Guidelines for suspension of business dealings with suppliers/ contractors' is available on www.bhel.com on "supplier registration page".

The offers of the bidders who are on the banned/ hold list and also the offer of the bidders, who engage the services of the banned/ hold firms, shall be rejected. The list of **banned/ hold firms** is available on BHEL web site www.bhel.com.

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:**

- (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.
- (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.

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- (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 indulges in mal-practices, cheating, bribery, fraud or and other misconduct or formation of cartel so as to influence the bidding process or influence the prices 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 extent guidelines of the company available on www.bhel.com and / or under applicable legal provisions.

- 24.0 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.

25.0 Preference to Make In India:

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 preferences to Class I local supplier, is as defined I 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.

Compliance to Restrictions under Rule 144 (xi) of GFR 2017

- (i) Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority. The Competent Authority for the purpose of this Clause shall be the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade (DPIIT).
- (ii) "Bidder" (including the term 'tenderer', 'consultant' or 'service provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency branch or office controlled by such person, participating in a procurement process.
- (iii) "Bidder from a country which shares a land border with India" for the purpose of this Clause means: -
- An entity incorporated established or registered in such a country; or
 - A subsidiary of an entity incorporated established or registered in such a country; or
 - An entity substantially controlled through entities incorporated, established or registered in such a country; or
 - An entity whose beneficial owner is situated in such a country; or
 - An Indian (or other) agent of such an entity; or
 - A natural person who is a citizen of such a country; or

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- g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above

(iv) The beneficial owner for the purpose of (III) above will be as under:

1. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together or through one or more juridical person, has a controlling ownership interest or who exercises control through other means.

Explanation:

- a. "Controlling ownership interest" means ownership of or entitlement to more than twenty-five per cent of shares or capital or profits of the company.
- b. "Control" shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholders agreements or voting agreements.
2. In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership.
3. In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person has ownership of or entitlement to more than fifteen percent of the property or capital or profits of the such association or body of individuals.
4. Where no natural person is identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;
5. In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

(v) An Agent is a person employed to do any act for another, or to represent another in dealings with third person.

(vi) The successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority.

Note:

- (i) The bidder shall provide undertaking for their compliance to this Clause, in the Format provided in **Annexure-11**.
- (ii) Registration of the bidder with Competent Authority should be valid at the time of submission as well as acceptance of the bids.

26.0 While every care has been taken to ensure that the contents (w.r.t. statutory obligations/ Compliances) of this tender document are accurate and up to date. In case of any conflict between the statutory provisions stipulated in this tender document and in the original source such as applicable Acts or the prevailing laws / rules, the statutory provisions contained in the extant law/ rule and the original instructions shall prevail.

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27.0 Liquidated Damages (LD)/Penalty shall be applicable as per relevant clause of GCC.

28.0 Bid should be free from correction, overwriting, using corrective fluid, etc. Any interlineation, cutting, erasure or overwriting shall be valid only if they are attested under full signature(s) of person(s) signing the bid else bid shall be liable for rejection. All overwriting/cutting, etc., will be numbered by bid opening officials and announced during bid opening. **(Clause applicable in case of Paper Bid only.)**

29.0 In the course of evaluation, if more than one bidder happens to occupy L-1 status, effective L-1 will be decided by soliciting discounts from the respective L-1 bidders.

In case more than one bidder happens to occupy the L-1 status even after soliciting discounts, the L-1 bidder shall be decided by a toss/ draw of lots, in the presence of the respective L-1 bidder(s) or their representative(s).

Ranking will be done accordingly. BHEL's decision in such situations shall be final and binding.

30.0 The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). 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.

In case, the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies/ guidelines.

31.0 Order of Precedence:

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

- (a) Amendments/Clarifications/Corrigenda/Errata etc. issued in respect of the tender documents by BHEL
- (b) Notice Inviting Tender (NIT) – Volume-1A
- (c) Price Bid / BOQ - Volume -2
- (d) Technical Conditions of Contract (TCC)—Volume-1B
- (e) Special Conditions of Contract (SCC) —Volume-1C
- (f) General Conditions of Contract (GCC) —Volume-1D
- (g) Forms and Procedures —Volume-1E
- (h)

It may please be noted that guidelines/ circulars/ amendments/ govt. directives issued from time to time shall also be applicable.

for BHARAT HEAVY ELECTRICALS LTD.
(SCT)

Enclosure:

- (i) Annexure-1: Pre Qualifying Requirements.
- (ii) Annexure-2: Check List.
- (iii) Annexure-3: Certificate by Chartered Accountant
- (iv) Annexure-4: Reverse Auction Process Compliance Form

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- (v) Annexure-5: Authorization of representative who will participate in the online Reverse Auction Process
- (vi) Annexure-6: RA Price Confirmation and Breakup
- (vii) Annexure-7: Integrity Pact
- (viii) Annexure-8: Undertaking as per C4 of Annexure-1 i.e. PQR
- (ix) Annexure-9: Declaration reg. Related Firms & their areas of Activities
- (x) Annexure-10: Declaration reg. minimum local content in line with Public Procurement (Preference to Make in India), Order 2017-Revision, dated 04th June, 2020 and subsequent order(s)
- (xi) Annexure-11: Declaration regarding compliance to Restrictions under Rule 144 (xi) of GFR 2017
- (xii) Other Tender documents as per this NIT.

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ANNEXURE – 1**PRE QUALIFYING REQUIREMENTS (PQR)**

JOB	Construction of Propulsion Manufacturing Block Foundation and Miscellaneous Enabling Works at BHEL CoE, Karkhiyaon, Varanasi.
TENDER NO.	COE/VNS/CVL/2023/001

Joint ventures/ Consortium bidders are not accepted. The bidders who fulfil the following requirements shall only be eligible to apply. Price Bids of only those bidders shall be opened who stand qualified after compliance of following criteria:

1. TECHNICAL

- (a) Experience of having successfully executed similar works during last 7 years ending last day of month previous to the one in which tenders are invited should be either of the following:
- i) One (1) work of value not less than Rs.17.80 Crores.
OR
 - ii) Two (2) works of value not less than Rs.11.12 Crores each.
OR
 - iii) Three (3) works of value not less than Rs.8.90 Crores each.
(Above values are inclusive of taxes)
- (b) 'Similar' works for criteria 1(a) above shall mean civil construction works for Buildings/ Industrial plants/ Factories for all works.

2. FINANCIAL**(a) TURNOVER:**

Bidders must have achieved an average annual financial turnover (Audited) of Rs.6.68 Crores or more over last three Financial Years (FY) ending 31st March of the previous financial years i.e. FY 2020-21, FY2021-22 & FY2022-23. Bidders shall submit the Audited Balance Sheet and Profit & Loss Account in support of this.

Note:

- 1) If financial statements are not required to be audited statutorily, then instead of audited financial statements, the financial statements are required to be certified by Chartered Accountant.
- 2) Financial documents, as above submitted shall bear UDIN No.

(b) NETWORTH

Net worth (only in case of Companies) of the Bidder based on the latest Audited Accounts as furnished for '(a)' above should be positive.

Note: Net worth shall be calculated based on the latest Audited Accounts, as furnished for '(a)' above.

Net Worth = Paid up Share Capital + Reserves.

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(Signature with Name, Designation and Date)

(c) PROFIT

Bidder must have earned profit in any one of the three Financial Years as applicable in the last three Financial Years as furnished for '(a)' above.

Note: PROFIT shall be PBT earned during any one year of last three financial years as in '(a)' above

(d) Bidder must not be under Insolvency Resolution Process or Liquidation or Bankruptcy Code Proceedings (IBC) as on date, by NCLT or any adjudicating authority/authorities, which will render him ineligible for participation in this tender, and shall submit undertaking (Annexure-8) to this effect.

3. INTEGRITY PACT

Bidder to sign and submit the Integrity Pact with BHEL

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

1. For evaluation of PQR, in case Bidder alone does not meet the pre-qualifying technical criteria mentioned above, bidder may utilize the experience of its Parent/ Subsidiary Company along with its own experience, subject to following:
 - (i) The parent company shall have a controlling stake of $\geq 50\%$ in the subsidiary company (as per **Format-1**).
 - (ii) The Parent Company/ Subsidiary Company of which experience is being utilized for bidding shall submit Security Deposit (SD) equivalent to 1% of the total contract value.
 - (iii) The parent/ subsidiary company and bidder shall provide an undertaking that they are jointly or severally responsible for successful performance of the contract (as per **Format-2**).
 - (iv) Parent Company/ Subsidiary Company of which experience is being used for bidding, cannot participate as a 'Standalone Bidder' or as a 'Consortium bidder'.
2. Completion date for achievement of the technical criteria specified in the Technical' criteria of PQR mentioned above should be in the last 7 years ending on the 'latest date of Bid Submission' of Tender irrespective of date of the start of work.
3. 'EXECUTED' means the bidder should have achieved the criteria specified in the Technical criteria of PQR as mentioned above, even if the Contract has not been completed or closed.

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

Credentials submitted by the bidder against "PRE-QUALIFYING CRITERIAS" shall be verified for its authenticity. In case, any credential (s) is/are found unauthentic, offer of the bidder is liable to the rejection. BHEL reserves the right to initiate any further action as per extant guidelines for Suspension of Business Dealings.

BIDDER
(Signature with Name, Designation and Date)

DOCUMENTS REQUIRED IN SUPPORT OF PQR

The tenderers should submit documents in support of possessing Qualifying requirements as under, duly certified and stamped by their authorized signatory:

SN	Documents Required
1	Copy of Income Tax return of previous three financial years i.e. 2020-21, 2021-22 & 2022-23.
2	Copy of balance sheet, P&L A/c duly certified & audited by CA for FY2020-21, FY2021-22 & FY2022-23 bearing UDIN No.
3	Covering letter with calculation of average financial turnover, Net worth and PBT of previous three years i.e. 2020-21, 2021-22 & 2022-23 duly certified by CA.
4	Details of work successfully completed in support of qualification requirements along with supporting.
5	Work orders / LOA (Letter of Award) along with BOQ (as applicable) and completion certificates with covering letter / indexing of the same.
6	Copy of PAN No. & GST registration certificate, PF & ESI registration.
7	Un-priced price bid format duly signed by the tenderer along with techno-commercial bid by mentioning "Quoted" at the place where quote is to be offered by the bidder.
8	A copy of tender enquiry duly signed and stamped on each and every page along with techno-commercial bid as a token of acceptance of T&C. Tenders shall be signed by persons duly authorized / empowered to do so.
9	No Deviation Certificate duly signed as per format given in Volume-1E Forms and Procedures
10	Details of the bidders duly filled and signed.

BIDDER
(Signature with Name, Designation and Date)

Format-1**Certificate for relationship between Parent Company / Subsidiary Company and the bidder**

To,

.....

.....

Dear Sir,

Sub: Bid for NIT No dated..... for “” (name of the tender).

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

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

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

BIDDER
(Signature with Name, Designation and Date)

Format-2

**Undertaking from the Parent Company/ Subsidiary Company of the bidder
(On the Letter Head of Parent Company/ Subsidiary Company, as applicable)**

From,
Name:
Full Address:

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

To,
.....
.....

Dear Sir,

We refer to the NIT No dated..... for “” (name of the Tender).

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

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

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

We confirm that we along with M/s.....(the bidder), are jointly or severally responsible for successful performance of the contract.

We confirm that our company shall not participate in the above tender as a ‘Standalone Bidder’ or as a ‘Consortium bidder’ and also shall not authorize any other bidder to use our Technical capability for the above tender.

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

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

BIDDER
(Signature with Name, Designation and Date)

ANNEXURE - 2**CHECK LIST****NOTE: Tenderers are required to fill in the following details and no column should be left blank**

1	Name and Address of the Tenderer		
2	Details about type of the Firm/Company		
3.a	Details of Contact person for this Tender	Name: Mr/Ms Designation: Telephone No: Mobile No: Email ID: Fax No:	
3.b	Details of alternate Contact person for this Tender	Name: Mr/Ms Designation: Telephone No: Mobile No: Email ID: Fax No:	
4	EMD DETAILS	DD No: Date: Bank: Amount: <u>Please tick (√) whichever applicable:-</u> ONE TIME EMD / ONLY FOR THIS TENDER	
5	Validity of Offer	TO BE VALID FOR SIX MONTHS FROM DUE DATE	
		APPLICABILITY (BY BHEL)	ENCLOSED BY BIDDER
6	Whether the format for compliance with PRE-QUALIFICATION CRITERIA (ANNEXURE-I) is understood and filled with proper supporting documents referenced in the specified format	Applicable	YES / NO
7	Audited profit and Loss Account for the last three years	Applicable	YES/NO
8	Copy of PAN Card	Applicable	YES/NO
9	Whether all pages of the Tender documents including annexures, appendices etc are read understood and signed	Applicable	YES/NO
10	Integrity Pact	Applicable	YES/NO
11	Declaration by Authorized Signatory	Applicable	YES/NO
12	No Deviation Certificate	Applicable	YES/NO
13	Declaration confirming knowledge about Site Conditions	Applicable	YES/NO
14	Declaration for relation in BHEL	Applicable	YES/NO

BIDDER
(Signature with Name, Designation and Date)

15	Non-Disclosure Certificate	Applicable	YES/NO
16	Bank Account Details for E-Payment	Applicable	YES/NO
17	Power of Attorney for Submission of Tender/Signing Contract Agreement	Applicable	YES/NO
18	Analysis of Unit rates	Applicable	YES/NO

Note: Strike off 'YES' or 'NO', as applicable. Tender not accompanied by the prescribed **above applicable documents** are liable to be summarily rejected.

DATE :

Sign. of the AUTHORISED SIGNATORY
(With Name, Designation and Company seal)

BIDDER
(Signature with Name, Designation and Date)

ANNEXURE – 3**Certificate by Chartered Accountant on letter head**

(applicable upto 31st Dec'2021 in line with MSME notification no. S.O. 2119 (E), dated 26th June'2020 and gazette notification no. S.O. 2347(E) dtd. 16.06.2021))

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

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

1. **For Manufacturing Enterprises:** Investment in plant and machinery (i.e. original cost excluding land and building and the items specified by the Ministry of Small Scale Industries vide its notification No.S.O.1722(E) dated October 5, 2006:
Rs Lacs
2. **For Service Enterprises:** Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the **MSMED** Act, 2006:
Rs Lacs
3. **For Enterprises** (having EM-II Certificate/ valid NSIC Certificate or Udyog Aadhar Memorandum): 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/ Medium (*Strike off which is not applicable*) Category under MSMED Act 2006.

Or

The enterprise has been graduated upward from its original category (micro/small/medium) (*strike off which is not applicable*), the enterprise shall maintain its prevailing status till expiry of one year from the close of year of registration, as notified vide S.O. No. 2119 (E) dated 26.06.2020 published in the gazette notification dated 26.06.2020 by Ministry of MSME.

Or

The enterprise has been reverse-graduated from its original category (micro/small/medium) (*strike off which is not applicable*), the enterprise will continue in its present category till the closure of the financial year and it will be given the benefit of the changed status only with effect from 1st April of the financial

BIDDER

(Signature with Name, Designation and Date)

year following the year in which such change took place, as notified vide S.O. No. 2119 (E) dated 26.06.2020 published in the gazette notification dated 26.06.2020 by Ministry of MSME.

Date:

(Signature)

Name:

Membership Number:

Seal of the Chartered Accountant

BIDDER

(Signature with Name, Designation and Date)

ANNEXURE - 4**Reverse Auction Process Compliance Form**

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

To

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

Sub: Agreement to the Process related Terms and Conditions

Dear Sir,

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

This letter is to confirm that:

- 1) The undersigned is authorized official/ representative of the company to participate in RA and to sign the related documents.
- 2) We have studied the Reverse Auction guidelines (as available on www.bhel.com), and the Business rules governing the Reverse Auction as mentioned in your letter and confirm our agreement to them.
- 3) We also confirm that we have taken the training on the auction tool and have understood the functionality of the same thoroughly.
- 4) We also confirm that, in case we become L1 bidder, we will FAX/ email the price confirmation & break up of our quoted price as per **Annexure - 6** within **two** working days (of BHEL) after completion of RA event, besides sending the same by registered post/ courier both to M/s. BHEL and M/s. {Service provider.}

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

With regards

Signature with company seal

Name:

Company / Organization:

Designation within Company / Organization:

Address of Company / Organization:

Sign this document and FAX/ email it to M/s {Service provider} at {.....} prior to start of the Event.

BIDDER

(Signature with Name, Designation and Date)

ANNEXURE – 5**Authorization of representative who will participate in the online Reverse Auction Process**

1	NAME OF THE BIDDER	
2	NAME & DESIGNATION OF OFFICIAL	
3	POSTAL ADDRESS (COMPLETE)	
4	TELEPHONE NOS. (LAND LINE & MOBILE BOTH)	
5	E-MAIL ADDRESS	
6	NAME OF PLACE/ STATE/ COUNTRY, WHEREFROM S/HE WILL PARTICIPATE IN THE REVERSE AUCTION	

BIDDER
(Signature with Name, Designation and Date)

ANNEXURE – 6**RA PRICE CONFIRMATION AND BREAKUP**

(To be submitted by L1 bidder after completion of RA)

To

- M/s. Service provider
- Postal address

CC: M/s BHEL

{Unit-
Address-}Sub: **Final price quoted during Reverse Auction and price breakup**

Dear Sir,

We confirm that we have quoted.

Rs. {____ in value & in words _____} for item(s) covered under tender enquiry No. {...} dt. {...}

Total price of the items covered under above cited enquiries is inclusive of {Packing & forwarding, GST, E.D., C.S.T., freight and insurance charges up to {.....} District, {.....} State and Type Test Charges etc., (exclusive of service tax), other as per NIT}

as our final landed prices as quoted during the Reverse Auction conducted today {date} which will be valid for a period of {____ in nos. & in words ____} days.

The price break-up is as given below.

Total

=====

- Rs. in value & in words

=====

Yours sincerely,

For _____

Name:**Company:****Date:****Seal:**

BIDDER

(Signature with Name, Designation and Date)

ANNEXURE – 7**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 Construction of Propulsion Manufacturing Block Foundation and Miscellaneous Enabling works at BHEL COE Karkhiyaon, Varanasi. 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.

Shardul
(Girish chand)
SDGM/SGT, COE Karkhiyaon

BIDDER
(Signature with Name, Designation and Date)

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.

BIDDER

(Signature with Name, Designation and Date)

Chand
(Girish Chand)
SDGM/SC, COE Bhubaneswar

- 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.

BIDDER

(Signature with Name, Designation and Date)

Chand
(Girish chand)
SDGM/SLT, COE kashiyoon

- 8.5 The role of IEMs is advisory, would not be legally binding and it is restricted to resolving issues raised by an intending bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.
- 8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process, the matter should be examined by the full panel of IEMs jointly as far as possible, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.
- 8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to CMD, BHEL, at the earliest. They may also send their report directly to the CVO and the Commission, in case of suspicion of serious irregularities requiring legal/ administrative action. IEMs will tender their advice on the complaints within 10 days as far as possible.
- 8.8 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.
- 8.9 IEM should examine the process integrity; they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the organization should be looked into by the CVO of the concerned organisation.
- 8.10 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code/ Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.
- 8.11 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.
- 8.12 The word 'Monitor' would include both singular and plural.

Section 9 - Pact Duration

- 9.1 This Pact shall be operative from the date IP is signed by both the parties till the final completion of contract for successful bidder and for all other bidders 6 months after the contract has been awarded. Issues like warranty / guarantee etc. should be outside the purview of IEMs.
- 9.2 If any claim is made/ lodged during currency of IP, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 - Other Provisions

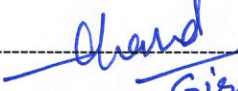
- 10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.
- 10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

BIDDER

(Signature with Name, Designation and Date)

Shard
(Girishchand)
SDGM/SCF, COE karkhiyaon

- 10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.
- 10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- 10.5 Only those bidders / contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.


For & On behalf of the Principal

(Office Seal)

Place-----

Date-----

गिरीश चन्द / GIRISH CHAND
वरिष्ठ उप महाप्रबंधक /Sr. DGM
Bharat Heavy Electricals Limited
(Govt. of India Undertaking)
Centre of Excellence, Karkhiyaon
Varanasi-221206

For & On behalf of the Bidder/ Contractor

(Office Seal)

Witness: _____

(Name & Address) _____

Witness: _____

(Name & Address) _____

BIDDER

(Signature with Name, Designation and Date)

ANNEXURE – 8

UNDERTAKING

(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/Madam,

Sub: Declaration Regarding Insolvency/ Liquidation/ Bankruptcy Proceedings

Ref: NIT/Tender Specification No:

I/We,

declare that, I/We am/are not under insolvency resolution process or liquidation or Bankruptcy Code Proceedings (IBC) as on date, by NCLT or any adjudicating authority/authorities, which will render us ineligible for participation in this tender.

**Sign. of the AUTHORISED SIGNATORY
(With Name, Designation and Company seal)**

Place:

Date:

BIDDER
(Signature with Name, Designation and Date)

ANNEXURE-9**DECLARATION**

Date: _____

To: _____

Address: BHEL, _____

email: _____

Sub: **Details of related firms and their area of activities**

Dear Sir/ Madam,

Please find below details of firms owned by our family members that are doing business/ registered for same item with BHEL, _____ (NA, if not applicable)

1	Material Category/ Work Description	
	Name of Firm	
	Address of Firm	
	Nature of Business	
	Name of Family Member	
	Relationship	
2	Material Category/ Work Description	
	Name of Firm	
	Address of Firm	
	Nature of Business	
	Name of Family Member	
	Relationship	
...		

Note: I certify that the above information is true and I agree for penal action from BHEL in case any of the above information furnished is found to be false.

Regards,

(_____)

From: M/s _____
Supplier Code: _____
Address: _____

BIDDER
(Signature with Name, Designation and Date)

ANNEXURE-10

**DECLARATION REGARDING MINIMUM LOCAL CONTENT IN LINE WITH
REVISED PUBLIC PROCUREMENT (PREFERENCE TO MAKE IN INDIA), ORDER 2017 DATED 04TH JUNE, 2020 AND
SUBSEQUENT ORDER(S)**

(To be typed and submitted in the Letter Head of the Entity/Firm providing certificate as applicable)

To,

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

Dear Sir,

Sub: Declaration reg. minimum local content in line with Public Procurement (Preference to Make in India), Order 2017-Revision, dated 04th June, 2020 and subsequent order(s).

Ref: 1) NIT/Tender Specification No:,
2) All other pertinent issues till date

We hereby certify that the items/works/services offered by..... *(specify the name of the organization here)* has a local content of _____ % and this meets the local content requirement for '**Class-I local supplier**' / '**Class II local supplier**' ** as defined in Public Procurement (Preference to Make in India), Order 2017-Revision dated 04.06.2020 issued by DPIIT and subsequent order(s).

The details of the location(s) at which the local value addition is made are as follows:

1. _____ 2. _____
3. _____ 4. _____

...

...

...

Thanking you,

Yours faithfully,

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

**** - Strike out whichever is not applicable.**

Note:

1. Bidders to note that above format Duly filled & signed by authorized signatory, shall be submitted along with the techno-commercial offer.
2. In case the bidder's quoted value is in excess of Rs. 10 crores, the authorized signatory for this declaration shall necessarily be the statutory auditor or cost auditor of the company (in the case of companies) or a practising cost accountant or practicing chartered accountant (in respect of suppliers other than companies).
3. In the event of false declaration, actions as per the above order and as per BHEL Guidelines shall be initiated against the bidder.

BIDDER
(Signature with Name, Designation and Date)

ANNEXURE-11

DECLARATION REGARDING COMPLIANCE TO RESTRICTIONS UNDER RULE 144 (xi) OF GFR 2017

(To be typed and submitted in the Letter Head of the Entity/Firm providing certificate as applicable)

To,

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

Dear Sir,

Sub: Declaration regarding compliance to Restrictions under Rule 144 (xi) of GFR 2017

Ref: 1) NIT/Tender Specification No:,
2) All other pertinent issues till date

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries. I certify that _____ *(specify the name of the organization here)*, is not from such a country / has been registered with the Competent Authority *(attach valid registration by the Competent Authority, i.e., the Registration Committee constituted by the Dept. for Promotion of Industry and Internal Trade (DPIIT))*; and will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority. *(attach relevant valid registration, if applicable)*

I hereby certify that we fulfil all requirements in this regard and is eligible to be considered.

Thanking you,
Yours faithfully,

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

Note: Bidders to note that in case above certification given by a bidder, whose bid is accepted, is found to be false, then this would be a ground for immediate termination and for taking further action in accordance with law and as per BHEL guidelines.

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BHARAT HEAVY ELECTRICALS LIMITED

Centre of Excellence (CoE), Karkhiyaon, Varanasi

Name Of Work:

**Construction of Propulsion Manufacturing Block
Foundation and Miscellaneous Enabling Works at
BHEL CoE, Karkhiyaon, Varanasi**

Tender Enquiry No. : COE/VNS/CVL/2023/001

VOLUME-1B

TECHNICAL CONDITIONS OF CONTRACT (TCC)

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Part-I

CHAPTER – I

Project Information

Project: Construction of Propulsion Manufacturing Block Foundation and Miscellaneous Enabling Works at BHEL CoE, Karkhiyaon, Varanasi.

Project Information is as follows:

	Title	Description
1	Owner/Customer	BHARAT HEAVY ELECTRICALS LTD.
3	Project Title	Construction of Propulsion Manufacturing Block Foundation and Miscellaneous Enabling Works at BHEL CoE, Karkhiyaon, Varanasi
4	Project Site Location	Agro Park, UPSIDC Area, Karkhiyaon, Tehsil Pindra, (NH-31) Dist. Varanasi, 221206.
5	Site Access	Proposed plot is located on NH-31 connecting Varanasi (north) - Jaunpur (south).
6	Nearest Railway Station	The closest railway station is a local halt- Khalispur, which is about 7 Km. from the plot.
7	Nearest Airport	The nearest major airport is Varanasi at about 15 km by road.
8	Nearest Highway	NH-31

Note: - The bidder is advised to physically visit and examine the site of WORKS and its surroundings and obtain for himself on his own responsibility all information that may be necessary for preparing the bid and entering into the CONTRACT. All costs for and associated with site visits shall be borne by the bidder. The Bidders shall fully acquaint themselves with site conditions, transportation routes, various distances and the fact that other contractors would be working in this area and their structures are to be protected. The material brought and stacked for construction should not make hindrance to other contractors. Necessary precaution and arrangements including sprinkling of water during work as acceptable to BHEL for safety & security for the above have to be made by the contractor. No claim will be entertained by BHEL on ground of lack of knowledge and the contractor's rates shall be deemed to have taken this into account.

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The contractor, in the event of this work awarded to him, shall establish an office at site and keep posted an authorized, responsible officer with valid Power of Attorney for the purpose of the contract. Any order or instructions of the 'Engineer' or his duly authorized representative, communicated to the contractor's representative at site office will be deemed to have been communicated to the contractor at his legal address.

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CHAPTER – II

Scope of Works

2.0 GENERAL SCOPE OF WORK

2.1 Scope of this tender covers works for Construction of Propulsion Manufacturing Block Foundation and Miscellaneous Enabling Works at BHEL CoE, Karkhiyaon, Varanasi

2.2 The brief scope of work is as follows:

The bidder's scope shall include soil stripping, excavation in soil, dewatering, backfilling, disposal of surplus earth, concreting including design mix, shuttering, reinforcement work, brick works, plastering and other miscellaneous work related to this tender's scope, site clearance before handing over to BHEL and other auxiliary items of work etc. all complete including supply of all materials, consumables, labour, tools and plants, transportation and storage, sample testing etc. all complete as per BOQ, specifications and drawings for proper and successful execution of the job for proposed BHEL's manufacturing facility for industrial products at Karkhiyaon, Varanasi, Uttar Pradesh.

2.2.1 The scope of works covers civil works for BHEL's Manufacturing Facilities at VARANASI, including supply of all materials, labors, tools and plants. The scope of work includes but not limited to the construction works for the structures given below:

- Construction of Propulsion Manufacturing Block Foundation.
- BHEL Pre-Fab Office and Covered Store.
- Construction Power Distribution System.
- Borewell.
- Area-levelling & Grading.
- Miscellaneous Enabling Works and any other work in the plant boundary of BHEL CoE, Karkhiyaon,

2.2.2 The works to be performed under this contract consist of providing all labours, Supervision, material, scaffolding, construction equipment, tools and plants, temporary works, supplies, transportation and all incidental items not shown or specified but reasonably implied or necessary for the proper completion of work in all respects. Testing of all materials, concrete, earthwork other allied works, preparation of bar bending schedules on the basis of construction drawings etc. are included in the rates of BOQ items. Works shall only be carried out with approved / ready for construction (RFC) drawings.

2.2.3 The contractor should fully apprise himself of the prevailing conditions at the proposed site, climatic conditions including monsoon pattern, local conditions, soil strata and site

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specific parameters and shall include for all such conditions and contingent measures in the bid, including those which may have not been specifically brought out in the specifications.

- 2.2.4** The area of work shall be cleared of all vegetation, rubbish and other objectionable matter and materials remove, shall be burnt or otherwise disposed of as directed by the Engineer-in-Charge. No separate payment for these operations shall be made. The cost of all these operations shall be deemed to have been included in the unit rates rendered for the different items under bill of quantities.
- 2.2.5** Any underground structure, facilities, piping etc. found in the area of work (if any) shall also be dismantled / removed and disposed off as directed by BHEL. No separate payment for these operations shall be made. The cost of all these operations shall be deemed to have been included in the unit rates rendered for the different items under bill of quantities.
- 2.2.6** All the works areas shall be adequately flood lighted to the satisfaction of the Engineer-in-Charge when the work is in progress during the night shifts.
- 2.2.7** The unit rates shall include all material, equipment, fixtures, labour, construction plant, temporary works and everything whether of permanent or temporary nature necessary for the completion of job in all respects.
- 2.2.8** The unit rates quoted for various items of B.O.Q. shall include all the technical specifications under Section D and nothing extra over B.O.Q. rates shall be payable.
- 2.2.9** Drawings showing enough details for the construction as per the specification shall be furnished to the contractor in a phased manner as far as possible.
- 2.2.10** The contractor shall be required to provide all facilities for inspection of works at no extra cost to BHEL. Any defect in quality of work or deviations from drawings / specifications pointed out during such inspection shall be made good by the contractor without any cost implication to BHEL.
- 2.3** **Cement and Steel Supply:** Cement, Reinforcement Steel (TMT) and Structural Steel (as per BOQ cum Rates Schedule) required for the tender scope are **in the scope of contractor**.
- 2.4** **In order to save time for setting-up of batching plant_contractor may explore the availability of Ready Mix Concrete Plant in the vicinity & if available, contractor may propose the RMC (Ready Mix Concrete) of desired mix & grade though RMC Supplier. Prior approval of BHEL Engineer-I/C is mandatory for supply of RMC through RMC Supplier. Raw materials like cement, admixture, 10mm / 20mm aggregates & course sand etc. for**

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RMC shall be of approved quality by BHEL. All concrete shall be produced as per the Design Mix / Nominal Mix approved from BHEL. No delay at the end of supplier shall be entertained by BHEL for whatever reason. Timely supply of RMC in requisite quantity and quality shall be the responsibility of contractor only. Field quality tests as per approved FQP shall be conducted at site for use of supplied RMC. Acceptance of RMC at site is sole decision of BHEL and no claim shall be accepted for rejected quantity of RMC, if any.

- 2.5** The working area shall be separated from the existing / adjacent plant area (if required) by cordoning off the area by providing MS/GI sheets of suitable heights with appropriate frame work as approved by BHEL. No extra payment shall be paid to contractor for this work.
- 2.6** BHEL Engineer's decision regarding clarification of items in the BOQ cum rate schedule and with respect to other sections of the contract shall be final and binding on the contractor.
- 2.7** The complete works shall be carried out as per **BOQ cum Rate schedule**. If any work covered in the scope of contract cannot be executed using items available in BOQ, additional / extra items shall be made and rates for such items shall be worked out as per **GCC clause 2.15.7**. However, contractor shall be bound to execute all the works under the scope of the contract and decision whether an extra item is applicable or not, shall be taken by BHEL Engineer, which shall be binding on the contractor.
- 2.8** In case the description / specifications as per BOQ are found to be incomplete, Indian Standard Codes (IS Codes) specifications shall be followed. Quantities mentioned in the BOQ cum Rate Schedules, are approximate only and liable for variation due to change of scope of work / variation in schedule of quantities, changes in design etc. The contractor shall undertake to execute actual quantities as per advice of BHEL Engineer and accordingly the final contract price shall be worked out on the basis of quantities actually executed at site and payments will also be regulated for the same.
- 2.9** Any activity which is necessarily required for satisfactory execution of any item of BOQ in line with technical specifications shall be deemed to be included in BOQ item even if it is not described in the item description and no extra payment shall be made against such activity.
- 2.10 Also included in the scope :**
Contractor's scope also includes following:
- 2.10.1** Furnishing all labours, materials, supervision, construction plans, equipment, supplies, transport to and from the site, materials handling, fuel, electricity, compressed air, water, transit and storage insurance and all other incidental items and temporary works not shown or specified but reasonably implied or necessary for the proper completion, maintenance and handing over the works, in accordance with the stipulations laid down in the contract documents and additional stipulations as may be provided by BHEL Engineer

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during the course of works.

- 2.10.2** Furnishing samples of all materials required by the engineers for testing / inspection and approval for use in the works. The samples may be retained by the engineer for final incorporation in the works.
- 2.10.3** Furnishing test reports for the products used or intended to be used, if called for the specifications or if so desired by the engineer.
- 2.10.4** Giving all notices, paying all fees, taxes etc., in accordance with the general conditions of contract, that are required for all works including temporary works.
- 2.10.5** Arranging manufacturer's supervision for items of work done as per manufacturer's specifications when so specified.
- 2.10.6** The scope of work will also include such other related works although they may not be specifically mentioned in the above paragraph and all such incidental items not specified but reasonably implied and necessary for completion of the job as a whole all as desired and as directed by the engineer.
- 2.10.7** The scope of work covered above is not a comprehensive list of items of work involved. The detail scope of work may vary considerably depending on the actual construction requirements

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CHAPTER – III**Facilities in the Scope of Contractor/ BHEL**

Sl. No.	Description	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.1.0	ESTABLISHMENT			
3.1.1	FOR CONSTRUCTION PURPOSE:			
A	Open space for office	Yes		BHEL may provide free of charge limited open space for office as per site conditions. Also refer clause no. 3.7.1
B	Open space for storage	Yes		
C	Construction of Contractor's office, canteen, Quality Lab and storage building including supply of materials and other services.		Yes	
D	Contractor's all office equipment, office / store / canteen consumables.		Yes	
E	Canteen facilities for the contractor's staff, supervisors and engineers etc.		Yes	
F	Firefighting equipment like buckets, extinguishers etc.		Yes	
G	Fencing of storage area, office, canteen etc. of the bidder		Yes	
3.1.2	FOR LIVING PURPOSES OF THE BIDDER			
A	Open space		Yes	
B	Living accommodation		Yes	

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Sl. No.	Description	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.2.0	ELECTRICITY			
3.2.1	<u>Electricity For construction purposes</u> Electricity for construction purpose shall be provided on chargeable basis at single point. Further distribution is in contractor's scope.		Yes	Electricity is in Contractor's Scope. Contractor has to deploy DG Sets as an alternate arrangement of electricity at no extra cost to BHEL.
3.2.1.1	Single Point source		Yes	
3.2.1.2	Further distribution for the work to be done which include supply of materials and execution		Yes	
3.2.2	Electricity for the office, stores, canteen etc. of the bidder which include:		Yes	
3.2.2.1	Distribution from single point including supply of materials and service		Yes	
3.2.2.2	Supply, installation and connection of material of energy meter including operation and maintenance		Yes	
3.2.2.3	Duties and deposits including statutory clearances for the above		Yes	
3.2.2.4	Living facilities for office use including charges		Yes	
3.2.2.5	Demobilization of the facilities after completion of works		Yes	
3.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc. on the above lines.		Yes	
3.3.0	WATER SUPPLY			
3.3.1	For construction purposes:			
3.3.1.1	Making the water available at single point.		Yes	Contractor has to make their arrangements for

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Sl. No.	Description	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.3.1.2	Further distribution as per the requirement of work including supply of materials and execution.		Yes	Construction water at his own cost by resorting to the methods like bore well, water tankers etc. with due statutory approvals.
3.3.2	<u>Water supply for Contractor's office, stores, canteen, Quality Lab etc.</u>		Yes	
3.3.2.1	Making the water available at single point		Yes	
3.3.2.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	
3.4.0	<u>LIGHTING</u>			
3.4.1	For construction work (supply of all the necessary materials) 1. At office storage area 2. At the preassembly area 3. At the construction site /area		Yes	
3.4.2	For construction work (execution of the lighting work/ arrangements) 1. At office storage area 2. At the preassembly area 3. At the construction site /area		Yes	
3.4.3	Providing the necessary consumables like bulbs, switches, etc. during the course of construction		Yes	
3.4.4	Lighting for the living purposes of the bidder at the colony / quarters		Yes	

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Sl. No.	Description	Scope / to be taken care by		Remarks
		BHEL	Bidder	
3.5.0	COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER			
3.5.1	Telephone, internet, intranet, e-mail etc.		Yes	
3.6.0	ENGINEERING WORKS FOR CONSTRUCTION:			
3.6.1	Providing the construction drawings for all the works covered under this scope	Yes		Further developmental drawings shall be done by bidder
3.6.2	Drawings for construction methods		Yes	In consultation with BHEL
3.6.3	Review of performance and revision of site construction schedules in order to achieve the end dates and other commitments	Yes	Yes	

3.7 Other important Conditions regarding facilities to be provided by BHEL / Contractor i.e. Space, Construction Power and Construction Water etc.:

- 3.7.1 BHEL may provide free of charge limited open space, for office & storage shed, as and where made available at site. It is the responsibility of the contractor to construct sheds, provide all utilities, dismantle and clear the site after completion of work or as and when required, as a part of his scope of work.

Note: Due to space constraint at site, contractor may have to arrange for open space for Batching Plant, Storage Area etc. outside the plant premises. Any cost implication of the same shall be to the account of contractor and no extra payment shall be made for any such arrangements made by contractor (if required).

- 3.7.2 Contractor shall be responsible for providing all necessary facilities like residential accommodation, transport, electricity, water, medical facilities etc. as required under various labour laws and statutory rules and regulations framed there under to the personnel employed by him.

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- 3.7.3 Contractor has to make their own arrangement for construction power supply distribution for construction purposes at site.** In the initial stages, the Contractor may have to deploy the DG sets for carrying out the awarded works. Further distribution of power (when received) shall be done by contractor at his cost. All wiring must comply with local regulations and will be subject to Engineer's inspection and approval before connecting supply.

BHEL shall provide metered construction power on chargeable basis at a single source. Further distribution shall be done by contractor on his own cost.

- 3.7.4 CONSUMABLES** - All consumables, like gas, electrodes, chemicals, lubricants etc. required for the scope of work, shall be arranged by the contractor at his cost unless otherwise specifically mentioned in the contract.

In the event of failure of contractor to bring necessary and sufficient consumables, BHEL may arrange for the same at the risk and cost of the contractor. The entire cost towards this along with overhead shall be paid by the contractor or shall be deducted from the contractor's bills.

- 3.7.5 DEWATERING** -The bidder shall, prior to submitting his tender for the work, visit and examine the site of works and its surroundings at his own expense, and obtain & satisfy themselves about the limit and extent of surface and subsurface water to be encountered during the performance of the work, and the requirement of drainage and pumping.
- 3.7.6** Adequate lighting facilities such as flood lamps, hand lamps and area lighting shall be arranged by the contractor at the site of construction, contractor's material storage area etc. within finally accepted rates.
- 3.7.7** Contractor shall ensure at all times that the work area & approach/ access roads are free from accumulation of water, so that the materials are safe and the erection/ progress schedule are not affected. No separate claim in this regard shall be admitted by BHEL.
- 3.7.8** The contractor shall maintain a site organization of adequate strength in respect of manpower, construction machinery and other implements at all times for smooth execution of the contract. This organization shall be reinforced from time to time, as required to make up for slippage from the schedule without any commercial implication to BHEL. The site organization shall be headed by a competent manager having sufficient authority to take decisions at site.
- 3.7.9** The Contractor shall during the progress of the work, provide, erect and maintain at his own expenses all necessary temporary workshops, stores, consumables, offices, etc. required for the proper and efficient execution of the work. The planning, setting and erection of these

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buildings shall have the approval of the Engineer and the Contractor shall at all times keep them tidy and in a clean and sanitary condition to the entire satisfaction of the Engineer.

- 3.7.10 On completion of work or as and when required by BHEL, all the temporary buildings, structures, pipe lines, cables etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, same will be got done by the Engineer and expenses incurred shall be recovered from the contractor along with prevailing overhead. The decision of BHEL Engineer in this regard shall be final.

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CHAPTER – IV**T&Ps and MMEs to be Deployed by Contractor****A. INDICATIVE LIST OF TOOLS & PLANTS TO BE DEPLOYED BY THE CONTRACTOR –****(A) - LIST OF T&Ps TO BE ARRANGED BY THE CONTRACTOR AT HIS OWN COST:**

Sl No.	EQUIPMENT	INDICATIVE QUANTITY
1	TRANSIT MIXER WITH MATCHING DUMPERS	As per requirement
2	SUBMERSIBLE PUMP (DIESEL / ELEC)	As per requirement
3	HYDRA CRANE 9 / 14 T (F15 - FARANA MODEL)	As per requirement
4	BATCHING PLANT (MIN 30/35 CUM PER HOUR) WITH CEMENT SILOS OF 2X200 MT CAPACITY	As per requirement
5	DG SET 125 kVA	1 Nos.
6	15/20 MT TRAILORS WITH PULLING UNIT / TRACTOR – TRAILORS	1 Nos.
7	REINFORCEMET CUTTING / BENDING MACHINE	1 Nos.
8	PORTABLE LIGHTING MAST / LIGHTING SYSTEM	2 Nos.
9	CEMENT STORAGE SHED OF APPROX. 250 MT CAPACITY FOR STORAGE OF CEMENT BAGS WITH AUTOMATIC CONVEYOR SYSTEM TO BATCHING PLANT	1 Nos.
10	WEIGH BATCHER CONCRETE MIXTURE M/C	2 Nos.
11	SCAFFOLDING MATERIAL	As per requirement
12	CONCRETE PUMPS (STATIC)	As per requirement
13	CONCRETE VIBRATORS	As per requirement
14	WELDING MACHINES	As per requirement
15	PLATE COMPACTOR	As per requirement
16	ALL SCAFFOLDING MATERIALS	As per requirement

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17	PLY SHUTTERING BOARD WITH ADEQUATE SUPPORTING STRUCTURE	As per requirement
18	HYD EXCAVATORS / POCLAINS / JCB	As per requirement
19	DUMPERS	As per requirement
20	DE WATERING PUMP – 5/10	As per requirement
21	WATER TANKER WITH SPRINKLER	As per requirement
22	CONCRETE BOOM PLACER	As per requirement

NOTES:

1. The above list – (A) is only indicative and these T&Ps may not be required for entire contract period but contractor will ensure that these T&Ps are provided as per the work requirement. **T&P deployment schedule will be finalized at site based on the work fronts and in consultation with BHEL Engineer. Contractor have to mobilize / maintain the T&P as per the schedule notified time to time by BHEL Engineer.**
2. If any one of T&P mentioned above is not needed for proper execution of scope of work, provided contractor has not utilized BHEL's free issued T&P for completing such work, no recovery from contractor shall be applicable.
3. Any additional item required in addition to above mentioned T&P for proper execution of scope of work, contractor has to arrange such T&P within quoted rate on the instruction of BHEL in writing in a reasonable period within two weeks from the written instruction from BHEL.
4. In case deployment of T&P w.r.t requirement, is delayed or deployed for a shorter period or abnormal down time of T&P or in case T&P w.r.t requirement was not deployed by the contractor as per instruction of BHEL and BHEL had to deploy either its own T&P or from outside, the recovery shall be done from the contractor as under:
 - a. In case BHEL had to deploy its own T&P, hire charges of T&P applicable for outside agencies as per extant guidelines for "Hire Charges on issue of Capital Tools & Plants" shall be recovered.
 - b. In case BHEL had to deploy the T&P from outside, actual hiring cost plus applicable overheads shall be recovered.

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5. All the tools and tackles/measuring instruments shall be duly tested/calibrated and valid certificate to that effect should be submitted to BHEL site in-charge before the start of work.
6. Other terms and conditions regarding above items please also refer clause for T&P/IMTEs in SCC.
7. All the tools and plants required for this scope of work, except the Tools & Plants provided by BHEL are to be arranged by the contractor within the quoted rates. The list is suggestive in nature. **Any additional T&P required to meet BHEL commitments/ schedule shall be arranged without any extra cost by the contractor.**
8. **If the work related to T&Ps mentioned above list - (A) is completed then, Engineer I / C can release the T&P during contract period / extended period if any. However, written permission shall be taken by contractor from BHEL's construction Manager before releasing T&P.**
9. All the tools and plants required for this scope of work are to be arranged by the contractor within the quoted rates. The list is suggestive in nature. Any additional T&Ps required to be arranged by the contractor.
10. If work gets delayed due to non-availability of T&Ps, BHEL reserves the right to get the work done at the risk and cost of contractor without prejudice to rights of BHEL as in GCC.

B- LIST OF IMTEs/MMEs REQUIRED (WITH UPDATED CALIBRATION & CERTIFICATIONS):

SL NO	EQUIPMENT
1	TOTAL STATION
2	AUTO LEVEL AND STAFF
3	COMPRESSION STRENGTH TESTING EQUIPMENT
4	CONSTRUCTION MATERIAL TEST EQUIPMENT
5	CONCRETE CUBE MOULDS (150 X 150 X 150) mm
6	CONCRETE SLUMP CONE
7	COARSE AGGREGATE SIEVES & SAND SIEVES
8	SIEVES AND SIEVE SHAKER
9	AGGREGATE IMPACT TEST MACHINE
10	PHYSICAL BALANCE FOR LAB WORK
11	RAPID MOISTURE METER
12	VICAT APPARATUS WITH PLUNGERS FOR CEMENT TESTING

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13	THEODOLITE ONE STAND ACCURACY
14	DUMPY LEVEL UP TO 350 MM
15	CORE CUTTER TEST APPARATUS
16	CUBE MOULDS (70MM SIZE)

NOTES:

1. The above list is only indicative and these IMTEs/MMEs may not be required for entire contract period and will be provided as per need. Contractor will assess actual quantity and period of requirement based on his experience.
2. Other terms and conditions regarding above items please also refer clause for T&P/MMEs.
3. All the IMTEs /MMEs required for this scope of work, except the IMTEs / MMEs provided by BHEL, are to be arranged by the contractor within the quoted rates. **The list is suggestive in nature. Any additional IMTEs / MMEs required to be arranged by the contractor.**

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CHAPTER – V

T&Ps and MMEs to be Deployed by BHEL on Sharing Basis

NOT APPLICABLE

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CHAPTER – VI

Time Schedule

6.0 MOBILIZATION, TIME SCHEDULE, CONTRACT PERIOD AND GRACE PERIOD

6.1 INITIAL MOBILIZATION:

After receipt of LOI, Contractor shall discuss with Project Manager / Construction Manager regarding initial mobilization. Contractor shall mobilize necessary resources within 2 weeks of issue of letter of intent or as per the directive of Project Manager / Construction Manager. Such resources shall be progressively augmented to match the schedule of milestones as directed by BHEL Engineer.

6.2 START DATE / ZERO DATE:

The schedule date of start of work shall be the date within 15 days of issue of LOI; The Actual Date of Start of Contract Period (Zero Date) shall be date of handing over of site to contractor for work and shall be certified by the BHEL Engineer. **The time schedule of 12 months shall be counted from the zero date.**

6.3 COMPLETION PERIOD:

Entire work as detailed in tender specification **shall be completed within 12 (Twelve) months from the actual date of start of work** as per the programs / milestones indicated by BHEL. Contractor has to mobilize adequate resources to meet BHEL's commitments to their stakeholders as indicated from time to time. **In the event the contractor fails to respond to these requirements, BHEL shall take appropriate actions to meet commitments in line with the provisions of General Conditions of Contract.**

- 6.4** In case due to reasons not attributable to the contractor, the work gets delayed and scheduled completion gets extended, time extension will be granted by BHEL as per clause no. 2.11 of GCC.
- 6.5** The work under the scope of this contract is deemed to be completed in all respects, only when all the works are carried out as per satisfaction of BHEL. The decision of BHEL on completion date shall be final and binding on the contractor.
- 6.6** In order to meet above schedule in general, and any other intermediate targets set, to meet project schedule requirements, contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL without any extra cost to BHEL.
- 6.7** This project is a fast track project. BHEL is making all out efforts to advance the project schedule. No extra payment whatsoever shall be paid on this account.

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6.8 CONTRACT PERIOD:

The contract period for completion of entire work under scope of this contract shall be **12 (Twelve) Months** from the actual / zero date of start of work.

6.9 The Milestones are as under:

Mile Stones as per BOQ/ Drawings	Schedule	Intermediate Milestone (M1 & M2)
Area levelling, Office completion, Borewell and Construction Power establishment.	Within 03 Months from Zero date	
50% of Propulsion Shop Foundations	Within 05 Months from Zero date	M1
Foundation of Propulsion shop & handing over for super structure erection	Within 08 Months from Zero date	M2

6.10 Provision of Penalty in case of slippage of Intermediate Milestones

- A. Two Major Intermediate Milestones are identified as M1 and M2 above.
- B. In case of slippage of these identified Intermediate Milestones, Delay Analysis shall be carried out on achievement of each of these two Intermediate Milestones.
- C. In case delay in achieving M1 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 2% of executable contract value, will be withheld.
- D. In case delay in achieving M2 Milestone is solely attributable to the contractor, 0.5% per week of executable contract value*, limited to maximum 3% of executable contract value , will be withheld.
- E. Amount already withheld, if any against slippage of M1 milestone, shall be released only if there is no delay attributable to contractor in achievement of M2 Milestone.
- F. Amount required to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone payment (corresponding RA Bill) and balance amount (if any) shall be withheld @10% of RA Bill amount from subsequent RA bills.
- G. Final deduction towards LD (if applicable), on account of delay attributable to contractor shall be based on final delay analysis on completion/ closure of contract. Withheld amount, if any due to slippage of identified intermediate milestone(s) shall be adjusted against LD or released as the case may be.

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H. In case of termination of contract due to any reason attributable to contractor before completion of work, the amount already withheld against slippage of intermediate milestones shall not be released and be converted into recovery.

** **Executable Contract Value** - Value of work for which inputs/ fronts were made available to contractor and were scheduled for execution till the date of achievement of that milestone*

6.11 CONSEQUENCE OF DELAY:

It may be noted that in the event, delay in completion is attributable to the contractor; BHEL will impose LD on the contractor as per clause no. 2.7.8 of GCC.

6.12 TAKING OVER OF WORKS BY BHEL

6.12.1 All works shall be taken over by BHEL in part or in full when it has been completed in all respects and /or can be put to use satisfactorily. The complete work under the contract shall be taken over only after completion of all punch points, pending work, rework wherever required, site clearing and reconciliation of materials.

6.12.2 The guarantee period shall start only after the complete work under the contract has been taken over by BHEL.

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CHAPTER – VII

Terms of Payment

- 7.1** The 'Engineer' will certify regarding the actual work executed in the measurement books and bills, which shall be accepted by the contractor in measurement book.
- 7.2** **The Contractor shall be paid monthly running bill as per Chapter – X of SCC and Clause Nos. 2.23 of GCC.** The format for billing shall be approved by BHEL before raising invoices.
- 7.3** **The contractor on certification of the engineer at site be entitled for payments of his running bills which shall be subject to any deduction/retention specifically under clauses 2.23 of GCC and 10.0 of SCC.**
- 7.4** The Contractor shall be paid monthly running bill of **100%** of the value of the work actually executed on site provided the work has been executed to the satisfaction of the Engineer.
- 7.5** From the amount payable, recovery such as advances, security deposit, taxes etc. would be made.
- 7.6** Measurement of work completed shall be done by the Contractor and submitted to BHEL for checking and approval. For this purpose, Contractor shall submit hard copies as well as a soft copy in the pen drive containing abstract & detailed measurement sheets of the bill. The measurement sheets and the bill will be checked and approved by BHEL for further processing, or returned to the Contractor for correction and resubmission. The certificate of Engineer regarding such approval and passing of sums shall be final and conclusive against the Contractor.
- 7.7** The abstract of the measurements and RA bill shall be entered in BHEL Measurement Book and signed and dated by both parties as per the provisions of the General Conditions of Contract.
- 7.8** All running bill payments shall be regarded as advance payments against the final bill. Any certificate relating to the work done during monthly running bills may be modified by any subsequent interim certificates or by the final certificates and no certificate of the Engineer

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supporting an advance payment shall of itself be conclusive evidence that any work or materials to which it relates are in accordance with the contract.

- 7.9** In case any amount is withheld by BHEL during course of execution of work on account of non-compliance of contract requirement, the same shall be recovered / released from the contractors bills as deemed fit by the engineer-in-charge of BHEL and the decision of engineer-in-charge shall be final in this regard and binding on the contractor.

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CHAPTER – VIII

Taxes and Other Duties

8 TAXES & DUTIES

8.1.1	Price quoted should be inclusive of all applicable Taxes/charges but <u>Excluding GST</u> . The Contractor shall pay all other taxes, fees, royalty, commission etc. which may be levied on the contractor in executing the contract. In case BHEL is forced to pay any of such taxes, it shall be recovered from Contractor's bills or otherwise as deemed fit. GST Shall be payable extra as per following :
8.1.2	Contractor/Vendor has to issue invoice indicating HSN/SAC code, Description, Value, Rate, applicable tax and other particulars in compliance with the provisions of relevant GST Act and Rules made thereunder. With the implementation of e way bill provisions, contractor shall comply with same as applicable.
8.1.3	Vendor has to submit GST compliant invoice within seven days from the due date of invoice as per GST Law. In case of delay, BHEL reserves the right of denial of GST payment if there occurs any hardship to BHEL in claiming the input thereof. In case of goods, vendor has to provide scan copy of invoice & GR/LR/RR to BHEL before movement of goods starts. Special care should be taken in case of month end transactions.
8.1.4	GST amount claimed in the invoice shall be released on fulfilment of all the following conditions by the Contractor : - a. Supply of goods and/or services have been received by BHEL. b. Original Tax Invoice (e-Invoice as per GST Act) has been submitted to BHEL. c. Respective invoice has appeared in BHEL's GSTR – 2B for the month corresponding to the month of invoice. Alternatively, BG of appropriate value may be furnished which shall be valid at least one month beyond the due date of confirmation of relevant payment of GST on GSTN portal or sufficient security is available to adjust the financial impact in case of any default by the contractor.
8.1.5	a. TDS under GST law as applicable shall be deducted. b. TDS under Income Tax Act will be deducted as per applicable laws. PAN must be linked with AADHAAR.
8.1.6	Contractor shall be solely responsible for discharging his GST liability according to the provisions of GST Law and BHEL will not entertain any claim of GST/interest/penalty or any other liability on account of failure of contractor in complying the provisions of GST Law or discharging the GST liability in a manner laid down thereunder

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8.1.7	In case declaration of any invoice is delayed by the vendor in his GST return or any invoice is subsequently amended/alterd/deleted on GSTN portal which results in any adverse financial implication on BHEL, the financial impact thereof including interest/penalty shall be recovered from the Contactor's due payment.
8.1.8	Any denial of input credit to BHEL or arising of any tax liability on BHEL due to non-compliance of GST Law by the Contractor in any manner, will be recovered along with liability on account of interest and penalty (if any) from the payments due to the Contactor.
8.1.9	The admissibility of GST, taxes and duties referred in this chapter or elsewhere in the contract is limited to direct transactions between BHEL & its Contractor. BHEL is not responsible for any liability that may arise due to any transaction beyond the direct transaction between BHEL & its Contractor.
8.1.10	<u>Variation in Taxes & Duties:</u> Any upward variation in GST shall be considered for reimbursement provided supply of goods and services are made within schedule date stipulated in the contract or approved extended schedule for the reason solely attributable to BHEL. However downward variation shall be subject to adjustment as per actual GST applicability. In case the Government imposes any new levy/tax on the output service/goods after price bid opening, the same shall be reimbursed by BHEL at actual. The reimbursement under this clause is restricted to the direct transaction between BHEL and its contractor only and within the contractual delivery period only. In case any new tax/levy/duty etc. becomes applicable after the date of Bidder's offer but before opening of the price Bid, the Bidder/Contractor must convey its impact on his price duly substantiated by documentary evidence in support of the same before opening of price bid. Claim for any such impact after opening the price bid will not be considered by BHEL for reimbursement of tax or reassessment of offer.
8.1.11	<u>Modalities of Tax Incidence on BHEL:</u> Where GST law permits more than one option or methodology for discharging liability of tax/ levy/ duty; the contractor shall approach BHEL before choosing any option to discharge his tax liability. BHEL shall have the right to direct the contractor to adopt the appropriate option considering the amount of tax liability on BHEL as well as procedural simplicity with regard to assessment of the liability. The option chosen by BHEL shall be binding on the contractor for discharging the obligation of BHEL in respect of the tax liability to the contractor.
8.2	BUILDING & OTHER CONSTRUCTION WORKERS (REGULATION OF EMPLOYMENT AND CONDITIONS OF SERVICE) ACT, 1996 (BOCW Act) AND RULES OF 1998 READ WITH BUILDING & OTHER CONSTRUCTION WORKERS CESS Act, 1996 & CESS RULES, 1998.
	In case any portion of work involves execution through building or construction workers, then compliance to the above titled Acts shall be ensured by the contractor and contractor

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	shall obtain license and deposit the cess under the Act. In the circumstances it may be ensured as under:-
8.2.1	It shall be the sole responsibility of the contractor in the capacity of employer to forthwith (within a period of 15 days from the award of work) apply for a license to the Competent Authority under the BOCW Act and obtain proper certificate thereof by specifying the scope of its work. It shall also be responsibility of the contractor to furnish a copy of such certificate of license / permission to BHEL within a period of one month from the date of award of contract.
8.2.2	It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under these act and rules including that of payment / deposit of 1% cess on gross payment made for value of work involving building or construction workers engaged by the contractor within a period of one month from the receipt of payment.
8.2.3	It shall be the responsibility of the sub-contractor to furnish the receipts /challans towards deposit of the cess together with the number, name and other details of beneficiaries (building workers) engaged by the sub-contractor during the preceding month.
8.2.4	It shall be the absolute responsibility of the sub-contractor to make payment of all statutory payments & compensations to its workers including that is provided under the Workmen's Compensation Act, 1923.
8.2.5	The contractor shall, however ensure before deposit of any BOCW Cess, that BHEL is not depositing the same in order to avoid excess deposit of cess.
8.2.6	The contractor shall bear cost of BOCW cess either by way of deposit or through recovery by BHEL in case the same is deposited by the BHEL.
8.2.7	In case of failure in above mentioned compliances, BOCW Cess @ 1% as well as applicable penalty as specified in BOCW Act/Rules shall be deducted from the contractor.

Note:

1	The Gross amount is to be construed as cost of construction in line with the provisions of the BOCW of the BOCW Cess act and in case of compliance by BHEL by way of deduction at source in line with clause No 3(2) of the act an equitable adjustment to the relatable cost of construction attributable to the bidder shall be made in terms of clause no 8.2 of TCC.
2	In case compliance by BHEL by way of deduction at source in line with clause no 3(2) is not resorted to, the compliance of BOCW Cess act shall be ensured by the bidder in line with the provisions of BOCW Cess act in terms of clause no 8.2.2b of TCC.
3	The contractor may consider the cost of construction for levy of BOCW Cess inclusive of GST, however, due to whatsoever reason if the GST does not form the cost of construction for levy of aforesaid Cess an equitable adjustment thereof shall be made to the contract price.

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CHAPTER – IX

Materials & Other Requirements

9.0 MATERIALS

- 9.1 **The contractor shall, at his own expenses (Inclusive of Taxes), provide all materials including paints, welding electrodes, Cement (or RMC) & Structural steel etc. required for the work and including reinforcement steel (TMT).**
- 9.2 All materials to be provided by the Contractor shall be of the best kind in conformity with the specifications laid down in the contract or as per relevant Indian standard and the Contractor shall, if requested by the BHEL Engineer, furnish proof to the satisfaction of BHEL Engineer that the materials so comply.
- 9.3 The Contractor shall, at his own expense and without delay, supply to the BHEL Engineer samples of materials proposed to be used in the works. The BHEL Engineer shall within seven days of supply of samples or within such further period as he may require will intimate to the Contractor in writing, whether samples are approved by him or not. If samples are not approved, the Contractor shall forthwith arrange to supply to the BHEL Engineer for his approval fresh samples complying with the specifications laid down in the Contract. Any delay in approval of samples (original or fresh ones) shall not make the contractor eligible for any compensation.
- 9.4 The BHEL Engineer shall have full powers for removal of any or all of the materials brought to site by the Contractor which are not in accordance with the Contract specifications or do not conform in character or quality to samples approved by him. In case of default on the part of the Contractor in removing rejected materials, the BHEL Engineer shall be at liberty to have them removed by other means. The BHEL Engineer shall have full powers to procure other proper material to be substituted for rejected materials and in the event of the Contractor refusing to comply; he may cause the same to be supplied by other means. All costs, which may attend upon such removal and / or substitution, shall be borne by the Contractor.
- 9.5 The Contractor shall indemnify BHEL, its representatives or employees against any action, claim or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties or other charges which may be payable in respect of any article or material or part thereof included in the Contract. In the event of any claim being made or action being brought against BHEL or any agent, servant or employee of BHEL in respect of any such matters as aforesaid, the Contractor shall immediately be notified thereof, provided that such indemnity shall not apply when such infringement has taken place in complying with the specific directions issued by BHEL but the Contractor shall pay any royalties or other charges payable in respect of any such use, the amount so paid being reimbursed to the Contractor only if the use was the result of any drawings / specifications issued after submission of the tender.
- 9.6 The BHEL Engineer shall be entitled to have tests carried out as specified in the Contract for any materials supplied by the Contractor other than those for which, as stated above, satisfactory proof

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has already been furnished, at the cost of the Contractor and the Contractor shall provide at his expense all facilities which the Engineer may require for the purpose. If no tests are specified in the Contract, and such tests are required by the Engineer, the Contractor shall provide all facilities required for the purpose and the charges for these tests shall be borne by the Contractor only. The cost of materials consumed in tests shall be borne by the Contractor in all cases except when otherwise provided.

- 9.7 In addition, the Contractor shall perform / submit at his own cost such tests / samples as may be required by the BHEL Engineer out of the materials used by the company except for the costs of materials used in such tests/ samples.
- 9.8 After acceptance of the Contract, if Contractor desires BHEL to supply any other materials, such material may be supplied by BHEL, if available, at rates to be fixed by the BHEL Engineer along with prevailing departmental charges. BHEL reserve the right not to issue any material. The non-issue of such material will not entitle the Contractor for any compensation whatsoever either in time or in cost.
- 9.9 Material required for the works, whether brought by the Contractor or supplied by BHEL, shall be stored by the Contractor only at places approved by the Engineer. Storage and safe custody of material shall be the responsibility of the contractor.
- 9.10 BHEL's officials concerned with the Contract shall be entitled at any time to inspect and examine any materials intended to be used in or on the works, either on the Site or at factory or workshop or other place(s) where such materials are assembled, fabricated, manufactured or at any place (s) where these are lying or from which these are being obtained and the Contractor shall give such facilities as may be required for such inspection and examination.
- 9.11 All materials brought to the Site shall become and remain the property of BHEL and shall not be removed off the Site without the prior written approval of the BHEL Engineer. But whenever the Works are finally completed and advance, if any, in respect of any such material is fully recovered, the Contractor shall at his own expense forthwith remove from the Site all surplus material originally supplied by him and upon such removal, the same shall re-vest in and become the property of the Contractor.
- 9.12 It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, before procurement of Paint, welding electrodes, cement, TMT & Structural steel. On receipt of materials at site these shall be subjected to inspection and approval by BHEL. The contractor shall inform BHEL details regarding manufacturing certificate, batch No. date of expiry etc. and produce test certificate for each lot / batch with correlation of batch / lot no. with respective test certificate. No Material will be allowed to be used without valid test certificate.
- 9.13 All charges on account of Octroi, terminal or sales tax and other duties on material obtained for the works from any source shall be borne by the contractor.

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9.14	ISSUE AND ACCOUNTING OF REINFORCEMENT STEEL.
9.14.1	Reinforcing steel will be issued as free issue materials from BHEL site stores or other issuing points as specified by the Engineer. Such issues would be only for permanent works. Necessary indents shall be raised by the contractor as per procedure laid down by the Engineer-in-Charge about 7 days in advance of the actual requirement for incorporation in the works.
9.14.2	Materials will be issued only for permanent works and not for making templates, other temporary works, enabling works etc. and the same shall not be taken into account for purpose of material reconciliation.
9.14.3	The contractor shall bear all other costs including the lifting, carting from issue points to works site / contractor's stores, custody and handling etc. and return of surplus / serviceable materials to BHEL's stores to be designated by the Engineer-in-charge and all expenditure will be made by the contractor.
9.14.4	All steel shall be issued in available lengths / shapes and no claims for extra payment on account of issue of non-standard lengths / shapes will be entertained. For the purpose of billing and accounting only linear measurement will be taken and weight will be calculated as per the IS Co-efficient. The different in unit weight as per IS and actual as issued, if any shall be to the contractor's account and contractor shall quote the rates for corresponding item to take care of such difference.
9.14.5	The contractor shall satisfy himself of the quality and quantity of the materials at the time of taking delivery from BHEL stores. No claims whatsoever will be entertained by BHEL because of quality or quantity after the materials are taken by the contractor from BHEL stores.
9.14.6	The contractor shall submit to BHEL well in advance of before Three month from requirement, a statement indicating estimated quantity of steel required during a quarter. In addition, the contractor shall also furnish the estimated requirement of steel during a month by the third week of the previous month indicating his requirement.
9.14.7	The total quantity of steel required for the work will be calculated from the approved Bar Bending schedule, fabrication drawings, approved laps, chairs and lugs etc. The measurement for payment as well as for accounting shall be based on the sectional weights as indicated in the IS 1786 specifications.
9.14.8	In the case of steel materials, the same shall be issued generally on the basis of linear measurement and the corresponding weight will be calculated as per Indian Standard. For the purpose of billing & accounting, only linear measurement will be taken and any difference in weight based on linear measurement & actual weight shall be to contractor's account. Quoted price shall be deemed to include the above & the permissible wastage mentioned. No claim whatsoever shall be entertained on account of wastage & difference in weight as referred to above.

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9.14.9	Issue of stores material is subject to availability and the contractor shall not be entitled to any claim or compensation for non-supply or delay in the supply under any circumstances. The material will be issued generally during the working hours.							
9.14.10	The Contractor will have to submit their design mix for different grades of Concrete keeping in view the requirements stipulated in IS: 456, specifically regarding slump and Water Cement ratio and Specific Gravity of Materials brought to site as analyzed in the laboratories. The design shall be used upon absolute volume method and theoretical consumption of Cement shall be worked out on this basis. For other than above designated mix Concrete items, the coefficients for consumption of cement shall be adopted as per CPWD practice.							
9.14.11	The theoretical consumption of reinforcement steel required for the work will be calculated on the basis of approved drawings / joint measurements. In the case of cement, the theoretical consumption shall be decided by the Engineer as mentioned above and his decision in this regard shall be final and binding on the Contractor. Reinforcement and structural steel shall be measured by weight in tones. The weight will be arrived at by multiplying the used length by the sectional weight. The sectional weight will be same as were applied at the time of issue. Standard hooks, cranks, bends and authorized laps, chairs, separator pieces etc. specified in drawing or instructed by engineer as required shall be measured and paid for. No payment shall be made for binding wires, spacer block etc. required for keeping the steel in position unless otherwise specified in the contract. No extra payment will be made for modification of already embedded reinforcement, if required due to faulty fabrication or placement.							
9.14.12	The contractor shall submit proper account of material / material reconciliation statement for the material drawn by him from stores once in every three months. Failing compliance of this requirement further issue of steel to the contractor may be suspended and no claim of compensation for delay in execution on this account shall be entertained.							
9.14.13	All the reinforcement steel thus issued shall be properly accounted for as per the following permissible wastage over the theoretical quantity / consumption incorporated in the works.							
	<table border="1"> <thead> <tr> <th>Item</th><th>Area</th><th>Permissible Variation / Wastage</th></tr> </thead> <tbody> <tr> <td>Reinforcement Bars</td><td>For All works</td><td>3%</td></tr> </tbody> </table>		Item	Area	Permissible Variation / Wastage	Reinforcement Bars	For All works	3%
Item	Area	Permissible Variation / Wastage						
Reinforcement Bars	For All works	3%						
9.14.14	Any unused / serviceable quantity of reinforcement steel not returned in good condition & wastages / loss / consumption beyond specified / agreed limits shall be charged at penal rate of Rs 80,000 per MT for reinforcement steel at the time of preparing final bill, during finalization of the contract. The decision of Engineer-in-charge with regard to applicability of penal rates shall be final & binding upon the contractor.							

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9.14.15	For the materials i.e. Reinforcement (TMT) being issued free of cost, the scrap generated shall belong to BHEL.
9.14.16	NA
9.14.17	SCRAP & SERVICEABLE MATERIALS: All reinforcement steel of length above 3M shall be considered as serviceable materials provided the materials is in good and acceptable condition. Reinforcement steel in length less than 3M shall be treated as scrap. All scrap material including TMT, cement & structural steel shall be the property of contractor and it shall be the responsibility of contractor to remove such scraps from site as per instructions from BHEL from time to time after submission of due reconciliation & certification by BHEL Engineer.

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CHAPTER – X

Other Important Conditions

10.1 EXECUTION OF WORK

- 10.1.1 The work shall be executed in a workman like manner and to the entire satisfaction of the Engineer and as per technical specification issued with tender, IS codes as applicable. In case of conflict, the decision of the BHEL Engineer shall be final & binding.
- 10.1.2 The Engineer I/c will communicate or confirm his instructions to the Contractor in respect of the execution of the work in a "**Work Site Order Book**" maintained at his office and the Contractor shall visit this office daily and shall confirm receipt of such instructions by signing the relevant entries in this book or through e-mail. Such entries / e-mails will rank as order or notices in writing within the intent and meaning of these conditions

10.2 SETTING OUT

- 10.2.1 All the works shall be set out to the true lines, grades and elevation indicated on the drawing. The contractor shall be responsible to locate and set out the works. Only one grid reference line and bench mark shall be made available for setting out the works under the contract. This reference lines shall be used as datum for the works under the contract and the contractor has to establish for his work area at available points horizontal and vertical control points. The contractor shall inform BHEL well in advance of the times & places at which he wishes to do work in the area allotted to him so that suitable datum points established by him are checked by BHEL to enable the contractor to proceed with the works. Any work done without being properly located may be removed and / or dismantled by BHEL at contractor's expenses.
- 10.2.2 The contractor shall at his own expense take all proper and responsible precautions to preserve and maintain these datum marks to its true position. In the event of these marks being disturbed or obliterated by accident or due to any other cause whatsoever, the same may be deemed necessary placed by BHEL at contractor's expenses.

10.3 SITE DRAINAGE

- 10.3.1 All water including sub-soil water which may accumulate on the Site during the progress of the works or in trenches and excavations, including monsoon period shall be removed by the contractor from the Site to the satisfaction of the BHEL Engineer. It will also be responsibility of the contractor to de-water all the foundation pits, trenches with suitable de-watering methods like, pumping out, well point system etc. Considering the 2-3M depth of water table at plant site. All such expenditure on de-watering shall be deemed to be included in quoted rates.

10.4 INSPECTION AND STAGE APPROVAL OF THE WORK

- 10.4.1 BHEL through duly authorized representative shall have at all reasonable times access to the contractor's premises or works and shall have the power to inspect drawings or any portion of the work, examine the materials and workmanship and shall have the authority to reject any

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work. This would be implemented through joint inspection by the representative of the owner and BHEL and in the form of joint protocols without any extra claims and loss of time and amount.

- 10.4.2 All work embracing more than one process shall be subject to examination and approval at each stage thereof and the Contractor shall give due notice in writing to the Engineer when each stage is ready. In default of such notice being received, the Engineer shall be entitled to approve the quality and extent thereof at any time he may choose and in the event of any dispute, the decision of the Engineer thereon shall be final and conclusive.

10.5 UNCOVERING AND MAKING GOOD

- 10.5.1 The Contractor shall uncover any part of the Works and/or make openings in or through the same as the BHEL Engineer may from time to time direct for his verification and shall reinstate and make good such part to the satisfaction of the BHEL Engineer. If any such part has been covered up or put out of view after being approved by the BHEL Engineer and is subsequently found on uncovering to be executed in accordance with the Contract, the expenses of uncovering and / or making opening in or through, reinstating and making good the same shall be borne by BHEL. In any other case all such expenses shall be borne by the Contractor.

10.6 NUISANCE

- 10.6.1 The Contractor shall not at any time do, cause or permit any nuisance on Site or do anything which shall cause unnecessary disturbance or inconvenience to owners, tenants or occupiers of other properties near the Site and to the public generally.

10.7 MATERIAL OBTAINED FROM EXCAVATION

- 10.7.1 Materials of any kind obtained from excavation on the Site shall remain the property of BHEL and shall be disposed of as the BHEL Engineer may direct.

10.8 TREASURE, TROVE, FOSSILS etc.

- 10.8.1 All fossils, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the site shall be the absolute property of BHEL and the Contractor shall take reasonable precautions to prevent his workmen or any other person from removing or damaging any such article or thing and immediately upon discovery thereof and before removal, acquaint the BHEL Engineer with such discovery and carryout the BHEL Engineer's directions as to the disposal of the same.

10.9 PROTECTION OF WORKS

- 10.9.1 Trees designated by the BHEL Engineer shall be protected from damage during the course of the Works and earth level within 1 meter of each such tree shall not be charged. Wherever necessary, such trees shall be protected by providing temporary fencing.

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- 10.9.2 The contractor shall provide and maintain at his own expense all lights, guards, fencing and watching when and where necessary or required by the BHEL Engineer for the protection of the Works or for the safety and convenience of those employed on the Works or the public.
- 10.9.3 The contractor shall have total responsibility for protecting his works till it is finally taken over by the BHEL. No claim will be entertained by the BHEL for any damage or loss to the contractor's works and the contractor shall be responsible for the complete restoration of the damaged works to its original condition to comply with the specifications and drawings. Should any such damage to the contractor's works occur because of other party not under his supervision or control, the contractor shall make his claim directly with the party concerned. The contractor shall not cause any delay in the repair of such damaged works because of any delay in the resolution of such disputes. The contractor shall proceed to repair the work immediately and no cause thereof will be assigned pending resolution of such disputes.

10.10 PROTECTION OF EMBEDMENTS, BOLTS ETC.

- 10.10.1 The contractor shall ensure proper protection to the satisfaction of the BHEL Engineer, of all bolts, inserts, embedment etc. from weather etc. by greasing, wrapping them with gunny bags or canvas or by any other means as directed by BHEL Engineer. Cost of such protections shall be deemed to be included in the rates quoted for the item.

10.11 CLEARANCE OF SITE AND REPAIRS.

- 10.11.1 Contractor has to clear the site / area where mechanical / storage and electrical erection work is to be commenced / or in progress. The contractor shall remove construction materials and equipment lying in the vicinity and causing obstruction in the erection work within 24 hrs notice, In case he fails to clear the site, this will be done at his risk & cost by BHEL.

10.12 QUALITY ASSURANCE

- 10.12.1 The contractor has to establish / arrange at site the field testing facilities for testing of civil construction materials and concrete cubes for ensuring the proper quality, grade and strength of the materials used in the construction in line with approved field quality check list/ relevant IS Code specifications as specified by BHEL Engineer. Contractor has to submit detailed report for testing of all material used etc. All testing shall be done as per IS code specifications/ BHEL's quality plan. If further test is required by the engineer to be carried from outside laboratory, the cost of the same shall be borne by the contractor.

10.13 COMPLETION OF WORK

- 10.13.1 The works shall be completed to the entire satisfaction of the BHEL Engineer and in accordance with the completion schedule as specified in the Contract, and all unused stores and materials, tools, plant, equipment, temporary buildings, site office, labor hutments and other things shall be removed and the site and work cleared of rubbish and all waste materials and delivered up clean and tidy to the satisfaction of the BHEL Engineer at the Contractor's expenses.

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10.13.2 BHEL shall have power to take over from the Contractor from time to time such sections of the work as have been completed to the satisfaction of the BHEL Engineer. Such work however shall not be treated as have been completed until the extra works are executed to the satisfaction of BHEL Engineer.

10.14 COMMENCEMENT OF GUARANTEE PERIOD

10.14.1 The Guarantee period shall commence only after completion & handing over of the entire works. The BHEL Engineer shall certify to the contractor the date on which the work is completed & handed over and the date thereof for commencement of Guarantee Period. The duration of Guarantee Period shall be as per GCC.

10.15 METHOD OF MEASUREMENT

10.15.1 Method of measurements if not specified in the tender, shall be as per relevant IS Codes / CPWD codes.

10.16 HSE & OHSAS:

10.16.1 The contractor shall comply with the requirements / stipulations of Chapter-IX of SCC towards Health, Safety and Environment.

10.17 DISCREPANCIES AND ADJUSTMENT OF ERRORS:

10.17.1 The several documents forming the Contract are to be taken as mutually explanatory of one another, detailed drawings being followed in preference to small scale drawings and figures dimensions in preference to scale and special conditions in preference to general conditions.

10.17.2 If there are varying or conflicting provisions made in any one document forming part of the contract, the BHEL Engineer shall be the deciding authority with regard to the document.

10.17.3 Any error in description, quantity in schedule of quantities or any omission therefrom shall not vitiate the contract or release the contractor from the execution of the whole or any part of the works comprised therein according to the drawings and specifications or from any of his obligations under the contract.

CONTRACTOR*(Signature with Name, Designation and Date)*

Part-II Chapter XII
TECHNICAL SPECIFICATIONS

Following Documents are attached as Part-II: Technical Specifications of Technical Conditions of Contract (Volume-1B: TCC)

Sl. No.	Description	Document No.
1.	TECHNICAL SPECIFICATIONS (TS)	TS, PART-A (General) TS, PART-B (Civil) TS, PART-C (Architect)

TS-PART – A, B & C
(VOL-1B TCC PART-II CHAPTER XII)

SPECIFIC TECHNICAL REQUIREMENTS FOR CIVIL WORKS

TECHNICAL SPECIFICATIONS , PART-A**(TS, PART-A)****1.0 GENERAL**

TCC, TS ,Part-A covers specific technical requirements of contract and should be read in conjunction with BOQ, TCC, TS Part-B & C (Civil) and other sections of the contract. In case of conflict between TS Part-A,B & C the BHEL engineer's decision shall be final and deciding for work execution.

2.0 FREE ISSUE MATERIALS

No material shall be issued free from BHEL.

3.0 DISMANTLING OF EXISTING STRUCTURES

The contractor will have to carryout dismantling of buried/ semi buried structures, if any, encountered within the battery limit and disposal of it within plant boundary as directed by BHEL at no extra cost to BHEL.

4.0 STATUTORY REQUIREMENTS

Bidder shall comply with all the applicable statutory rules pertaining to Factories Act, Fire Safety Rules of Tariff Advisory Committee, Water Act for pollution control, Explosives Act, etc.

Provisions of safety, health and welfare according to Factories Act shall be complied with. These shall include provision of continuous walkway minimum 500 wide along the crane-girder level on both sides of building, comfortable approach to EOT crane cabin, railing, fire escape, locker room for workmen, pantry, toilets, rest room, etc.

Provisions for fire proof doors number of staircases, fire separation wall, lath plastering/encasing the structural members (in the fire prone areas), type of glazing etc. shall be made according to the recommendations of Tariff Advisory Committee.

Statutory clearances and norms of State Pollution Control Board shall be followed.

Bidder shall obtain approval of Civil/Architectural drawings from concerned authorities before taking up the construction work.

5.0 LAYOUT

Before starting the work, the Contractor shall carry out the setting out of foundation and structures and provide levels, with reference to general existing grid and bench mark. If the contractor uses the grid, , bench mark and reference pillar made by other Contractors, he shall coordinate with the Contractor and shall satisfy himself of the accuracy of the reference

marks. If he is required to set out the foundation afresh, he shall do so independently with reference to the one existing grid and bench mark which has been followed by other agency at the instruction of the Engineer. In case any discrepancy be found, it shall be immediately brought to the notice of the engineer for any rectification/modification necessary. No complaint shall be entertained at a later stage. The Contractor shall accurately set out the position for holding down bolts and inserts.

If required, in the opinion of the Engineer, he shall construct and maintain pillars for Grid, references and bench marks and maintain them till the completion of the construction. He shall also help the Engineer with instruments, materials and labours for checking the detailed lay outs and levels. The Contractor shall be solely responsible for the correctness of the layout and levels, and Engineer's approval shall not be deemed to imply any warranty in carrying out the work correctly.

6.0 WORKMANSHIP

Workmanship shall be of the best possible quality and all work shall be carried out by skilled workmen except for those which normally require unskilled persons. Welding shall be done by experienced and certified welders in proper sequence using necessary jigs and fixtures. Fabrications shall be done in shops having proper equipment for accurate edge planning and milling of column shall ends, base late surfaces etc. and shaping and dimensioning of anchor bolt assembly, inserts and other misc. items. In addition to the requirement specified above, if the bye-laws of the local Govt., Municipal or other authorities require the employment of licensed or registered workmen for various traders, the contractor shall arrange to have the work done by such registered or licensed personnel. In case of manufactured materials, the Contractor shall have, with no additional cost the owner, the services of the supervisors of the manufacturers to achieve that the work is being done according to the manufacturer's specifications.

7.0 TEMPORARY WORK

All scaffoldings, staging, temporary bracing and other necessary temporary work required for proper execution of the Contract shall be provided by the Contractor at his own cost and inclusive of all materials, labour, supervision and other facilities.

The layout and details of such Temporary work shall have the prior approval of the Engineer as agreed, but the Contractor shall be responsible for proper strength and safety of the same. All Temporary work shall be so constructed as not to interfere with any permanent work or with the work by other agencies. If it is necessary to remove any of the temporary work at any time to facilitate execution of the work or with the work of other agencies, such removal and re-erection, if required, shall be carried out by the Contractor at the discretion of the Engineer without any delay and any extra cost on this account shall be borne by the Contractor.

8.0 INTERFACE WITH STRUCTURES UNDER OTHER'S SCOPE

- a) In cases of interface e.g. structures under other's scope of supply being supported on structures under scope of this contractor, the same will be discussed and suitably addressed.
- b) Modification in layout of foundation/structure during detail engineering stage may be necessary to avoid fouling with those under other's scope. Necessary changes on this account will be made without any extra cost to Owner.
- c) Necessary engineering is to be done and provisions are to be kept accordingly by the Contractor to construct foundations/underground structures, etc. without disturbing/ endangering the constructions done under the scope of other contracts.

9.0 INSPECTION, TESTING AND QUALITY CONTROL FOR CIVIL WORKS

Sampling and testing for major items of civil works viz earthwork, concreting, structural steel work (including welding) etc. shall be carried out in accordance with the requirements of this specification and field quality plan (FQP).

The bidder shall submit for BHEL's approval a detailed field quality assurance programme for civil works before starting of the construction work. This shall include frequency of sampling and testing nature/type of test, method of test, setting of a testing laboratory, arrangement of testing apparatus/equipment, deployment of qualified/experienced manpower, preparation of format for record, Field Quality Plan, etc. Tests shall be done in the field and/or at a laboratory approved by the Engineer and the Bidder shall submit to the Engineer, the test results in triplicate. In addition, the bidder shall furnish the original test certificate from the manufacturer's of various materials to be used in the construction.

If any work found to be of inferior quality or sub-standard, the same shall be dismantled and shall be redone as per approved quality or relevant standard. BHEL reserve the rights to reject the work of inferior quality. All expenses on account of dismantling and rework shall be born by contractor.

Contractor shall arrange for conducting the initial and field CBR test for the road construction as per latest IRC guidelines. The contractor's finally accepted rates shall include cost of such field tests with standard equipments and IMTEs

10.0 CONSTRUCTION / ERECTION METHODOLOGY

- Construction excavation activities shall be fully mechanized from the start of the work.
- All excavation and backfilling work shall be done using excavators, loaders dumpers, dozers, poclains, excavator mounted rock breakers, rollers, sprinklers, water tankers, etc. Manual excavation can be done only on isolated place with specific approval of engineer.
- Dewatering shall be done using the combination of electrical and stand-by diesel pumps.
- For concreting, weigh batching plants, transit mixers, concrete pumps, hoists, etc. shall be used.
- All fabrication and erection activities of structural steel shall be carried out using automatic submerged arc welding machines, cutting machine, gantry cranes, crawler / wheel mounted heavy cranes and other equipments like heavy plate bending machines, shearing machines, lathe, milling machines etc. Use of derricks shall not be permitted.
- All handling of materials shall be with cranes. Heavy tailors shall be used for transportation.
- Mechanized modular units of scaffolding and shuttering shall be used.
- Grouting shall be carried out using hydraulically controlled grouting equipment.
- Roadwork shall be done using pavers, rollers and premix plant.
- All finishing items shall be installed using appropriate modern mechanical tools.
- Manual punching etc. shall not be permitted.
- Heavy duty hoist for lifting of construction materials shall be deployed.
- Compressors for cleaning of foundations and other surfaces shall be used.
- Field laboratory shall be provided with all modern equipment for survey, testing of aggregates, concrete, welding etc. For testing of steel works, ultra sonic testing machines, radiographic testing machines, dye penetration test equipment, destruction testing equipment, etc shall be deployed.
- All persons working at site shall be provided with necessary safety equipment and all safety aspects shall be duly considered for each construction/erection activity. Moreover, only the persons who are trained in the respective trade shall be employed for executing that particular work.
- Fabrication and Erection of all fabricated columns shall be done in single piece unless otherwise provided for in the approved drawings. Main columns of the power house building can have maximum of one number of the erection splice. All shop and site splice shall suitably staggered. The erection splice shall be provided with full strength splice cover plate over the butt weld. Contractor shall submit the erection scheme for the erection of all type of structures and carryout the erection work only after approval of the scheme by the owner.

11.0 COMPLETION CERTIFICATES/ NOC FROM LOCAL STATUTORY BODIES

Contractor has to arrange at his own cost to obtain building/ work completion certificates or NOCs if required to be obtained from the local statutory bodies of central and state govt. such as electrical safety, UPSIDC, Fire authority, UP PWD, UP pollution control board etc. However, any fees required for obtaining such NOCs shall be paid by BHEL on production of relevant depository challans/ receipts from such Govt. authorities.

12.0 FIELD LABORATORY FACILITIES AT SITE FOR MATERIAL TESTING:

Contractor shall provide field testing facilities at site laboratory built by the contractor as per list of apparatus at annexure-A-1.

13.0 MAKE OF BOUGHT OUT MATERIAL:

Contractor shall supply bought out items as per the list attached at annexure-A-2 of this section.

ANNEXURE – “A-1”**BIDDER SHALL PROVIDE MINIMUM FOLLOWING FACILITIES IN SITE FIELD LABORATORY FOR MATERIAL TESTING****General Equipment**

Sl.No	Description	Sl.No	Description
1.	Balances	10.	Burette stand
2.	Drier	11.	Pipette
3.	Thermometer	12.	Wooden mallet
4.	Hydrometer	13.	Hair brush
5.	Hand-scoop	14.	Wire Brush
6.	Glass beakers	15.	Buckets
7.	Measuring Cylinder	16.	Test Tubes
8.	Desiccator	17.	Working platforms
9.	Burette	18.	Alcometer

Soil testing apparatus for conducting the following tests:

Particle size analysis and index properties of soil

Moisture-density relations of soil

Specific gravity of soil

Density of soil in place by sand replacement method

CBR initial and field testing apparatus as per IRC guidelines

Testing Equipment for conducting the following tests on concrete samples:

Compressive strength of concrete

Slump of concrete

Specific gravity and absorption and bulking of fine aggregates

Sieve analysis of fine aggregates and coarse aggregates

Annexure – “A-2”**INDICATIVE LIST OF APPROVED MAKE OF BOUGHT OUT MATERIAL TO BE ARRANGED BY THE CONTRACTOR AT HIS OWN COST**

The following list must be read in conjunction with the relevant make/ makes of materials mentioned in the BOQ or elsewhere in this tender document.

S.NO.	MATERIAL NAME	MAKE
1.	GI & MS PIPES	SURYA, PRAKASH, JINDAL-HISSAR, TATA
2.	GI FITTINGS(MALLEABLE)	UNIK, KS, ZOLOTO
3	CEMENT	JP BUNIYAD, ACC, MAIHAR CEMENT , ULTRATECH , L&T , BIRLA ,GRASIM,AMBUJA,SHREE, DALMIA BHARAT, RAMCO OR EQUIVALENT
4	EARTH	Best quality local yellow soil free from any chemicals useful for backfilling and horticulture work.
4	REINFORCEMENT STEEL	TATA-TMT, SAIL, JINDAL, IISCO OR EQUIVALENT
5	STRUCTURAL STEEL	TATA, SAIL , JINDAL, IISCO OR EQUIVALENT
6	COARSE SAND	JHANSI (BANDA) /KALPI /DUDHI
7	LOCAL SAND (Fine sand)	GHAGHARA/ GANGA/ OTHI
8	STONE BALLAST FOR BASE CONCRETE	SHANKERGARH/ DALA OR EQUIVALENT
9	STONE GRIT, 20MM, 12MM, 8MM FOR RCC WORK	JHANSI (Kabrai) or Dala
10	“HARDCRETE” HARDENER COMPOUND	SNOCEM/ PD LIGHT/M-SEAL OR EQUIVALENT

11	PLASTIC EMULSION PAINT	ASIAN, BERGER, DULUX, NEROLAC, BROLAC (J&N) BRITISH, SHALIMAR
12	ACRYLIC SMOOTH EXTERIOR PAINT "TRUMP/APEX PAINT"	ASIAN, BERGER, DULUX, NEROLAC
13	COMPOSITE PANEL	EUROBOND, INDOBOND
14	GLAZING / STRUCTURAL GLAZING	SAINT-GOBAIN, MODIFLOAT
15	SUPER SYNTHETIC ENAMEL PAINT	LUXOL-3, ASIAN, BERGER, DULUX, NEROLAC
16	ALUMINUM SECTIONS FOR DOORS AND WINDOWS	HINDALACO , JINDAL
SANITARY & WATER SUPPLY :		
17	WHITE VITREOUS CHINA CLAY SQUATTING PAN	PARRYWARE/HINDUSTAN/CERA/ NEYCER PARRY & JOHNSON PEDDERS.
18	- DO - URINAL	PARRYWARE/HINDUSTAN/CERA/ NEYCER PARRY & JOHNSON PEDDERS.
19	- DO - SQUATTING PLATE	PARRYWARE/HINDUSTAN/CERA/ NEYCER PARRY & JOHNSON PEDDERS.
20	- DO - WASH BASIN	PARRYWARE/HINDUSTAN/CERA/ NEYCER PARRY & JOHNSON PEDDERS.

S.NO.	MATERIAL NAME	MAKE
21	MIRROR	ATUL , SAINTGOBAIN ,KIRAN
22	PPR & PVC PIPES	SUPREME, PRINCE ,RELIANCE ,PREMIER,POLYPACK
23	G. I PIPES, 12.5MM, 25MM,32MM, 40MM	'B' CLASS TATA, JINDAL (HISSAR), Q.S.T. 'B' CLASS OR EQUIVALENT
24	CI NAHANI TRAP, PIPES & FITTINGS	SKF, BIC , NICCO OR EQUIVALENT
25	FINISH PAINT & PRIMER	BERGER, ASIAN
26	TILES	KAJARIA, JHONSON, RAK, SOMANY
25.	CP BRASS FITTING E.G., BIB-COCK. STOP COCK,. ANGLE COCK, TOWEL RAIL, SHOWER ETC.	L & K, JAGUAR/ ARK /MARK, PARCO, TECHNO, GEM, KINGSTON
26	2500/2000/1000 LTRS/ 500 LTRS CAPACITY OVER HEAD TANKS.	SYNTEX, TOPCON, ELECTROPLAST, STAR, LOTUS

Part-III TCC

Following Documents are attached as Part-III: Technical Specifications of Technical Conditions of Contract (Volume-1B TCC: GREEN BUILDING)

Green Building Procedures During Pre-Construction Stage & Construction Stage

1.0 The Standard conditions mentioned below are complying by the contractor with GRIHA requirements.

The Employer (BHEL) desires to obtain **Five STAR rating** of **GRIHA** for the proposed Office complex at Noida. The design of the complex has, therefore, been carried out keeping in view the Green Building norms. (Refer Appendix 1 of FOT).

To ensure that the desired green building rating is achieved, it is necessary to follow certain **“Green Building Compliance Procedures”** during construction stage also as per The contracting agency, finalized for construction of this work, will be required to follow these procedures strictly in order to achieve the targeted credits points. All such procedures to be complied with have been listed in the subsequent pages. The tenderers are required to go through the same before preparing their offer for the job. The rates quoted by the tenderers shall be inclusive of any expenses involved for compliance with the **“Green Building Procedures”** during construction.

List of Green Building Procedures to be complied during Construction

All relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 will be adhered to.

- 1.2 Adequate safety measures for workers during handling of materials at site will be taken up
- 1.3 The contractor will comply with the regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations and safe means of entry and exit.
- 1.4 Eliminate Risk from Electrical Equipment
 - The contractor will comply the relevant industrial electrical safety legislations.
 - The Contractor will take adequate precautions to prevent danger from electrical equipment i.e., no material will be so stacked or placed as to cause danger or inconvenience to any person or the public.
 - All necessary fencing and lights will be provided to protect the public.

- All electric machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provision and to the satisfaction of the Engineer-in-charge.
- The contractor will arrange for a first aid kit including the adequate supply of sterilized dressing materials and appliances to meet emergencies. He will also arrange suitable transport to take injured or sick person(s) to the nearest hospital.
- The contractor will provide, erect and maintain informatory height/safety signs, hoardings written in English and Hindi wherever required or as suggested by the Engineer-in-charge.

1.5 SANITATION, LIVING & SAFETY FACILITIES:

The contractor will ensure adherence to following minimum practices for safety during **construction.**

- **Provide safety and protective equipment shows, helmets, boots, gloves, life jackets, harness for workers working at height, welding goggles for welders and any other necessary PPE (personnel protective equipment) as necessary for all workers, personnel available at site and visiting the site.**
- **Barricade at the edge, open slabs and deep/excavated areas as per site requirement.**
- **Provide safety net wherever required.**
- **Designate emergency assembly area and install signage indicating the same.**
- Install 'DANGER' signage on electric panels. Guarding all parts of dangerous machinery,
- **Install signage communicating and educating the site personnel regarding the safety that need to be followed.**
- **Not allow an individual to work on site while his ability or alertness is impaired by fatigue, illness or some other cause which might expose him to injury.**
- Precautions for working on machinery,
- Maintaining hoists and lifts, lifting machines, chains, ropes, and other lifting tackles in good condition,
- Welder's protective eye-shields to workers who are engaged in welding works.
- Earplugs to workers exposed to loud noise and workers working in crushing, compaction, or concrete mixing operation.

- Safety belts to the labourers working at construction site over the drain.
- The contractor will also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint.
- Contractor will provide facemasks for use to the workers when paint is applied in the form of spray
- **Following amenities need to be provided for construction labour working for the project,**
 - **Clean, Lit and Ventilated hutments**
 - **Hygiene and separate toilets for male and female with water facility at project site and at hutments**
 - **Clean washing area with water facility for washing clothes and utensils**
 - **Crèche**
 - **Potable water for drinking at site.**
 - **Potable water for drinking, cooking, food cleaning and food cooking at hutments.**
- **Potable water meeting IS standard for drinking, cooking and cleaning food at site and hutments as applicable.**
- **Maintain the area near hutments clean and with no stagnation of water near hutments, washing area, bathing area and toilets.**
- **Place fire extinguishers and sand buckets as applicable, near DG, Electric panels.**
- **Provide first-aid facility on site and install signage indicating first-aid facility area. The first aid box shall be marked with a red cross on a white background.**

1.6 The contractor will make sure that during the construction work:

- Providing measures to prevent fires. Fire extinguishers and buckets of sand to be provided in a fire-prone area and elsewhere,
- Providing sufficient and suitable light for working during the night,
- Measures to protect workers from materials of construction, transportation, storage, and other dangers and health hazards, and
- Safety policies of the construction firm/division/company are stringently adhered to.

1.7 On-site basic facilities for construction workforce to be provided: -

- Adequate housing to meet or exceed local/ labour bye-law requirement.

- Sanitary measures to meet or exceed local/ labour Bye-Laws requirement (OR) provide at least one toilet seat/ urinal for every 50 workers in any shift, whichever is more stringent. The sanitary measures should be provided separately for men and women.
- First-aid and emergency facilities.
- Adequate drinking water facilities.
- Personal protective equipment (by developer / contractor).
- Dust suppression measures.
- Adequate illumination levels in construction work areas.
- Day care/ crèche facility for workers' children (only if, more than 50 female building workers are ordinarily employed).

- 1.8 All vehicles, equipment and machinery to be procured for construction will confirm to the relevant Bureau of Indian Standard (BIS) norms.
- 1.9 Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that emission levels comply with environmental emission Standards/norms.
- 1.10 Noise limits for construction equipment's will not exceed 75 dB (A), measured at one meter from the edge of the equipment in free area, as specified in the Environment Protection Act, 1986, schedule VI part E, as amended on 19th May, 1993. The maximum noise levels near the construction site should be limited to 65 dB (A) Leq (5min.) in project area.
- 1.11 Utmost care shall be taken to keep the noise level to the barest minimum so that no disturbance as far as possible is caused to the occupants / users of adjacent buildings.
- 1.12 For controlling the noise from Vehicles, Plants and Equipment's, the Contractor will ensure conformance the following:
- All vehicles and equipment used in construction will be fitted with exhaust silencers.
 - Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced.
 - Noise emission from compactors (rollers) front loaders, concrete mixers, cranes (movable), vibrators and saws should be less than 75 dB (A).
- 1.13 As per the Standards/Guidelines for control of Noise Pollution from Stationary Diesel Generator (DG) Sets, noise emission in dB(A) from DG set (15 - 500 KVA) should be less than $94 + 10 \log_{10}$

(KVA). The standards also suggest construction of acoustic enclosure around the DG set and provision of proper exhaust muffler with insertion loss of minimum 25dB(A) as mandatory.

1.14 AIR POLLUTION CONTROL MEASURES:

Following measures to reduce air pollution during construction will be taken:

- Clearing vegetation only from the areas where work will start right away
- Vegetating/mulching areas where vehicles do not ply
- Applying gravel/landscaping rock to the areas where mulching/paving is impractical
- Identifying roads on-site that would be used for vehicular traffic. Upgrading vehicular roads (if these are unpaved) by increasing the surface strength by improving particle size, shape, and mineral types that make up the surface and base. Add surface gravel to reduce source of dust emission. Limit amount of fine particles (smaller than 0.075 mm) to 10%–20%
- **Limiting vehicular speed on-site to 10 km/hr. Wheel washing facility at entrance and exit points of vehicles and install signage as ‘Wheel Washing Area’.**

1.15 Water spraying by wetting the surface by spraying water on

- any dusty materials before transferring, loading, and unloading,
- areas where demolition work is being carried out,
- any unpaved main-haul road, and
- Areas where excavation or earth-moving activities are to be carried out.

1.16 over and enclosure to be done by

- Providing barricading of min **3 m** high along the site boundary, excavated area next to a road or other public area. Barricading height near the adjacent Existing building shall be provided more than 3m as per the site requirement to avoid any dust ingress to the operational buildings.
- Providing dust screens, sheeting or netting to scaffold along the perimeter of a building, covering stockpiles of dusty material with impervious sheeting.
- Covering dusty load on vehicles by impervious sheeting before they leave the site, and vehicles transferring, handling/storing dry loose materials like bulk cement and dry pulverized fly ash inside a totally enclosed system.
- Instruct the material supplier to cover dusty load on vehicles. Maintain date stamped photographs as a documentary evidence.
- Provide DG exhaust at height 3 meter from site level and DG shall meet the CPCB pollution norms.

1.17 The following are guidelines to be followed to avoid wastage of curing water.

- Curing chemicals should be sprayed on concrete structures and free flowing water should not be cured.
- After curing on the first day, all concrete structures should be painted with curing chemicals. This will stop daily water curing and save water.
- Water should be sprayed on concrete structures after covering them with cloth/gunny bags. This decreases water rebound and ensures sustained and complete curing.
- Ponds should be made using cement and sand mortar to avoid water flowing away from the flat surface while curing.
- Water ponding should be done on all sunken slabs. This also highlights the importance of having an impervious formwork.

1.18 CONSTRUCTION WASTE MANAGEMENT:

Following are the guidelines to ensure maximum resource recovery and safe disposal of wastes generated during construction (Typical construction debris in residential projects include broken bricks, steel bars, broken tiles, glass, wood waste, paint cans, cement bags, packing materials, etc.) and to reduce the burden on the landfill. Logs are to be maintained by contractor and all calculations for are to be provided for green building documentation. Copy of bills is to be provided for any scrap materials sold to local recycler.

- **Install waste collection bins to collect and segregate recyclable, hazardous and other waste separately. Install signage to educate site personnel regarding which waste to be put in which bins.**
- **Provide central waste collection area, where, all the segregated waste from bins is placed and stored separately. Designate with signage a ‘Central Waste Collection Area’. Sell the recyclable waste to recycling vendors and maintain the challan for waste sold indicating the material sold, quantity and units (like, kg, ton, sqm etc.,)**
- **Employ measures to segregate the waste on-site into inert, chemical or hazardous wastes.**
 - **Maintain record indicating the total waste generated, sold to recyclers, reused on site and sent to landfill.**

- Reuse/Recycle the segregated waste and unused chemical/ hazardous wastes such as oil, paint and batteries.
 - Inert waste to be disposed-off by municipal corporation/local bodies at landfill sites.
- 1.19 The contractor will ensure proper waste management on the site to limit the amount of construction waste sent to landfill by maximum of 5% of total waste generated. This can be achieved by minimizing waste generation, using the waste generated within the site for a purpose and selling to recyclers. Copy of bills is to be provided for any scrap materials sold to local recycler. Provide segregated waste collection bins on site during construction to collect following type of materials in separate bins,
- **Hazardous**
 - **Recyclable (For selling to recyclers)**
 - **Reusable in construction again**
 - **Other waste**
- 1.20 Allocate a separate space for the collected waste before transferring it to the recycling/disposal stations to prevent the mixing up of segregated waste before processing or disposal.
- 1.21 Use different coloured bins for the collection of different categories of waste from the building.
- 1.22 Soil erosion control measures for pre-construction and during construction to conform to the best management practices highlighted in the National Building Code (NBC) of India, Part 10, Section 1, Chapter 4 – Protection of Landscape during Construction and Chapter 5 – Soil and Water Conservation

1.23 TOP SOIL AND VEGETATION PRESERVATION:

- **Existing Top 20 cm soil on site from areas which are going to be disturbed (like proposed for buildings, roads, paved areas and external services) during construction activity shall be preserved in layer of**
40 cm height with grass mulching or temporary vegetation to maintain fertility of soil.
- **This preserved Fertile top soil shall be used in project landscape at reuse later stage.**
- **Temporary storm water channels need to be made along the top soil preservation area and further connected temporary sedimentation tank.**
- **During construction, preserve the existing trees those are not cut, by providing brick work or barricading with green net around the trees. Such that, construction activity does not damage the trees.**

- If any vegetation is planned during the construction for making it part of post-construction or operational phase landscape, consider native trees for the same. Also, protect this vegetation with brick work or green net.

SOIL EROSION AND SPILL CONTROL:

- Temporary sedimentation tank need to be made on the site, as necessary, to allow settling of soil eroded before discharging to storm water outside the site.
 - Construct temporary storm water channels and connect to sedimentation tanks, as necessary, to route storm water to sedimentation tank.
 - Store diesel tanks and chemicals on hard floor to avoid contamination of soil in case of spill.
 - Avoid stagnation of water on site.
- 1.24 Measures such as temporary and permanent seeding, mulching, earth dikes, silt fencing, sediment traps, and sediment basins, as appropriate to be adopted
- 1.25 Appropriate measures to address soil erosion, post occupancy to be adopted
- 1.26 Contractor has to collect all material and equipment certificates to document green building requirements and the collected documents to be submitted to project owner on fortnightly basis.

INSTALLATION & COMMISSIONING:

- All MEP equipment shall be properly installed and commissioned as per the manufacturer guidelines.
- Commissioning and Installation reports shall be documented for MEP equipment.
- Handover of equipment and MEP services shall involve, proper training along with O&M manuals and Drawings. O&M manuals at a minimum shall contain technical specifications, start and shutdown procedures, format for preventive maintenance indicating parameters need to monitored/checked, preventive maintenance schedules for daily, monthly, quarterly, half yearly and yearly as applicable.

2.0 PENALTY**2.1 Liable Charges to be recovered from contractor for non-compliance of Green Building norms during construction**

To ensure that the desired green building rating is achieved, it is necessary to follow certain

“Green Building Compliance Procedures” during construction stage also. The contracting agency, finalized for construction of this work, will be required to follow the procedures strictly in order to achieve the targeted credits points. All such procedures to be complied with have been listed in the subsequent pages. The tenderers are required to go through the same before preparing their offer for the job. The rates quoted by the tenderers shall be inclusive of any expenses involved for compliance with the “Green Building Procedures” during construction.

The penalty shall be charged as per mentioned below in the table and shall be deducted from the final payment of the contractor. Non-Compliance with mandatory criteria under GRIHA shall render the project ineligible for GRIHA Rating. The GRIHA rating authority would be conducting a total of 3 or more site visits (at the start of construction, midway through the construction and at the time of building operation). After each site visit, a report shall be furnished by the GRIHA rating authority. 15 days shall be provided by the rating authority to rectify any shortcomings found. The penalty stated below shall stand void for all such GRIHA Version 2015 clauses that is found as not applicable as per site conditions and the non-applicability of the clause is mentioned in the site visit reports furnished by the GRIHA rating authority.

Charges: Shortcoming in compliance of Green Building norms during construction shall be informed to the contractor in writing for necessary compliance within 07 days failing which the contractor shall be liable to be charged @ Rs. 10000/- per incidence per week. Engineer In charge shall have the discretion to stop the contractor’s work/ get the shortcoming complied at contractor’s risk & cost if further continuance of work may arise to unsafe working condition.

3.0 The proposed building is a Green Building under GRIHA system. The site requirement and mandatory criterions during construction or preconstruction period are under the scope of the contractor and no claim/cost against requisite activities such as providing and erecting barricading, signage, labour hutment, health and safety etc. as mentioned above shall be entertained.

FORM OF TENDER- Appendix- 1

(UNDERTAKING FOR GREEN BUILDING GRIHA VERSION 3.1)

We do hereby undertake that we will follow all the guidelines of GRIHA Version 3
& Compliance report of SCC applicable for this project.

STAMP & SIGNATURE OF AUTHORISED SIGNATORY

Note:

1. In case of JV/Consortium, the undertaking shall be submitted by each member of the JV/Consortium.
2. The undertaking shall be signed by authorized signatory of the tenderer. In case of JV/Consortium by the authorized signatory of the constituent member's counter signed by the authorized signatory of tenderer.



BHARAT HEAVY ELECTRICALS LIMITED
Centre of Excellence (CoE) , Karkhiyaon, Varanasi

Name Of Work:
Construction of Propulsion Manufacturing Block
Foundation and Miscellaneous Enabling Works
at BHEL CoE, Karkhiyaon, Varanasi

Tender Enquiry No. : COE/VNS/CVL/2023/001

SECTION TS-PART – B
(VOL-1B TCC PART-II CHAPTER XII)

SPECIFIC TECHNICAL REQUIREMENTS FOR CIVIL
WORKS

TS-PART B: STANDARD TECHNICAL SPECIFICATION FOR CIVIL WORKS

TS-PART - B**STANDARD TECHNICAL SPECIFICATION FOR CIVIL WORKS**

Following sections of technical specifications shall be followed for all works at site in addition to standard CPWD specifications.

B1: EARTHWORK IN EXCAVATION AND BACKFILLING**1.00.00 SCOPE**

This specification covers earth work excavation in all types of soil, soft rock and hard rock including setting out, clearing and grubbing, shoring, dewatering, back filling around foundations/pipelines to grade, watering, compaction of fills, testing, approaches, disposal of surplus earth, protective fencing, lighting etc relevant to the structures and locations covered under this contract.

1.01.0 Work To Be Provided By The Contractor

The work to be provided for by the contractor unless specified otherwise shall include but not be limited to the following.

a) Supplying and providing all labour, supervision services including as required under statutory labour regulations, materials, scaffolding, equipments, tools and plants, transportation etc required for the work.

b) Preparation and submission of working drawings showing the approaches, slopes, berms, shoring, sumps for dewatering including drainage, space for temporary stacking of soils, disposal area, fencing etc and all other details as may be required by the engineer.

c) Carrying out sampling and testing on fill materials/fills to assess the quality/moisture content/degree of compaction and submission of the test results whenever required by the engineer.

1.02.00 Work to be provided by others

No work under this specification will be provided by any agency other than the contractor unless specifically mentioned elsewhere in the contract.

2.00.00 Codes and Standards

All work shall be carried out as per this specification and shall conform to the latest revision and/or replacements of the following or any other Indian Standard (IS) Codes unless specified otherwise.

IS-1200	Method of measurement of building and civil engineering works, Part-I: Earthwork
IS-2720	Method of test for soils (Relevant parts)
IS-3764	Excavation work - Code of safety
IS-4081	Safety code for blasting and related drilling operations
IS-4701	Indian Standard Code of Practice for earthwork on Canals
IS:6922	Criteria for safety and design of structures subject to underground blasts

In case of conflict between this specification and those (IS Codes) referred to herein, the former shall prevail. In case any particular aspect of work is not covered specifically by this specification/IS Codes, any other standard practice as may be specified by the engineer shall be followed.

2.01.00 Conformity with Designs

The contractor shall carry out the work as per the approved drawings, specification and as directed by the engineer.

2.02.00 Materials**2.02.01 General**

All materials required for the work shall be of the best quality available and as approved by the engineer.

2.02.02 Material for Excavation

For the purpose of identifying the various strata encountered during the course of excavation, the following classification are to be followed.

a) Soil

It include all type of soil including laterite and moorum etc with/without any percentage of kankars which can be excavated by normal means such as shovel, pick axe, crow bar, spade etc and those which do not fall under clause 2.02.02 (b) and (c) etc.

b) Soft Rock

It include the rocks (including weathered rock) which are removable by splitting with the help of crow bar, pick axe, wedges, pavement breakers, pneumatic tools, hammers or such implements etc and not requiring blasting (for excavation) in the opinion of the engineer.

c) Hard Rock

It include the rocks which require blasting for excavation in the opinion of the engineer. Where blasting is prohibited for any reasons, the excavation shall be carried out by chiselling or any other method as approved by the

engineer. The mere fact that the contractor resorts to blasting shall not classify the soft rock under hard rock.

However, the engineer's decision on the type of strata encountered during excavation shall be the final and binding on the contractor.

2.02.03 Material for Filling

Material to be used for back filling shall be free from vegetations, roots, salts, rubbish, lumps, organic matter and any other harmful chemicals etc and shall be got approved by the engineer. Normally excavated earth shall be used for back filling. In case such earth contains deleterious salts, the same shall not be used. All clods of earth shall be broken or removed. Where the excavated material is mostly rock and if filling with the same is permitted by the engineer in writing, then the filling with rock shall be done in the following manner. The boulders shall be broken into pieces not exceeding 150mm size in any direction and mixed with fine materials consisting of decomposed rock, moorum or any approved earth to fill the voids as far as possible and the mixture shall then be used for filling.

In case the earth required for backfilling is over and above the earth available from the compulsory excavations within the project area, then borrow areas for obtaining suitable fill material shall be arranged by the contractor himself from outside the plant boundary limits and all expenses including royalties, taxes, duties etc shall be borne by him. The selected earth from the borrow areas shall be got approved by the engineer. The borrowed material shall be free from roots, vegetations, decayed organic matter, harmful salts and chemicals, free from lumps and clods etc. The contractor shall obtain and submit necessary clearances/permissions from the concerned authorities for the borrow areas/materials acquired to the engineer.

If specified, the back filling shall be done with clean well graded sand from approved quarries free from harmful and deleterious materials.

2.03.00 Quality Control

All works shall confirm to the lines, levels, grades, cross sections and dimensions shown on the approved drawings and/or as directed by the engineer. The contractor shall establish and maintain quality control for the various aspects of the work, method of construction, materials and equipments used etc. The quality control operation shall include but not be limited to the following.

Sl. No.	Activity	Check
1	Lines, levels & grades	a) By periodic surveys b) By establishing markers, boards etc
2	Back filling	(a) On quality of fill material

		(b)	On moisture content of back fill
		(c)	On degree of compaction achieved

3.00.0 EXECUTION

The contractor shall prepare and submit the detailed drawings/schemes for excavation and back filling works as proposed to be executed by him showing the dimensions as per the construction drawings and specification adding his proposal of slopes, shoring, approaches, dewatering, drainage, berms and compaction etc within 15 days of award of the contract to the engineer for approval.

3.01.0 SETTING OUT

On receiving the approval from the engineer with modifications and corrections if any, the contractor shall set out the work from the control points furnished by the engineer and fix permanent points and markers for ease of periodic checking as the work proceeds. These permanent points and markers shall be fixed at the interval as prescribed by the engineer and shall be got checked and certified by the engineer after whom the contractor shall proceed with the work. It should be noted that this checking by the engineer prior to the start of the work will in no way relieve the contractor of his responsibility of carrying out the work to true lines, levels and grades as per the drawings and specification. If any errors are noticed in the contractor's work at any stage, the same shall be rectified by the contractor at his own risk and cost.

3.02.00 Clearing and Grubbing

The area to be excavated shall be cleared out of fences, trees, logs, stumps, bushes, vegetation, rubbish, slush etc. Trees upto 300mm girth shall be uprooted. Trees above 300mm girth to be cut shall be approved by the engineer and marked. Cutting of trees shall include removing roots as well. After the tree is cut and roots taken out, the pot holes formed shall be filled with good earth in 250mm layers and compacted unless directed otherwise by the engineer. The trees shall be cut in to suitable pieces as instructed by the engineer. Before earthwork is started, all the spoils, unserviceable materials and rubbish shall be burnt or removed and disposed to the approved disposal area(s) as specified by the engineer. Useful materials, saleable timber, fire woods etc shall be the property of the owner and shall be stacked properly at the worksite in a manner as directed by the engineer.

3.03.00 Excavation for Foundations and Trenches

3.03.01 General

All excavation shall be done to the minimum dimensions as required for the safety and working facility. In each individual case, the contractor

shall obtain prior approval of the engineer for the method he proposes to adopt for the excavation including dimensions, side slopes, shoring, dewatering, drainage and disposal etc. This approval however shall not in any way make the engineer responsible for any consequent loss or damage. The excavation must be carried out in the most expeditious and efficient manner. All excavation in open cuts shall be made true to the line, slopes and grades as shown on the drawings and/or as directed by the engineer. No material shall project within the dimension of minimum excavation lines marked. Boulders (if any) projecting out of the excavated surfaces shall be removed if they are likely to be a hindrance to the work/workers in the opinion of the engineer.

Method of excavation shall in every case be subject to the approval of the engineer. The contractor shall ensure the stability and safety of the excavation, adjacent structures, services and works etc including the safety of the workmen. If any slip occurs, the contractor shall remove all the slipped materials from the excavated pit without any extra cost to the engineer/owner. All loose boulders and semi detached rocks which are not inside but so close to the area to be excavated and may liable to fall or otherwise endanger the workmen, equipment of the work etc during excavation in the opinion of the engineer shall be stripped off and removed away from the area of excavation. The method to be used for removal shall be such that it should not shatter or render unstable or unsafe the portion which was originally sound and safe. In case any material not required to be removed initially but later to become loose or unstable in the opinion of the engineer shall also be promptly and satisfactorily removed.

The rough excavation may be carried out upto a maximum depth of 150 mm above the final level. The balance shall be excavated with special care. If directed by the engineer, soft and undesirable spots shall be removed even below the final level. The extra excavation shall be filled up as instructed by the engineer. If the excavation (in all types of soil and rock) is done to a depth greater than that shown on the drawing or as directed by the engineer, the excess depth up to the required level shall - be filled with cement concrete not leaner than 1:4:8 or richer as directed by the engineer at the own risk and cost of the contractor. In case where excavation in soil, soft rock (including weathered rock) and hard rock are involved, the excavation in each stratum shall be carried out separately with the approved methodology and as per the instructions of the engineer.

All excavated materials such as rock, boulders, bricks, dismantled concrete blocks etc shall be the property of the owner and shall be stacked separately as directed by the engineer. All gold, silver, oil, minerals, archeological and other findings of importance, trees cut or other materials of any description and all precious stones, coins, treasures, relics, antiquities and other similar things which may be found in or upon the site shall be the property of the owner and the contractor shall duly preserve the same to the satisfaction of the engineer/owner.

The contractor shall deliver the same to such person or persons as may be authorized or appointed from time to time by the owner to receive the same.

Prior to starting the excavation, the ground level at the location shall be checked jointly with the engineer.

3.03.02 Excavation in All Type of Soil and in Soft Rock

The excavation in all type of soil, soft rock including decomposed rock etc shall be carried out as per the approved proposal and as directed by the engineer. The work shall be carried out in a workmanlike manner without endangering the safety of nearby structures/services or works and without causing hindrance to any other activities in the area. Foundation pits shall not be excavated to the full depth unless construction is imminent. The last 150mm depth shall be excavated once concreting work is imminent. At the discretion of the engineer, the full depth may be excavated and the bed be covered with lean concrete as specified after watering and compacting the bed. As the excavation reaches the required dimensions, lines, levels and grades etc, the work shall be got checked and approved by the engineer. In cases where deterioration of the ground, upheaval, slips etc are expected, the engineer may order to suspend the work at any stage and instruct the contractor to carry out the protection works before the excavation will be restarted.

3.03.03 Excavation in Hard Rock

Hard rocks shall normally be excavated by means of blasting. In case where blasting is prohibited for any reasons, the excavation shall be carried out by chiselling or any other approved method as directed by the engineer. Personnel deployed for rock excavation shall be protected from all hazards such as loose rock/boulder rolling down and from general slips of excavated surfaces. Where the excavated surface is not stable against sliding, necessary supports such as props, bracings or bulkheads shall be provided and maintained during the period of construction. Where the danger of falling loose rock/boulder from the excavated surfaces deeper than 2m exist, steel mesh anchored to the lower edge of the excavation and extending over and above the rock face adequate to retain the dislodged material shall be provided and maintained.

3.03.04 Disposal of Surplus Materials

All surplus material from excavation shall be removed and disposed of from the excavation site to the designated disposal area indicated by the engineer. All good and sound rocks obtained from excavations and all assorted materials of dismantled structures are the property of the owner and if the contractor wants to use it, he shall have to obtain it from the engineer at a mutually agreed rate. All sound rocks and other assorted materials like excavated bricks etc shall be stacked separately.

3.03.05 Protection

The contractor shall notify the engineer as soon as the excavation is expected to be completed within a day so that he shall inspect it at the earliest. Immediately after approval of the engineer, the excavation must be covered up in a shortest possible time. But in no case the excavation shall be covered up or worked on before approval by the engineer. Excavated material shall be placed 1.5m or half the depth (of excavation) whichever is more from the edge of the excavation or further away if directed by the engineer. Excavation shall not be carried out below the foundation level of the structure close by until the required precautions are taken. Adequate fencing is to be made enclosing the excavation. The contractor shall protect all the underground services exposed during excavation. All existing surface drains in the work area shall be suitably diverted by the contractor before taking up excavation to maintain the working area neat and clean.

3.03.06 Dewatering

All excavation shall be kept free of water and slush. Grading in the vicinity shall be controlled to prevent the surface water running into the excavations. The contractor shall remove any water inclusive of rain water and subsoil water etc accumulated in the excavation by pumping or other means as approved by the engineer and keep the excavations dewatered and/or lower the subsoil water level to 300mm below the founding level until the construction of foundation and backfilling are completed in all respects.

Sumps made for dewatering must be kept clear of the foundations. The engineer's prior approval on the method of pumping to be adopted shall be taken; but in any case, the pumping arrangement shall be such that there shall be no movement or blowing in of subsoil due to the differential head of water during pumping.

3.03.07 Timber Shoring

Close or open type timber shoring as approved by the engineer depending on the nature of sub-soil, depth of pit or trench and the type of timbering shall be adopted. Timbers made out of approved quality shall only be used. It shall be the responsibility of the contractor to take all necessary steps to prevent the sides of trenches and pits from collapsing.

a) Close Timbering

Close timbering shall be done by completely covering the sides of the trenches and pits generally with short, upright members called "polling boards". These shall be of 250mm wide(min.) and 40mm thick(min.) sections as directed by the engineer. The boards shall generally be placed vertically in pairs, one on each side of the cut and shall be kept apart (maximum spacing is limited to 1.20m) by horizontal walers of strong wood cross strutted with wooden struts or as directed by the

engineer. The length of wooden struts shall depend on the width of the trench or pit.

In case where the soil is very soft and loose, the boards shall be placed horizontally against the sides of excavation and supported by vertical walers which shall be strutted to similar timber pieces on the opposite face of the trench or pit. The lowest board supporting the sides shall be taken into the ground. No portion of the vertical side of the trench or pit shall remain exposed to avoid any slipping out of earth.

The withdrawal of the timber shall be done very carefully to prevent the collapse of the pit or trench. It shall be started from one end and proceeded systematically to the other end. Concrete or masonry shall not be damaged during the removal of the timber. No claim shall be entertained for any timber which cannot be withdrawn and is lost or buried.

b) Open Timbering

In case of open timbering, vertical board of 250mm wide(min.) and 40mm thick(min.) shall be spaced sufficiently apart to leave unsupported strips of maximum 500mm average width. The detailed arrangement, size of timber and the spacing etc shall be subjected to the approval of the engineer. In all other respects, the specification for close timbering shall apply to open timbering as well.

3.03.8 Treatment of Slips

The contractor shall take all precautions to avoid high surcharges and provide proper surface drainage to prevent flow of water over the sides of the excavations. These precautions along with proper slopes, berms, shoring and control of ground water should cause no slips to occur. If however slips still occur, the same shall be removed by the contractor with his own risk and cost.

3.04.00 Backfilling

3.04.01 General

The material to be used for backfilling shall be approved by the engineer which shall be obtained directly from the excavation, from the nearby areas where excavation work by the same agency is in progress, from the temporary stacks of excavated spoils or from the borrow pits as directed by the engineer. The material shall be free from lumps and clods, roots and vegetations, harmful salts and chemicals, organic materials etc.

In locations where sand filling is required, the sand used should be clean, well graded and be of the quality normally acceptable for use in concrete.

3.04.02 Filling and Compaction in Pits and Trenches all Around the Structures

As soon as the work in foundation has been accepted, the spaces around the foundation in pits and trenches shall be cleared of all debris, brick bats, mortar droppings etc and filled with approved earth in layers not exceeding 250mm (in loose thickness). Each layer(loose) shall be

watered, rammed and properly compacted to the required degree to the satisfaction of the engineer. Earth shall be compacted with approved mechanized compaction machine. Usually, no manual compaction shall be allowed unless specifically permitted by the engineer. The moisture content of the fill material during compaction shall be controlled near to its optimum moisture content so as to obtain the required degree of compaction. The final surface shall be trimmed and levelled to proper profile as desired by the engineer.

3.04.03 Plinth Filling

The plinth shall be filled with earth in layers not exceeding 250mm (in loose thickness) and each layer shall be watered and compacted to the required degree with approved compaction machine or manually if specifically permitted by the engineer. When the filling reaches the finished level, the surface shall be flooded with water for at least 24 hours, allowed to dry and then rammed and compacted in order to avoid any settlement at a later stage. The finished surface of fill shall be trimmed to the slope intended to be provided for the floor.

3.04.04 Filling in Trenches for Water Pipes and Drains

Filling in trenches for pipes and drains shall be commenced as soon as the joints of pipes and drains have been tested and passed. Where the trenches are excavated in soil, the filling shall be done with earth on the sides and top of pipes in layers not exceeding 150mm, watered, rammed and compacted taking care that no damage is caused to the pipe below.

In case of trenches excavated in rock, the filling upto a height of 300mm or the diameter of the pipe whichever is more above the crown of the pipe or barrel shall be done with fine material such as earth, moorum, disintegrated rock or ash as per the availability at site and shall be filled in compacted layers not exceeding 150mm. The remaining filling shall be done in layers with the mixture of boulders (of size not exceeding 150mm) and fine material as specified elsewhere in the specification. Each layer shall be watered, rammed and compacted to the required degree and to the satisfaction of the engineer.

3.04.05 Filling in Disposal Area

Surplus materials from excavation which are not required for backfilling shall be disposed of in the designated disposal areas. The spoils shall

not be dumped haphazardly but should be spread in layers approximately 250mm thick when loose, watered and compacted with the help of a compacting equipment as per the directions of the engineer. In wide areas, rollers shall be employed and compaction shall be done to the satisfaction

of the engineer at the optimum moisture content which shall be checked and controlled by the contractor. In certain cases the engineer may direct the contractor to dispose the surplus materials without compaction which can be done by tipping the spoils from a high bench neatly maintaining a proper level and grade of the bench.

3.05.00 Approaches and Fencing

The contractor should provide and maintain proper approaches for the workmen and inspection. The roads and approaches around the excavation should be kept clear at all times so that there is no hindrance to the movement of men, material and equipment of various agencies connected with the project. Sturdy and elegant fencing is to be provided around the top edge of the excavation as well as around the bottom of the fill at the surplus disposal area where dumping from a high bench is in progress.

3.06.00 Lighting

Full scale area lighting is to be provided if night work is permitted or directed by the engineer. If no night work is in progress, red warning lights should be provided at the corners of the excavated pit and the edges of the fill.

4.00.00 TESTING AND ACCEPTANCE CRITERIA

4.01.00 Excavation

On completion of excavation, the dimension of the pits will be checked as per the drawings after the pits are completely dewatered. The work will be accepted after all undercuts have been set right and all over excavations are filled back to the required lines, levels and grades by placing ordinary cement concrete of 1:4:8 proportion and/or richer and/or by compacted earth as directed by the engineer. The choice of the grade of concrete will be a matter of unfettered discretion of the engineer. Over excavation of the sides shall be made good by the contractor while carrying out the backfilling. The excavation work will be accepted after the above requirements are fulfilled and all the temporary approaches encroaching inside the excavation have been removed.

4.02.00 Backfilling

The degree of compaction required will be as per the stipulation laid down in IS:4701 and the actual method of measuring the degree of compaction will be as decided by the engineer. The work of back filling will be

accepted after the engineer is satisfied with the degree of compaction achieved.

5.00.00 RATES AND MEASUREMENTS**5.01.00 Rates**

a) The item of work in the schedule of quantities describe the work very briefly. The various items of the schedule of quantities shall be read in conjunction with the corresponding section in the technical specification including amendments and additions if any. For each item in the schedule of quantities, the bidder's rate shall include all the activities covered in the description of the items as well as for all necessary operations in detail as described in the technical specification.

b) No claims shall be entertained if the details shown on the released for construction drawings differ in any way from those shown on the tender drawings.

c) The unit rate quoted shall include minor details which are obviously and fairly intended and which may not have been included in these documents but are essential for the satisfactory completion of the work.

d) The bidder's quoted rate shall be inclusive of supplying and providing all labour, men, materials, equipments, tools and plants, supervision, services, approaches, schemes etc.

e) In case blasting in hard rock is envisaged, the unit rate quoted for earth work shall include the cost of storage and safety arrangements for the materials required for blasting. No separate payment will be made on this account.

5.02.00 Measurements

Method of measurements are specified in the proceeding sections. Where not so specified, the latest version of IS:1200, Part-1 shall be applicable.

a) The length, breadth and depth shall be measured correct to the nearest centimetre if measurements are taken by tape. Rounding of numerical shall be as per relevant IS Codes. If the measurements are taken with staff and level, the levels shall be recorded correct to 5mm. The area and volume shall be worked out in square meter and cubic meter respectively correct to the nearest of two decimal places.

b) For earth work in excavation, the ground levels shall be taken before and after completion of the work in the actually excavated area. The quantity of earth work in excavation shall be computed from these levels in cubic meter.

c) Where soft rock and hard rock are mixed, the measurement shall be done as follows. The two types of rock shall be stacked separately and measured in stacks. The net quantity of each type of rock shall be so arrived by applying a deduction of 50% for looseness/voids in the stacks. If the sum of net quantity of the two types of rock so arrived exceeds the total quantity of excavation, then the quantity of each type of rock shall be worked out from the total quantity (from excavation) in the ratio of net quantities in stack measurements of the two types of rock. If stacking is not feasible, the method as suggested by the engineer shall be followed.

d) Where soil, soft rock and hard rock are mixed, the measurement shall be done as follows. The soft and hard rock shall be removed from the excavated material and stacked separately and measured in stacks. The net quantity of each type of rock shall be so arrived by applying a deduction of 50% for looseness/voids in stacks. The difference between the entire excavation and the sum of the quantities of soft and hard rock so arrived shall be taken as soil.

6.00.00 INFORMATION TO BE SUBMITTED BY THE BIDDER**6.01.00 With Tender**

Detail of equipments and machineries proposed to be used for excavation, backfilling and compaction shall be submitted along with the tender.

6.02.00 After Award

After award of the contract the successful bidder shall submit the following for approval.

a) Within 30 days of the award of contract, the contractor shall submit a detailed programme of the work as proposed to be executed giving completion dates of excavation for the various foundations and the time required for backfilling and compaction after completion of foundation for the structures. The earthwork programme shall be planned in accordance with the foundation programme. The programme should also show how the excavation and backfilling quantities will be balanced minimizing the temporary stacking of spoils. It is to be noted that the engineer even after initial approval of the programme may instruct the contractor to enhance or to retard the progress of work during the actual execution in order to match with the progress of foundations. The initial programme being submitted by the contractor should have sufficient flexibility to take care of such reasonable variations.

b) Within 15 days of the award of contract, the contractor shall submit the drawings for earth work in excavation and backfilling showing detail of slopes, shoring, approaches, sump pits, dewatering lines, fencing etc for the approval of the engineer.

B2: CEMENT CONCRETE (PLAIN & REINFORCED)**1.00.00 SCOPE****1.01.00 General**

This specification covers all the requirements, described hereinafter for general use of Plain and Reinforced Cement Concrete work in Structures and locations, cast-in-situ or precast, and shall include all incidental items of work not shown or specified but reasonably implied or necessary for the completion of the work. Special requirements for structures such as reinforced concrete chimney, cooling towers, etc. have been covered under the respective specifications. Those specifications shall be used in conjunction with this specification.

1.02.00 IS: 456 shall form a part of this specification and shall be complied with unless permitted otherwise. For any particular aspect not covered by this Code, appropriate Code, specifications and/or replacement by any International code of practice as may be specified by the Engineer shall be followed. All codes and Standards shall conform to its latest revisions. A list of IS codes and Standards is enclosed hereinafter for reference. However, should the list be not exhaustive and does not cover any aspect of the work, then relevant Indian and, in its absence, relevant International code shall apply.

2.00.00 General**2.01.00 Work to be provided for by the Contractor**

The work to be provided for by the Contractor, unless otherwise specified shall include but not be limited to the following

- a) Furnish all labour, supervision, services including facilities as may be required under statutory labour regulations, materials, forms, templates, supports, scaffolds, approaches, aids, construction equipment, tools and plants, transportations, etc. required for the work.
- b) Prepare Bar bending Schedules for reinforcement bars showing the positions and details of spacers, supports, chairs, hangers etc.
- c) Prepare working drawings of formworks, scaffolds, supports, etc.
- d) Prepare shop drawings for various inserts, anchors, anchor bolts, pipe sleeves, embedments, hangers, openings, frames etc.
- e) Prepare detailed drawings of supports, templates, hangers, etc. required for installation of various embedments like inserts, anchor bolts, pipe sleeves, frames, joint seals, frames, openings etc.

As decided by the Engineer some or all of the drawings & schedules prepared under item (b) to (e) above will have to be submitted for approval.

- f) Submit for approval detailed schemes of all operations required for executing the work, e.g. material handling, Concrete mixing, Placement of concrete, Compaction, curing, services, Approaches, etc.
- g) Design and submit for approval concrete mix designs required to be adopted on the job.
- h) Furnish samples and submit for approval results of tests of various properties of the following:
 - i) The various ingredients of concrete
 - ii) Concrete
 - iii) Embedments
 - iv) Joint seals
- i) Provide all incidental items not shown or specified in particular but reasonably implied or necessary for successful completion of the work in accordance with the drawings and specifications.
- j) For supply of certain materials normally manufactured by specialist firms, the Contractor may have to produce, if directed by the Engineer, a guarantee in approved Performa for satisfactory performance for a reasonable period as may be specified, binding both the manufacturers and the Contractor, jointly and severally.

2.02.00 Work by others

No work under this specification will be provided by any agency other than the Contractor unless specifically mentioned elsewhere in the contract.

2.03.00 Information to be submitted by the Tenderer

2.03.01 With Tender

The following technical information's are required with the tender:

- a) Source and arrangement of processing of aggregates proposed to be adopted.
- b) Type of plant and equipment proposed to be used.
- c) Names of firms with which association is sought for to execute the special items of work in the contract.
- d) Types of formwork proposed to be used.

2.03.02 After Award

The Contractor shall submit the following information and data including

samples where necessary, progressively during the execution of the contract.

a) Programme of Execution

Within 30 days of the award of contract, the Contractor will submit a Master Programme for completion of the work.

This Master Programme may have to be reviewed and updated by the Contractor, quarterly or at more frequent intervals as may be directed by the Engineer depending on the exigencies of the work.

Detailed day-to-day Programme of every month is to be submitted by the Contractor before the end of the previous month.

b) Samples

Samples of the following materials and any other materials proposed to be used shall be submitted as directed by the Engineer, in sufficient quantities free of cost, for approval. The Engineer for future reference will preserve approved samples. The approval of the Engineer shall not, in any way, relieve the Contractor of his responsibility of supplying materials of specified qualities:

- i) Coarse and fine aggregates.
- ii) Admixtures.
- iii) Plywood for Formwork.
- iv) Embedded and anchorage materials as may be desired by the Engineer.
- v) Joint sealing strips and other waterproofing materials.
- vi) Joint filling compounds.
- vii) Foundation quality Rubber Pads.

c) Design Mix

Design mix as per specification giving proportions of the ingredients, sources of aggregates and cement, along with test results of trial mixes as per relevant I.S., is to be submitted to the Engineer for his approval before it can be used on the works.

d) Bar Bending Schedules

Bar Bending Schedules in accordance with Clause 2.01.00 (b) and 3.16.01 of this specification.

e) Detailed Drawings and Designs of Formworks to be used

Detailed design data and drawings of standard formworks to be used as per clause 2.01.00 (c).

f) Detailed Drawings for Templates & Temporary Supports for embedment As per Clause 2.01.00 (e).

g) Mill Test Reports for Cement & Reinforcing Steel.

h) Inspection Reports

The Engineer in accordance with Clause 2.04.00 of this specification may desire inspection Reports in respect of Formwork and Reinforcement and any other item of work as.

i) Test Reports

Reports of tests of various materials and concrete as required under Clause 4.0: SAMPLING & TESTING of this specification or as directed by the Engineer.

j) Any other data, which may be required as per this specification or as directed by the Engineer.

2.04.00 Conformity with Design

The Contractor will prepare checklists in approved Performa, which will be called "Pour Cards". These Pour Cards will list out all items of work involved. The Contractor will inform the Engineer, sufficiently in advance, whenever any particular pour is ready for concreting. He shall accord all necessary help and assistance to the Engineer for all checking required in the pour. On satisfying himself that all details are in accordance to the drawings and specifications, the engineer will give written permission on the same Pour Cards allowing the contractor to commence placement of concrete. Details of all instructions issued by the Engineer and the records of compliance by the Contractor, deviations allowed by the Engineer and any other relevant information will be written on accompanying sheets attached to the Pour Cards. The Pour Cards along with accompaniments will be handed over to the Engineer before starting placement of concrete. One of the mix designs developed by the Contractor as per the I.S. Specifications and established to the satisfaction of the Engineer by trial mixes shall be permitted to be used by the Engineer, the choice being dictated by the requirements of designs and workability. The methods of mixing, conveyance, placement, vibration, finishing, curing, protection and testing of concrete will be as approved or directed by the Engineer.

2.05.00 Materials to be used

2.05.01 General Requirement

All materials whether to be incorporated in the work or used temporarily for the construction shall conform to the relevant IS

Specifications unless-stated otherwise and be of best approved quality.

2.05.02 Cement

Ordinary Portland cement of grade-43 as per IS:8112/fly ash based Portland puzzolona cement conforming to IS:1489 (Part-1) shall preferably be used in reinforced/plain cement concrete works for all areas However, other types of cement such as ordinary Portland cement conforming to IS:269, Portland slag cement conforming to IS:455 respectively can be used under special circumstances. Cement used in all concrete mixes shall be in general of grade 33/43 unless design requires a higher grade. Ordinary Portland cement shall be used for following structure.

In special cases, Rapid Hardening Portland Cement, Low Heat Cement, Sulphate resistant cement, high strength Ordinary Portland Cement etc. may be permitted or directed to be used by the Engineer.

For Brickwork, plaster, flooring and other finishing works, ordinary Portland cement of 33/43 grade shall be used.

2.05.03 Coarse Aggregate

Aggregate of sizes ranging between 4.75 mm and 150 mm will be termed as Coarse Aggregate. Coarse aggregate for concrete shall be chemically inert, hard, strong durable against weathering, of limited porosity, and free from deleterious materials. It shall be properly graded. Coarse aggregates shall be either crushed gravel or stone. All aggregates shall meet the requirement of IS:383:1970. Only Coarse Aggregate from, approved quarries and conforming to IS-383 will be allowed to be used on the works. Petrographic test shall be carried out by the contractor free of cost for checking the quality of rock from quarry. This test shall be repeated by the Contractor free of cost for change in quarry or as directed by the Engineer. The results shall be checked for reactivity of silica in aggregate with alkalis of cement.

2.05.04 Fine Aggregate

Aggregate smaller than 4.75 mm and within the grading limits and other requirements set in IS: 383 are termed as Fine Aggregate or Sand. Only Fine Aggregate from approved sources and conforming to the above IS Specification will be allowed to be used in works. Sand shall be hard, durable, clean and free from adherent coatings or organic matter and clay balls or pellets. Sand when used as fine aggregate in concrete shall conform to IS:383. For plaster, it shall conform to IS:1542 and for masonry work to IS:2116.

2.05.05 Water

Water for use in Concrete shall be clear and free from injurious oils, acids, alkalis, organic matter, salt, silts, or other impurities. Generally, IS: 3550 will be followed for routine tests. Acceptance of water shall be as per IS: 456.

2.05.06 Admixture

Only admixtures of approved quality will be used when directed or permitted by the Engineer. The different types of admixtures, which may be necessary to satisfy the concrete mix and the design requirement, shall be as per IS-9103 and may be one of the followings:

- a) Accelerating admixture
- b) Retarding admixture
- c) Water reducing admixture
- d) Air entraining admixture

The contractor shall inform the Engineer about the type of admixture which he is planning to use in different areas within the scope of work for the approval of the Engineer. The admixture shall be of proven make and from a reputed manufacturer. It should not have any adverse effect on strength, durability of concrete and reinforcement. Super plasticizers conforming to IS: 9103 or ASTM C-494 shall only be used as admixture having the above properties either individually or in a combination as per the direction of the Engineer.

2.05.07 Reinforcement

Reinforcement shall be as per relevant IS Specification and from a reputed make preferably SAIL, TATA, RATHI or equivalent as mentioned in the Contract/Drawing/Instructions. All bars above 10 mm dia. shall be of tested quality.

2.06.00 Storage of Materials**2.06.01 General**

All materials shall be so stored as to prevent deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work. Any material, which has deteriorated or has been damaged or is otherwise considered defective by the Engineer, shall not be used for concrete and shall be removed from site immediately, failing which, the Engineer shall be at liberty to get the materials removed and the cost incurred thereof shall be realised from the Contractor's dues. The Contractor shall maintain upto-date accounts of receipt, issue and balance (stack wise) of all materials. Storage of materials shall conform to IS: 4082.

2.06.02 Cement

Sufficient space for storage, with open passages between stacks, shall be

arranged by the Contractor to the satisfaction of the Engineer.

Cement shall be stored off the ground in dry, leak proof, well-ventilated warehouses at the works in such a manner as to prevent deterioration due to moisture or intrusion of foreign matter.

Cement shall be stored in easily countable stacks with consignment identification marks. Consignments shall be used in the order of their receipts at site. Sub-standard or partly set cement shall not be used and shall be removed from the site, with the knowledge of the Engineer, as soon as it is detected.

2.06.03 Aggregates

Aggregates shall be stored on raised surface constructed by providing planks or steel plates or on concrete or brick masonry pavement. Each size shall be kept separated with wooden or steel or concrete or masonry bulkheads or in separate stacks and sufficient care shall be taken to prevent the material at the edges of the stock piles from getting intermixed. Stacks of fine and coarse aggregates shall be kept sufficiently apart with proper arrangement of drainage. The aggregates shall be stored in easily measurable stacks of suitable depths as may be directed by the Engineer.

2.06.04 Reinforcement

Reinforcing steel shall be stored consignment-wise and size-wise off the ground and under cover, if desired by the Engineer. It shall be protected from rusting, oil, grease, and distortions.

If necessary, the reinforcing steel may be coated with cement wash before stacking to prevent scale and rust at no extra cost to the Owner. The stacks shall be easily measurable. Steel needed for immediate use shall only be removed from storage.

2.07.00 Quality Control

Contractor shall establish and maintain quality control for different items of work and materials as may be directed by the Engineer to assure compliance with contract requirements and maintain and submit to the Engineer records of the same. The quality control operation shall include but not be limited to the following items of work:

- a) Admixture: Type, quantity, physical, and chemical properties that affects strength, workability, and durability of concrete.
For air entraining admixtures, dosage to be adjusted to maintain air contents within desirable limits.

b) Aggregate:	Physical, chemical and mineralogical details grading, moisture content and impurities.
c) Water:	Impurities tests.
d) Cement:	Tests to satisfy relevant IS Specifications.
e) Formwork:	Material, shapes, dimensions, lines, elevations, surface finish, adequacy of form, ties, bracing and shoring and coating.
f) Reinforcement:	Shapes, dimensions, length of splices,. welded splices. clearances, ties and supports Material tests or Certificates to satisfy relevant IS Specification.
g) Grades of Concrete:	Usage and mix design
h) Batching & Mixing:	Types and capacity of plant, concrete mixers transportation equipment.
i) Joints:	Locations of joints, water stops and filler items Dimension of joints, quality, and shape of joint material and splices.
i) Embedded a and Anchorage Items:	Material, shape, location, setting.
k) Placing:	Preparation, rate of pouring, weather limitations, time intervals between mixing and placing and between two successive lifts, covering over dry or wet surfaces, cleaning and preparation of surfaces on which concrete is to be placed, application of mortar/slurry for proper bond, prevention of cold joint, types of chutes or conveyors.
l) Compaction:	Number of vibrators, their prime mover, frequency and amplitude of vibration, diameter and weight of vibrators, duration of vibration, hand-spreading, rodding and tamping.
m) Setting of base & Bearing plates:	Lines, elevations, and bedding mortar.

n) Concrete Finishes: Repairs of surface defects, screening, floating, steel trowelling and brooming, special finishes.

o) Curing: Methods and length of time.

Copies of records and tests for the items noted above, as well as, records of corrective action taken shall be submitted to the Engineer for approval as may be desired.

3.00.00 INSTALLATION

All installation requirements shall be in accordance with IS: 456 and as supplemented or modified herein or by other best possible standards where the specific requirements mentioned in this section of the specification do not cover all the aspects to the full satisfaction of the Engineer.

3.01.00 Washing and Screening of Aggregates

Washing and screening of coarse and fine aggregates to remove fines, dirt, or other deleterious materials shall be carried out by approved means as desired by the Engineer.

3.02.00 Admixture

All concrete shall be designed for normal rate of setting and hardening at normal temperature. Variations in temperature and humidity under

different climatic conditions will affect the rate of setting and hardening, which will, in turn, affect the workability and quality of the concrete. Admixtures including plasticisers of approved make may be used with the Engineer's approval in accordance with IS-456 to modify the rate of hardening, to improve workability or as an aid to control concrete quality. The Engineer reserves the right to require laboratory test or use test data, or owner satisfactory reference before granting approval. The admixture shall be used strictly in accordance with the manufacturer's directions and/or as directed by the Engineer.

3.03.00 Grades of Concrete

Concrete shall be in one of the grades designated in IS: 456. Grade of concrete to be used in different parts of work shall be as shown on the drawing. In case of liquid retaining structures, IS: 3370 will be followed. Minimum cement content shall be as per IS: 456.

3.04.00 Proportioning and Works Control

3.04.01 General

“Design Mix Concrete” and “Nominal Mix Design” is defined as follows for use in this specification:

- a) Proportioning of ingredients of concrete made with preliminary tests by designing the concrete mix. Such concrete shall be called "Design Mix Concrete".
- b) Proportioning of ingredients of concrete made without preliminary tests adopting nominal concrete mix. Such concrete shall be called "Nominal Mix Concrete".

As far as possible, design mix concrete shall be used on all concrete works. Nominal mix concrete, in grades M-15 or lower only may be used if shown on drawings or approved by the Engineer. In all cases the Proportioning of ingredients and works control shall be in accordance with IS: 456 and shall be adopted for use after the Engineer is satisfied regarding its adequacy and after obtaining his approval in writing.

3.04.02 Mix Design Criteria

Concrete mixes will be designed by the Contractor to achieve the strength, durability, and workability necessary for the job, by the most economical use of the various ingredients. In general, the design will keep in view the following considerations

- a) Consistent with the various other requirements of the mix, the quantity of water should be kept at the lowest possible level.
- b) The nominal maximum size of coarse aggregate shall be as large as possible within the limits specified.
- c) The various fractions of coarse and fine aggregates should be mixed in

such a proportion as to produce the best possible combined internal grading giving the densest and most workable mix.

- d) The finished concrete should have adequate durability in all condition, to withstand satisfactorily the weather and other destruction agencies, which it is expected to be subjected to in actual service.
- e) The mix design shall have required workability and characteristic strength as per IS: 456. The quantity of cement, aggregates, and admixtures shall be determined by mass.

The requirement of adequate structural strength is catered for by the choice of proper grade of concrete in structural design. The Contractor will strictly abide by the same in his design of concrete mix installation. Various trials shall be given by the contractor with specific

cement content on each trial. In some cases, plasticizers and other admixtures may be necessary to achieve the desired results.

3.05.00 Strength Requirements

The strength requirements of both design mix and nominal mix concrete where ordinary Portland Cement or Portland Blast furnace slag cement is used, shall be as per IS: 456. All other relevant clauses of IS: 456 shall also apply.

3.06.00 Minimum Cement Content

The minimum cement content for each grade of concrete shall be as per IS: 456. Contractor has to consider actual environmental exposure condition at site. Based on various tests results and as per Engineer, the environment condition shall be adopted for which minimum cement content shall be considered. No extra payment shall be made on account of any variation in environment condition.

- a) Sufficient number of trial mixes (to be decided by the Engineer) will be taken at the laboratory for the various designs and graphs of w/c ratio Vs crushing strengths at various ages will be plotted.
- b) All tests will be done in presence of the Engineer who shall be the final authority to decide upon the adoption of any revised minimum cement content. The Contractor will always be responsible to produce quality concrete of the required grade as per the acceptance criteria of IS: 456.
- b) The Engineer will always have the unquestionable right to revise the minimum cement content as decided above, if, in his opinion, there is any chance of deterioration of quality on account of use of lower cement content or any other reason.

3.07.00 Water-Cement Ratio

The choice of water-cement ratio in designing a concrete mix will depend on:-

- a) The requirement of strength.
- b) The requirement of durability.

3.07.01 Strength Requirement

In case of "Design Mix Concrete" the water-cement ratio of such value as to give acceptable test results as per IS: 456, will be selected by trial and error. The values of water-cement ratios for different grade and mix designs will have to be established after conducting sufficiently large number of preliminary tests in the laboratory to the satisfaction of the Engineer. Frequent checks on test will have to be carried out and the water-cement ratios will be revised if the tests produce unsatisfactory

results. Notwithstanding anything stated above the Contractor's responsibility to produce satisfactory test results and to bear all the consequences in case of default remains unaltered.

In case of nominal mix concrete, the maximum water-cement ratio for different grades of concrete is specified in Table-5 of IS: 456 and no tests are necessary. The acceptance test criterion for nominal mix concrete shall be as per IS: 456.

3.07.02 Durability Requirement

Tables 4 & 5 of IS: 456 give the maximum water-cement ratio permissible from the point of view of durability of concrete subjected to adverse exposure to weather, sulphate attacks, and contact with harmful chemicals. Impermeability may also be an important consideration.

Whenever the water-cement ratio dictated by Durability consideration is

lower than that required from strength criteria, the former should be adopted.

In general the water cement ratio between 0.4 and 0.45 will be desirable to satisfy the durability requirement and from the consideration of impermeability of concrete. The contractor may propose lower water cement ratio as mentioned above by addition of a suitable plasticizer/super-plasticizer. Trial mix shall be carried out accordingly.

However, the contractor has to propose specifically along with field trials in the event of lower cement content if found suitable along with a plasticizer.

3.08.00 Workability

The degree of workability necessary to allow the concrete to be well consolidated and to be worked into the corners of formwork and around the reinforcement and embedments and to give the required surface finish shall depend*on the type and nature of structure and shall be based on experience and tests. The usual limits of consistency for various types of structures shall be as per CPWD specs.

3.09.00 Size of coarse Aggregates

The maximum size of coarse aggregates for different locations shall be as follows unless otherwise directed by the Engineer

Very narrow space mm	-	12
Reinforced concrete Except foundation mm	-	20

Ordinary Plain concrete and Reinforced concrete foundations	- 40 mm
Mass concrete	- 80 mm
Lean concrete	- 40 mm

Grading of coarse aggregates for a particular size shall conform to relevant I.S. Codes and shall also be such as to produce a dense concrete of the specified proportions, strength and consistency that will work readily into position without segregation.

Coarse aggregate will normally be separated into the following sizes and stacked separately in properly designed stockpiles

80 mm to 40 mm, 40 mm to 20 mm and 20 mm to 5 mm. In certain cases it may be necessary to further split the 20 mm to 5 mm fraction into 20 mm to 10 mm and 10 mm to 5 mm fractions.

This separation of aggregates in different size fractions is necessary so that they may be remixed in the desired proportion to arrive at a correct internal grading to produce the best mix.

3.09.01 Temperature control of concrete in top decks of machine foundations
The temperature of fresh concrete shall not exceed 20°C when placed. A suitable measuring device for measuring the temperature of concrete as approved by the Engineer shall be used. For maintaining the limiting temperature of the 20°C, crushed ice shall be used as mixing water. The ice shall be formed of water conforming IS: 456. The Contractor shall establish the quantity of crushed ice to be mixed in order to achieve the limiting temperature of 20°C.

3.09.02 Base raft and top decks of all machine foundations shall be cast in a continuous operation without any construction joint.

3.10.00 Mixing of Concrete

Ingredients of the concrete mix shall be measured by weight. Concrete shall always be mixed in mechanical mixer. Water shall not normally be charged into the drum of the mixer until all the cement and aggregates constituting the batch are already in the drum and mixed for at least one minute. Mixing of each batch shall be continued until there is a uniform distribution of the materials and the mass is uniform in colour and consistency, but in no case shall mixing be done for less than 2 (two) minutes and at least 40 (forty) revolutions after all the materials and water are in the drum. When absorbent Aggregates are used or when the mix is very dry, the mixing time shall be extended as may be directed by the Engineer. Mixers shall not be loaded above their rated capacity as this prevents thorough mixing.

The entire contents of the drum shall be discharged before the ingredients for the next batch are fed into the drum. No partly set or remixed or excessively wet concrete shall be used. Such concrete shall be immediately removed from site. Each time the work stops, the mixer shall be thoroughly cleaned & when the next mixing commences, the first batch shall have 10% additional cement at no extra cost to the Owner to allow for loss in the drum. Regular checks on mixer efficiency shall be carried out as directed by the Engineer as per IS: 4634 on all mixers employed at site only those mixers whose efficiencies are within the tolerances specified in IS: 1791 will be allowed to be employed.

Batching Plant shall conform to IS: 4925. The measuring gauges of batching plant shall be periodically calibrated for which the contractor shall provide standard weights. The accuracy of all gauges shall be within limits prescribed by the Engineer.

When hand mixing is permitted by the Engineer, for unimportant out of the way locations in small quantities, it shall be carried out on a water-tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. In case of hand-mixing, 10% extra cement shall be added to each batch at no extra cost to the owner.

3.11.00 Conveying Concrete

Concrete shall be handled and conveyed from the place of mixing to the place of laying as rapidly as practicable by approved means and placed and compacted in the final position before the initial setting of the cement starts. Concrete should be conveyed in such a way as will prevent segregation or loss of any of the ingredients. For long distance haulage, agitator cars of approved design will be used. If, in spite of all precautions, segregations does occur during transport, the concrete shall be properly re-mixed before placement. During very hot or cold weather, if directed by the Engineer, concrete shall be transported in deep containers, which will reduce the rate of loss of water, by evaporation or loss of heat. If necessary, the container may have to be covered and insulated. Conveying equipments for concrete shall be well maintained and thoroughly cleaned before, commencement of concrete mixing. Such equipments shall be kept free from set concrete.

3.12.00 Placing and Compacting Concrete

Where specifically covered, the relevant I.S. Code will be followed for the procedure of surface preparation, placement, consolidation, curing, finishes, repairs and maintenance of concrete. If, however, there is no specific provision in relevant I.S. code for any particular aspect of work, any other standard code of practice, as may be specified by the Engineer, will be adopted. Concrete may have to be placed against the following types of surfaces:

- a) Earth foundation
- b) Rock foundation
- c) Formwork
- d) Construction joint in concrete or masonry

The surface on or against which concrete is to be placed has to be cleaned thoroughly. Rock or old construction joint has to be roughened by wire brushing, chipping, sand blasting or any other approved means for proper bond. All cuttings, dirt, oil, foreign and deleterious material, laitance, etc. are to be removed by air water jetting or water at high pressure. Earth foundation on which direct placement of concrete is allowed, will be consolidated as directed by the Engineer such that it does not crumble and get mixed up with the concrete during or after placement, before it has sufficiently set and hardened.

Formwork, reinforcement, preparation of surface, embedments, joint seals etc., shall be approved in writing by the Engineer before concrete is placed. As far as possible, concrete shall be placed in the formwork by means approved by the Engineer and shall not be dropped from a height or handled in a manner which may cause segregation. Any drop over 1500 mm shall have to be approved by the Engineer.

Rock foundation or construction joint will be kept moist for at least 72 hours prior to placement. Concrete will be placed always against moist surface but never on pools of water. In case the foundation cannot be dewatered completely, special procedure and precaution, as directed by the Engineer will have to be adopted.

Formwork will be cleaned thoroughly and smeared lightly with form oil or grease of approved quality just prior to placement.

A layer of mortar of thickness 12 mm of the same or less w/c ratio and the same proportion as that of the concrete being placed or cement slurry will be spread thoroughly on the rock Foundation or construction joint just prior to placement of concrete.

After concrete has been placed, it shall be spread, if necessary & thoroughly compacted by approved mechanical vibration to maximum, subsidence without segregation and thoroughly worked around shape. Vibrators shall not be used for pushing concrete into adjoining areas. Vibrators must be operated by experienced workmen and the work carried out as per relevant IS Code of Practice: In thin members with heavy congestion of reinforcement or other embedments, where effective use of internal vibrator is, in the opinion of the Engineer, doubtful, in addition to immersion vibrators the contractor may have to employ form vibrators conforming to IS: 4656. For slabs and other similar structures, the contractor will additionally employ screed vibrator as per IS: 2506. Hand tamping may be allowed in rare cases, subject to the approval of the Engineer. Care must be taken to ensure that the inserts fixtures, reinforcement, and formwork are not displaced or distorted during placing

& consolidation of concrete.

The rate of placement of concrete shall be such that no cold joint is formed and fresh concrete is placed always against green Concrete, which is still plastic and workable. No concrete shall be placed in open, during rains. During rainy season, no placement in the open is to be attempted unless sufficient tarpaulins or other similar protective arrangement for completely covering the still green concrete from rain is kept at the site of placement. If there has been any sign of washing of cement and sand, the entire affected concrete shall be removed immediately. Suitable precautions shall be taken in advance to guard against rains before leaving the fresh concrete unattended. No accumulation of water shall be permitted on or around freshly laid concrete.

Slabs, beams, and similar members shall be poured in one operation, unless otherwise instructed by the Engineer. Mouldings, throating, drip course, etc., shall be poured as shown on the drawings or as directed by the Engineer. Holes shall be provided and bolts, sleeves, anchors, fastenings, or other fixtures shall be embedded in concrete as shown on the drawings or as directed by the Engineer. Any deviation there from shall be set right by the Contractor at his own expense as instructed by the Engineer.

In case the forms or supports get displaced during or immediately after the placement and bring the concrete surface out of alignment beyond tolerance limits, the Engineer may direct to remove the portion and reconstruct or repair the same -at the Contractor's expense.

The Engineer shall decide upon the time interval between two placements of concrete of different ages coming in contact with each other, taking in consideration the degree of maturity of the older concrete, shrinkage, heat dissipation and the ability of the older concrete to withstand the load imposed upon it by the fresh placement.

Once the concrete is deposited, consolidated and finished in its final position, it shall not be distributed.

3.13.00 Construction Joints and Cold Joints

3.13.01 Construction Joints

It is always desirable to complete any concrete structure by continuous pouring in one operation. However, due to practical limitation of methods and equipment and certain design considerations, construction joints are formed by discontinuing concrete certain predetermined stages. These joints will be formed in a manner specified in the drawings/Instruction.

Vertical construction joints will be made with rigid stop-board forms

having slots for allowing passage of reinforcement rods and any other embedments and fixtures that may be shown. Next stage concrete shall be placed against construction joint as per clause 3.12 is achieved.

Where the location of the joints is not specified, it will be in accordance with the following:

- a) In a column, the joint shall be formed 75 mm below the lowest soffit of the beam framing into it.
- b) Concrete in a beam shall preferably be placed without a joint, but if Provision of a joint is unavoidable, the joint shall be vertical and at the middle of the span.
- c) A joint in a suspended floor slab shall be vertical and at the middle of the span and at right angles to the principal reinforcement.
- d) Feather-edges in concrete shall be avoided while forming a joint.
- e) A construction joint should preferably be placed in a low-stress zone and at right angles to the direction of the principal stress.
- f) In case the Contractor proposes to have a construction joint anywhere to facilitate his work, the proposal should be submitted well in advance to the Engineer for study and approval without which no construction joint will be allowed.

3.13.02 Cold Joint

An advancing face of a concrete pour, which could not be covered by fresh concrete before expiry of initial setting time (due to an unscheduled stoppage or delay on account of breakdown in plant, inclement weather, low rate of placement or any other reason), is called a cold joint. The Contractor should always remain vigilant to avoid cold joints.

If, however, a cold joint is formed due to unavoidable reasons, the following procedure shall be adopted for treating it:

- a) If the concrete is so green that it can be removed manually and if vibrators can penetrate the surface without much effort, fresh concrete can be placed directly against the old surface. The old concrete should be covered by fresh concrete as quickly as possible and the joint thoroughly and systematically vibrated.
- b) In case concrete has hardened a bit more than (a) but can still be easily removed by a light hand pick, the surface will be raked thoroughly and the loose concrete removed completely without disturbing the rest of the concrete in depth. A rich mortar layer 12 mm in thickness, will be placed on the cold joint fresh concrete shall be placed on the mortar layer and the joint will be thoroughly and

systematically vibrated penetrating the vibrator deep into the old layer of concrete.

- c) In case the concrete at the joint has become so stiff that it cannot be remoulded and mortar or slurry does not raise inspite of extensive vibration, the joint, will be left to harden for at least 12 - 24 hrs. It Will then be treated as a regular construction joint, after cutting the concrete to required shape and preparing the surface as described under clause 3.12.

3.14.00 Repairs, Finishes, and Treatment of Concrete surfaces

- 3.14.01** Adequate and sound concrete surfaces, whether formed or unformed, can be obtained by employing a concrete mix of proper design, competent formwork, appropriate methods of handling, placing, and consolidation by experienced workmen.

Unsound concrete resulting from improper mix design, incompetent methods, equipment and formwork, poor workmanship and protection will not be accepted and will have to be dismantled, removed and replaced by sound concrete at the Contractor's cost. The Engineer may, at his sole discretion, allow to retain concrete with minor defects provided the Contractor is able to repair it by approved methods at no extra cost to the Owner, All concrete work shall be inspected by the Contractor immediately after the forms are removed & he will promptly report occurrence of any defects to the Engineer. All repair works will be carried out as per the instructions and in the presence of the Engineer or his representative. Generally, repair work will consist of any or all of the following operations:

- a) Sack rubbing with mortar and stoning with carborundum stone.
- b) Cutting away the defective concrete to the required depth shape.
- c) Cleaning of reinforcement & embedments. It may be necessary to provide an anti-corrosive coating on the reinforcement.
- d) Roughening by sand blasting or chipping.
- e) Installing additional reinforcement/welded mesh fabric.
- f) Dry packing with stiff mortar.
- g) Plastering, guniting, shotcreting etc.
- h) Placing and compacting concrete in the void left by cutting out defective concrete.
- i) Grouting with cement sand slurry of 1:1 mix.
- j) Repairing with a suitable mortar either cement or resin modified mortars.
- k) Polymer modified patching and adhesive repair& mortar for beams & columns.

3.14.02 Finishing unformed Surface

The contractor shall provide normal finishes in unformed surfaces which can be achieved by screeding, floating, trowelling etc. A few typical and common cases of treatment of concrete surface are cited below

a) Floor

Whenever a non-integral floor finish is indicated, the surface of reinforced concrete slab shall be struck off at the specified levels and slopes and shall be finished with a wooden float fairly smooth removing all laitance. No over trowelling, to obtain a very smooth surface, shall be done, as it will prevent adequate bond with the subsequent finish. If desired by the Engineer, the surface shall be scored and marked to provide better bond.

Where monolithic finish is specified or required, concrete shall be compacted and struck off at the specified levels and slopes with a screed, preferably a vibrating type and then floated with a wooden float. Steel trowelling is then started after the moisture film and shine have disappeared from the surface and after the concrete has hardened enough to prevent excess of fines and water to rise to the surface but not hard enough to prevent proper finishing of aberrations. Steel trowelling properly done will flatten and smoothen sandy surface left by wooden floats and produce a dense surface free from blemishes, ripples, and trowel marks.

A fine textured surface that is not slick and can be used where there is likelihood of spillage of oil or water can be obtained by trowelling the surface lightly with a circular motion after initial trowelling keeping the steel trowel flat on the surface.

To provide a better grip the Engineer may instruct marking the floor in a regular geometric pattern after initial trowelling.

b) Beams, Columns & Walls

If on such or any other concrete structure it is intended to apply plaster or such concrete surfaces against which brickwork or other allied works are to be built, the Contractor shall hack the surface adequately as soon as the form is stripped off so that proper bond can develop. Pattern, adequacy, and details of such hacking shall meet with the approval of the Engineer, who shall be informed to inspect such surfaces before they are covered up.

3.15.00 Protection and Curing of concrete

Newly placed concrete shall be protected by approved means from rain, sun, and wind. Concrete placed below the ground level shall be protected against contamination from falling earth during and after placing. Concrete placed in ground containing deleterious substances, shall be protected from contact with such ground, or with water draining from such ground, during placing of concrete and for a period of at least three days, or as otherwise instructed by the Engineer. The ground water around newly poured concrete shall be kept to an approved level by pumping out

or other adequate means of drainage to prevent floatation or flooding. Steps, as approved by the Engineer, shall be taken to protect immature concrete from damage by debris, excessive 'Loadings, vibration, abrasion, mixing with earth or other deleterious materials, etc. that may impair the strength and durability of the concrete.

As soon as the concrete has hardened sufficiently, it shall be covered either with sand, hessian, canvas, or similar materials and kept continuously wet for at least 14 (fourteen) days after final setting. Curing by continuous sprinkling of water will be allowed if the Engineer is satisfied with the adequacy of the arrangements made by the Contractor. Quality of water for curing shall be as per IS: 456.

If permitted by the Engineer, liquid curing compound may be used for prevention of premature water loss in concrete and thereby effecting curing of concrete. This type of curing compound shall be sprayed on newly laid concrete surfaces to form a thin film barrier against premature water loss without disturbances to normal setting action. The curing compound shall be emulsified paraffin based and shall comply with ASTM requirements for acceptance.

The curing compound shall be applied following the final finishing operation and immediately after disappearance of water from concrete surface. It is important not to apply the curing compound when standing water is still present on concrete.

The contractor shall arrange for the manufacturer's supervision at no extra cost.

The Contractor shall remain extremely vigilant and employ proper equipment and workmen under able supervision for curing. The Engineer's decision regarding the adequacy of curing is final. In case the Engineer notices any lapse on the part of the Contractor, he will inform the Contractor or his supervisor verbally or in writing to correct the deficiency in curing. If no satisfactory action is taken by the Contractor within 3 (three) hours of issuance of such instruction, the Engineer will be at liberty either to employ sufficient means through any agency to make good the deficiency and recover the cost thereof from the Contractor, or deduct certain amount from contractor's payment for the part where inadequate curing was noticed entirely at the discretion of the Engineer.

3.16.00 Reinforcement

Mild steel round bars, TMT bars, Hot rolled deformed bars or cold twisted deformed bars as medium tensile or high yield strength steel, plain hard drawn steel wire fabric etc, will be used as reinforcement as per drawings and directions. In an aggressive environment an anti-corrosive coating on the reinforcement may be provided as per IS: 9077, as shown on the drawing or as directed by the Engineer.

3.16.01 Bar Bending Schedules

The Contractor shall prepare Bar Bending Schedules showing clearly the arrangements proposed by the Contractor to match available stock of reinforcing steel, progressively, starting within one week of receipt of approval on corresponding design of RCC structure. As decided by the Engineer, some or all the detailed drawings and schedules will have to be submitted for approval. Approval of such detailed drawings by the Engineer shall not relieve the Contractor of his responsibility for correctness nor of any of his obligations to meet the other requirements of the contract. The contractor for record and distribution shall submit six prints of the final drawings & schedules with one reproducible print.

3.16.02 Cleaning

All steel for reinforcement shall be free from loose scales, oil, grease, paint or other harmful matters immediately before placing the concrete.

3.16.03 Bending

Unless otherwise specified, reinforcing steel shall be bent in accordance with the procedure specified in IS: 2502 or as approved by the Engineer. Bends and shapes shall comply strictly with the dimensions corresponding with the final Bar Bending Schedules. Bar Bending Schedules shall be rechecked by the Contractor before any cutting, bending is done.

No reinforcement shall be bent when already in position in the work, without approval of the Engineer, whether or not it is partially embedded in concrete. Bars shall not be straightened in a manner that will injure the material. Rebending can be done only if approved by the Engineer. Reinforcing bars shall be bent by machine or other approved means producing a gradual and even motion. All the bars shall be cold bent unless otherwise approved. Bending hot at a cherry-red heat (not exceeding 845°C) may be allowed under very exceptional circumstances except for bars whose strength depends on cold working. Bars bent hot - shall not be cooled by quenching.

3.16.04 Placing in Position

All reinforcements shall be accurately fixed and maintained in position as shown on the drawings by such approved and adequate means like mild steel chairs and/or concrete spacer blocks. Bars intended to be in contact at crossing points, shall be securely tied together at all such points by No. 20 G annealed soft iron wire or by tack welding in case of Bar larger than 25 mm dia., as may be directed by the Engineer. Binders shall tightly embrace the bars with which they are intended to be in contact and shall be securely held. The vertical distance between successive layers of bars

shall be maintained by provision of mild steel spacer bars. They should be spaced such that the main bars do not sag perceptibly between adjacent spacers. Before actual placing, the Contractor shall study the drawings thoroughly and inform the Engineer in case he feels that placement of certain bars is not possible due to congestion. In such cases he should not start placing any bar before obtaining clearance from the Engineer.

3.16.05 Welding

Lapping shall normally do splicing of reinforcement. For M.S. reinforcement bars, butt-welding may be done, if permitted by the Engineer, under certain conditions. The work should be done with suitable safeguards in accordance with relevant Indian Standards for welding of mild steel bars used in reinforced concrete construction as per IS: 2751

and IS: 456. Welded mesh fabrics conforming to IS: 1566 may also be

used if specified in the Drawings. Welding of cold twisted High yield strength deformed bar shall not be allowed.

3.16.06 Control

The placing of reinforcements shall be completed well in advance of concrete pouring. Immediately before pouring, the reinforcement shall be examined by the Engineer for accuracy of placement and cleanliness. Necessary corrections as directed by him shall be carried out. Laps and anchorage lengths of reinforcing bars shall be in accordance with IS: 456, unless otherwise specified. The laps shall be staggered as far as practicable and as directed by the Engineer. Arrangements for placing concrete shall be such that reinforcement in position does not have to bear extra load and get disturbed. The cover for concrete over the reinforcements shall be as shown on the approved drawings unless otherwise directed by the Engineer. Where concrete blocks are used for ensuring the cover and positioning reinforcement, they shall be made of mortar not leaner than 1 (one) part cement to 2 (two) parts sand by – volume and cured in a pond for at least 14 (fourteen) days. The type, shape, size and location of the concrete blocks shall be as approved by the Engineer.

3.17.00 Cold Weather Concreting

When conditions are such that the ambient temperature may be expected to be 5°C or below during the placing and curing period, the work shall conform to the requirement of IS: 456 and IS: 7861.

3.18.00 Hot Weather Concreting

When depositing concrete in very hot weather, the Contractor shall take

all precautions as per IS: 7861 and stagger the work to the cooler parts of the day to ensure that the temperature of wet concrete used in massive structures does not exceed 38°C while placing. Positive temperature control by precooling, post cooling or any other method, if required, will have to be done by the contractor at no extra cost.

3.19.00 Concreting under water

When it is necessary to deposit concrete under water it shall be done in accordance with the requirements of IS: 456.

3.20.00 Form Work

3.20.01 General

If it is so desired by the Engineer, the contractor shall prepare, before commencement of actual work, designs and working drawings for formwork and centring and get them approved by the Engineer. The formwork shall conform to the shape, grade, lines, levels and dimensions as shown on the drawings.

Materials used for the formwork inclusive of the supports and centring shall be capable of withstanding the working load and remain undistorted throughout the period it is left in service. All supports and scaffolds should be manufactured from structural or tubular steel except when specifically permitted otherwise by the Engineer.

The centring shall be true to vertical, rigid and thoroughly braced both horizontally and diagonally. Rakers are to be used where forms are to support inclined members. The forms shall be sufficiently strong to carry without undue deformation, the dead weight and horizontal pressure of the concrete as a liquid as well as the working load. In case the contractor wishes to adopt any other design criteria, he has to convince the Engineer about its acceptability before adopting it. Where the concrete is vibrated, the formwork shall be strong enough to withstand the effects of vibration without appreciable deflection, bulging, distortion or loosening of its components. The joints in the formwork shall be sufficiently tight to prevent any leakage of slurry or mortar.

To achieve the desired rigidity, tie bolts, spacer blocks, tie wires and clamps as approved by the Engineer shall be used but they must in no way impair the strength of concrete or cause stains or marks on the finished surface. Where there are chances of these fixtures being embedded, only mild steel and concrete of adequate strength shall be used. Bolts passing completely through liquid retaining walls/slabs for the

purpose of securing and aligning the formwork shall not be used.

The formwork shall be such as to ensure a smooth uniform surface free from honeycombs, air bubbles, bulges, fins and other blemishes. Any blemish or defect found on the surface of the concrete must be brought to the notice of the Engineer immediately and rectified as directed by him.

For exposed interior and exterior concrete surfaces of beams, columns and wall, plywood or other approved form shall be thoroughly cleaned and tied together with approved corrosion-resistant devices. Rigid care shall be exercised in ensuring that all column forms are in true plumb and

thoroughly cross-braced to keep them so. All floor and beam centring shall

be crowned not less than 8 mm in all directions for every 5 metres span. The formwork should lap and be secured sufficiently at the lift joints to prevent bulges and offsets.

Temporary openings for cleaning, inspection and for pouring concrete shall be provided at the base vertical forms and at other places, where they are necessary and as may be directed by the Engineer. The temporary openings shall be so formed that they can be conveniently closed when required, during pouring operations without leaving any mark on the concrete.

3.20.02 Cleaning and Treatment of Forms

All parts of the forms shall be thoroughly cleaned of old concrete, wood shavings, saw dust, dirt and dust sticking to them before they are fixed in position. All rubbish, loose concrete, chippings, shavings, sawdust etc. shall be scrupulously removed from the interior of the forms before concrete is poured. Compressed air jet and/or water jet along with wire brushes brooms etc. shall be used for cleaning. The inside surface of the formwork shall be treated with approved non-staining oil or other compound before it is placed in position. Care shall be taken that oil or other compound does not come in contact with reinforcing steel or construction joint surfaces. They shall not be allowed to accumulate at the bottom of the formwork. The oiling of the formwork will be inspected just prior to placement of concrete and redone wherever necessary.

3.20.03 Design

The formwork shall be so designed and erected that the forms for slabs and the sides of beams, columns, and walls are independent of the soffits of beams and can be removed without any strain to the concrete already placed or affecting the remaining formwork.

Removing any props or repropping shall not be done except with the specific approval of the Engineer. If formwork for column is erected for the full height of the column, one side shall be left open and built up in

sections, as placing of concrete progress. Wedges, spacer bolts, clamps or other suitable means shall be provided to allow accurate adjustment and alignment of the formwork and to allow it to be removed gradually without jarring the concrete.

3.20.04 Inspection of Forms

Casting of Concrete shall start only after the formwork has been inspected and approved by the Engineer. The concreting shall start as early as possible within 3 (three) days after the approval of the formwork and during this period the formwork shall be kept under constant vigilance against any interference. In case of delay beyond three days, a fresh approval from the Engineer shall be obtained.

3.20.05 Removal of Forms

Formwork shall be kept in position after casting of concrete for a minimum period as mentioned in IS: 456, however the period of retaining form in position can be extended as per drawing, instruction of Engineer or as required for satisfactory completion of work without any extra cost. Before removing any formwork, the Contractor must notify the Engineer well in advance to enable him to inspect the concrete if the Engineer so desires.

The Contractor shall record on the drawing or in any other approved manner, the date on which concrete is placed in each part of the work and the date on which the formwork is removed there from and have this record checked and countersigned by the Engineer regularly. The Contractor shall be responsible for the safe removal of the formwork and any work showing signs of damage through premature removal of formwork or loading shall be rejected and entirely reconstructed by him without any extra cost to the Owner, The Engineer may, however, instruct to postpone the removal of formwork if he considers it necessary.

If any other type of cement other than ordinary Portland cement and Rapid hardening cement is used, the time of removal of forms shall be revised such that the strength of this cement at the time of removal of forms match with strength of Portland cement at the time of removal of form.

3.20.06 Tolerance

The formwork shall be so made as to produce a finished concrete, true to shape, lines, levels, plumb and dimensions as shown on the drawings subject to the following tolerances unless otherwise specified in this specification or drawings or directed by the Engineer:-

- For -
- | | | |
|------------------------|---|--|
| a) Sectional dimension | - | ± 5 mm |
| b) Plumb | - | 1 in 1000 of height |
| c) Levels | - | ± 3 mm before any deflection has taken place |

The tolerance given above are specified for local aberrations in the finished concrete surface & should not be taken as tolerances for the entire structure taken as a whole or for the setting and alignment of formwork, which should be as accurate as possible to the entire satisfaction of the Engineer. Any error, within the above tolerance limits or any other as may be specially set up by the Engineer, if noticed in any lift of the structure after stripping of forms, shall be corrected in the subsequent work to bring back the surface of the structure to its true alignment.

3.20.07 Re-use of Forms

Before re-use, all forms shall be thoroughly scraped, cleaned, joints and planes examined and when necessary repaired, and inside surface treated as specified hereinbefore. Formwork shall not be used/re-used if declared unfit or unserviceable by the Engineer.

3.20.08 Classification

Generally, the "ordinary" class formwork shall be used unless otherwise specified.

- a) **Ordinary:** These shall be used in places where ordinary surface finish is required and shall be composed of steel and/or approved good quality partially seasoned timber.
- b) **Plywood:** These shall be used in exposed surfaces in the category "Fair Face" as per BOQ, where specially good finish is required and shall be made of approved brand of heavy quality plywood to produce a perfectly uniform and smooth surface conforming to the shape described in the drawing with required grain texture on the concrete. Re-use may only be permitted after special inspection and approval by the Engineer. He may also permit utilization of used plywood for the "ordinary" class, if it is still in good condition.
- b) **Ornamental:** These shall be used where ornamental and curved surface are required and shall be made of selected best quality well seasoned timbers or of plywood, which can be shaped correctly.

3.21.00 Opening, Chases, Grooves, Rebates, Blockouts etc.

The Contractor shall leave all openings, grooves, chases, etc. in concrete work as shown on the drawings or as specified by the Engineer.

3.22.00 Anchor Bolts, Anchors, Sleeves, Inserts, Hangers/Conduits/Pipe and other misc. Embedded Fixtures

The Contractor shall build into concrete work all the items noted below and shall embed them partly or fully as shown on drawings and secure

the same as may be required. The materials shall be as specified and be of best quality available according to relevant Indian Standards of approved manufacture and to the satisfaction of the Engineer. Exposed surfaces of embedded materials are to paint with one coat of approved anti-corrosive paint and/or bituminous paint without any extra cost to the Owner. If welding is to be done subsequently on the exposed surface of embedded material, the paint shall be cleaned off the member to a minimum length of 50 mm beyond each side of the weld line.

Necessary templates, jigs, fixtures, supports etc. shall be used as may be required or directed by the Engineer.

Items to be embedded

- a) Inserts, hangers, anchors, frame around openings, manhole covers, frames, floor clips, sleeves conduits and pipes.
- b) Anchor bolts and plates for machinery, equipment and for structural steel work.
- c) Steel structurals to be left embedded for future extension, special connection etc.
- d) Dowel bars, etc. for concrete work falling under the scope of other contractors.
- e) Lugs or plugs for door and window frames occurring in concrete work.
- f) Flashing and jointing in concrete work.
- g) Any misc. embedments and fixture as may be required.

Correct location and alignment, as per drawings/instruction of all these embedded items shall be entirely the responsibility of the Contractor.

3.23.00 Expansion and Isolation Joints

3.23.01 General

Expansion and isolation joints in concrete structures shall be provided at specific places as per details indicated on the drawings. The materials and types of joints shall be as specified hereinafter. In case of liquid retaining structures, additional precautions shall be taken to prevent leakage of liquids as may be specified on the drawings or as directed by the Engineer.

All materials are to be procured from reliable manufacturers and must have the approval of the Engineer. Where it is the responsibility of the Contractor to supply the material, the Engineer may demand test certificates for the materials and/or instruct the Contractor to get them tested in an approved laboratory free of cost to the Owner. Joints shall be formed true to line, level, shape, dimension, and quality as per drawings

and specifications. Prior approval of the method of forming the joints should be obtained from the Engineer before starting the work.

3.23.02 Bitumen Board/ Expanded Polystyrene Board

a) Bitumen Board

Bitumen impregnated fibreboard of approved manufacturer as per IS: 1838 may be used as fillers for expansion joints. It must be durable and waterproof. It shall be compressible and possess a high degree of rebound. The dimensions of the board should be equal to that of the joint being formed. It should, preferably be manufactured in one piece, matching the dimension of the joint and not prepared by cutting to size smaller pieces from larger boards at site. At the exposed end, the joint shall be sealed with approved sealing compound to a depth of at least 25 mm after application of an approved primer. The sealing compound and the primer shall be applied as specified by the manufacturer.

b) Expanded Polystyrene Boards

If required, commercial quality of expanded polystyrene products commonly used for thermal insulations may also be used as filler material in expansion joints. The thickness may vary from 12 mm to 50 mm. The material will have to be procured from reliable manufacturers as approved by the Engineer. The method of installations will be similar to that recommended by the manufacturers for fixing on cold storage walls. A coat of Bitumen paint may have to be applied on the board against which concrete will be placed.

3.23.03 Joint sealing strips

Joint sealing strips may be provided at the construction, expansion, and isolation joints as a continuous diaphragm to contain the filler material and/or to exclude passage of water or any other material into or out of the structure. The sealing strips will be either metallic like G.I., Aluminums, or Copper, or non-metallic like rubber or P.V.C. Sealing strips will not have any longitudinal joint and will be procured and installed in largest practicable lengths having a minimum number of transverse joints. The material is to be procured from reputed manufacturers having proven records of satisfactory supply of joint strips of similar make and shape for other jobs. The jointing procedure shall be as per the manufacturer's recommendations, revised if necessary, by the Engineer. The Contractor is to supply all labour and material for installation -including the material and tools required for jointing, testing, protection, etc. If desired by the Engineer, joints in rubber seals may have to be vulcanized.

a) Metal Sealing Strips

Metal sealing strips shall be either G.I., Aluminium or Copper and formed straight, U shaped, Z shaped or any other shape and of thickness as indicated in the drawing. The transverse joints will be gas welded using brass rods and approved flux and will be tested by an approved method to establish that it is leak proof. If required, longer lap lengths and different method of brazing which will render it leak proof, will be adopted by the Contractor. The edges shall be neatly crimped and bent to ensure proper bond with the concrete.

i) G.I. Strips

G.I. strips shall be minimum 1.5 mm thick and 150 mm in width unless specified otherwise. The standard of Galvanizing shall be as per relevant Indian Standards for heavy-duty work. At the joints, the overlapping should be for a minimum length of 50 mm.

ii) Aluminium Strips

Aluminium strips shall be minimum 18 SWG thick and 300 mm wide unless specified otherwise and shall conform to IS: 737 of 19000 grades or 31000 grade (Designation as per IS: 6051). A minimum lap of 50 mm length is required at the joints.

iii) Copper Strips

The Copper strips shall be minimum 18 SWC in thickness and 300 mm width unless specified otherwise and shall conform to the relevant Indian Standards. It should be cleaned thoroughly before use to expose fresh surface, without any reduction in gauge. A minimum lap of 50 mm in length is required at the joints.

c) Non-metallic Sealing Strips

These will be normally in Rubber or P.V.C. Rubber or P.V.C. joint seals can be of shape having any combination of the following features:

i) Plain

ii) Central bulb

iii) Dumb-bell or flattened ends

iv) Ribbed and Corrugated Wings

v) V shaped

As these types of seals can be easily handled in very large lengths unlike metal strips, transverse joints will be allowed only under unavoidable circumstances and with the specific approval of the

Engineer. The method of forming these joints, laps etc. shall be as specified by the Manufacturer and/or as approved by the Engineer taking particular care to match the central bulbs & the edges accurately.

c) Rubber Sealing Strips

The minimum thickness of Rubber sealing strips shall be 3 mm and the minimum width 100 mm. The actual size and shape will be as shown in drawings or as directed by the Engineer. The material will be natural rubber and be resistant to corrosion, abrasion, and tear and also to attacks from the acids, alkalis and chemicals normally encountered in service. The physical properties will be generally as follows. The actual requirements may be slightly different as decided by the Engineer:

Specific Gravity	:	1.1 to 1.15
Shore Hardness	:	65A to 75A
Tensile Strength	:	25 - 30 N/Sq.mm
Maximum Safe Continuous Temperature	:	75°C
Ultimate Elongation	:	Not less than 350%

d) P.V.C., Sealing Strips

The minimum thickness of P.V.C. sealing strips will be 3 mm and the minimum width 100 mm. The actual size and shape will be as shown in drawings or as directed by the Engineer. The material should be of good quality Polyvinyl Chloride highly resistant to tearing, abrasion, and corrosion as well as to chemicals likely to come in contact with during use. The physical properties will generally be as follows. The actual requirements, which will be directed by the Engineer, may vary slightly

Specific Gravity	:	1.3 to 1.35
Shore Hardness	:	60A to SOA
Tensile Strength	:	10 - 15 N/Sq.mm
Maximum Safe Continuous Temperature	:	70 Deg.C
Ultimate Elongation	:	Not less than 275%

3.23.04 Bitumen Compound

When shown in drawing or directed, the gap in expansion joints shall be thoroughly cleaned and bitumen compound laid as per manufacturer's specifications. The compound to be used shall be of approved manufacture and shall conform to the requirements of IS: 1834.

3.23.05 Isolation Joints

Strong and tough alkathene sheet or equivalent, about 1 mm in thickness and as approved by the Engineer shall be used in isolation joints. It shall be fixed by an approved adhesive compound on the cleaned surface of the already set concrete to cover it fully. Fresh concrete shall be laid against the sheet, care being taken not to damage the sheet in any way.

3.23.06**Pad**

Hard foundation quality rubber pads of required thickness and shapes shall be put below machine or other foundations as shown on the drawings. The rubber shall have a unit weight of 1500 Kg/Cu.m, a shore hardness - 65A to 70A and be of best quality of approved manufacture, durable, capable of absorbing vibration and must be chemically inert in contact with moist or dry earth or any other deleterious material expected under normal conditions.

3.24.00**Grouting under Machinery or Structural Steel Bases**

If required, grouting under base plates of machines or structural steel etc. shall be carried out by the Contractor. In general, the mix shall be 1 (one) part cement and 1 (one) part sand and just enough water to make it flow as required. The areas to be grouted shall be cleaned thoroughly with compressed air jet and/or with water in locations where accumulated surplus water can be removed. Where directed by the Engineer, 6 mm down stone chips may have to be used in the mix. Surface to be grouted shall be kept moist for at least 24 hours in advance. The grout shall be placed under expert supervision, so that there is no locked up air. Edges shall be finished properly. If specified on drawings, admixtures like Aluminium powder, "Ironite" etc. may have to be added with the grout in required proportions. Premixed non-shrink grout of approved manufacture having proper strength shall be used with Engineer's approval for important machineries.

3.25.00**Precast Concrete**

The Specification for precast concrete will be similar as for the cast-in-place concrete described herein and as supplemented in this section. All precast work shall be carried out in a yard made for the purpose. This yard shall be dry, properly levelled and having a hard and even surface. If the ground is to be used as a soffit former of the units, it shall be paved with concrete or masonry and provided with a layer of plaster (1:2 proportion) with smooth neat cement finish or a layer of M.S. sheeting. Where directed by the Engineer, casting will have to be done on suitable vibrating table. The yard, lifting equipment, curing tank, finished material storage space etc. shall be designed such that the units are not lifted from the mould before 7 (seven) days of curing and can be removed for erection after 28 (twenty-eight) days of curing. The moulds shall preferably be of steel or of timber lined with G.I. sheet metal. The yard shall preferably be fenced.

Lifting hooks, where necessary or as directed by the Engineer, shall be embedded in correct position of the units to facilitate erection, even though they may not be shown on the drawings, and shall be burnt off

and finished after erection.

Pre-cast concrete units, when ready, shall be transported to site by suitable means approved by the Engineer. Care shall be taken to ensure that no damage occurs during transportation. All adjustments, levelling, and plumbing shall be done as per instructions of the Engineer. The Contractor shall render all help with instruments, materials, and men to the Engineer for checking the proper erection of the pre-cast units.

After erection and alignment, the joints shall be filled with grout or concrete as per drawings. If centrings have to be used for supporting the pre-cast units, they shall not be removed until the joints have attained sufficient strength and in no case before 14 (fourteen) days. The joint between pre-cast roof planks shall be pointed with 1:2 cement: sand mortar where called for in the drawings.

3.26.00 Waterproofing of Concrete Structure

3.26.01 General

Where required, waterproofing of concrete structures shall be ensured internally by suitable design of the concrete mix, addition of suitable admixtures in the concrete or mortar at the time of mixing and/or installing water bars at the joints. In addition to the above measures, the structures shall be made watertight by adopting "structural waterproofing" as per specification. The design, material, and workmanship shall conform to the relevant I.S. Codes where applicable. The Engineer's approval of the materials shall be obtained by the Contractor before procurement. If desired by the Engineer, test certificates for the materials and samples shall be submitted by the Contractor free of charge. The materials shall be of best quality available indigenously, fresh clean and suitable for the duties called upon.

3.26.02 Water Bar/Seal/Special Treatment of Construction Joint

Water bearing structures and underground structures may have water bar/seals installed at the joints. They may be metallic, rubber, or P.V.C. The materials and installation will be as described under Clause 3.23.3. Construction joint shall be provided as per clause 3.13.1 with or without water bar/seal as shown on the drawing. In case of water bars being used at the construction joint, fixing of the same has to be done carefully, so that the water bar is not disturbed during concreting. The construction joint shall also be treated by any one of the following methods.

Method 1: A surface retarder in the form of a thixotropic gel shall be applied on the joint surface of the previous pour in case of joint on the wall and in case of floor the same shall be applied on the formwork against which previous pour of concreting shall be done. The retarder may be liquid or paste form depending on the type of formwork. The formwork shall be removed within 24 hours after concreting. Within 2

hours of striking of the formwork the retarder shall be washed off with strong water jet to make surface rough and clean. Then a rich cement mortar using cement, sand and aggregates (maximum size 8 mm) along with synthetic rubber emulsion type water resistant bonding agent shall be applied for a depth of 50 mm just before pouring the next stage of concreting. In case of walls, the above bonding agent will be mixed with water, which will be used for making the cement mortar. The proportion of mixing of this bonding agent with water shall be as per manufacturer's specification. In case of floor joint, however, after washing of retarder a solvent free two-component epoxy resin-bonding agent will be used at the joint before the next pour of concrete. The above bonding agent shall have the following properties after 28 days

Compressive strength	-	55 to 60 N/Sq.mm
Flexural strength	-	5 to 30 N/sq.mm
Tensile strength	-	15 N/Sq.mm (approx.)
Bonding strength to concrete	-	3 N/Sq.mm (approx.)
Bonding strength to steel	-	20 N/Sq.m (approx.)

The whole operation shall be done as per manufacturers specification. The contractor shall provide manufacturer's supervision at no extra cost to the owner.

Method 2: One row of threaded nozzles at regular intervals not exceeding 1.5 m centre to centre shall be placed in concrete along the construction joint during casting. Injection of cement water together with a suitable waterproof expanding grouting admixture of approved quality shall be done through the nozzles after the concrete has set to seal the voids in concrete near the construction joint in walls and slabs. The injection shall be done under pressure of approximately 2 to 4 kg/sq.cm. The nozzles shall be sealed off with suitable admixture after the injection is over. The whole operation shall be carried out as per manufacturer's specification and supervision. The cost of such manufacturer's supervision shall be borne by the contractor.

3.26.03 Waterproofing Admixtures

The waterproofing admixture for concrete and cement mortar/plaster shall conform to IS: 2645. The admixture shall not cause decrease of strength of concrete/plaster at any stage and it shall be free from chlorides and sulphates. The admixture shall not affect the setting time by more than 5%. The maximum permissible dosage of admixture will be 3% (three percent) by weight of cement, but a lower dosage will always be preferred. The product shall be stored in strong moisture proof packings. However, in case of important structures where M25 or higher grade concrete is specified, the use of melamine based, high range water reducing concrete admixture shall be used to provide a waterproof concrete, For achieving high strength concrete having cement content around 400 kg/cu.m. a melamine based super plasticizer will be preferable.

- a) In concrete: The admixtures shall be procured from reliable and reputed manufacturers and approved by the Engineer. The method of application and other details shall conform to the manufacturer's specification and/or as instructed by the Engineer. The Contractor shall have the services of the manufacturer's supervisor at no extra cost to supervise the work, if desired by the Engineer.
- b) In Plaster: The concrete surface, to be plastered, shall be hacked to Engineer's satisfaction, cleaned thoroughly and kept wetted for 24 hours. The plaster shall be in cement sand mortar mixed in proportion varying from 1:1 to 1:4 by volume along with the approved waterproofing admixture and laid in appropriate thickness and in layers not exceeding 15 mm/layer or as per manufacturer's specification. The additive shall be of quality and type approved by the Engineer. If desired by the Engineer, the Contractor shall have the work supervised by the manufacturer's supervisor at no extra cost. On completion, the Plastered surface shall be cured continuously for a minimum period of 14 days like concrete.

3.26.04 Structural waterproofing

- a) Nozzles spaced as required after the concrete is completed shall be drilled into surfaces to be rendered watertight. Non-shrink cement grout with waterproofing compound as per manufacturers specifications shall be injected under pressure to seal all voids.
- b) Special care shall be taken at joints by providing additional nozzles. The pressure grouting shall be done on the internal surface.

b) External Treatment

Two layers of (1 : 4) plaster of 12 mm thick each with waterproofing compound as per manufacturer's specification shall be provided on outer surface of concrete underground structures.

3.26.05 Protective coating on Inside Surface.

Two coats of cement based two components polymer modified flexible protective and waterproofing slurry having 1 mm thick for each coat shall be applied on the walls/floor after proper surface preparation as mentioned above. The slurry shall be applied by brush.

4.00.00 SAMPLING AND TESTING

4.01.00 General

The Contractor shall carry out all sampling and testing in accordance with the relevant Indian Standards and as supplemented herein for the

following items at his own cost unless otherwise specified in this specification. The Contractor shall get the specimens tested in a laboratory approved by the Engineer and submit to the Engineer the test results in triplicate within 3 (three) days after completion of the test.

4.02.00 Cement

Representative samples will be taken from each consignment of cement received from the manufacturer/supplier for carrying out the tests for fineness (by hand sieving), setting time and compressive strengths as per guidelines of IS: 269. Soundness Tests may also be required to be carried out if required by the Engineer. The Contractor shall carry out the tests without any expense to BHEL. No cement from a particular consignment/batch will be used on the works unless satisfactory 3 (three) days and 7 (seven) days test results for compressive strength are known. The Engineer and Contractor will jointly associate themselves with the tests irrespective of whether they are carried out by the BHEL or the Contractor. These tests are of great importance, as their results will have a bearing on the acceptance of concrete or otherwise as per the terms and conditions of the Contract.

4.03.00 Aggregates

The contractor shall carry out any or all the tests on aggregates as may be required by the Engineer in accordance with IS: 2386 PARTS-I to VIII. The acceptance criteria of the samples tested shall be in accordance with the requirements of the relevant Indian Standards.

4.04.00 Water

Sampling and Testing of water being used for concrete works as per IS: 3550 if required as per FQP will be carried out by the Contractor at regular intervals and whenever directed by the Engineer. The acceptance criteria will be as per IS: 456.

4.05.00 Admixture**4.05.01 Air Entraining Agents**

Initially, before starting to use A.E.A., relationship between the percentage of air entrained and the cylinder cube crushing strength vis-a-vis quantity of A.E.A. used for all types of concrete will be established by the Contractor by carrying out sufficiently large number of tests. After that, at regular intervals and whenever directed by the Engineer, the Contractor will check up the actual percentages of air entrained and corresponding crushing strengths to correlate with the earlier test results.

4.05.02 Other Admixtures

Tests for establishing the various properties of any other admixtures, which may be required to be added, shall be carried out by the Contractor.

4.06.00 Concrete

The sampling of concrete, making the test specimens, curing and testing procedure etc. shall be in accordance with IS: 516 and IS: 1199, the size of specimen being 15 cm cubes. Normally, only compression tests shall be performed but under special circumstances the Engineer may require other tests to be performed in accordance with IS: 516. Sampling procedure, frequency of sampling and test specimen shall conform to IS: 456. To control the consistency of concrete from every mixing plant, slump tests shall be carried out by the Contractor every two hours or as directed by the Engineer. Slumps corresponding to the test specimens shall be recorded for reference. The acceptance criteria of concrete shall be in accordance with IS: 456. Concrete work found unsuitable for acceptance shall have to be dismantled and replacement is to be done as per specification by the Contractor at his own cost. In the course of dismantling, if any damage is done to the embedded items or adjacent structures, the same shall be made good, free of charge by the Contractor, to the satisfaction of the Engineer.

5.00.00 ACCEPTANCE CRITERIA**5.01.00 Standard Deviation**

Standard deviation shall be based on test results and determination of Standard deviation shall conform to IS: 456.

5.02.00 Acceptance Criteria

The strength requirements and acceptance criteria shall conform to IS: 456.

5.03.00 Inspection and Core Tests

Inspection of concrete work immediately after stripping the formwork and core test of structures shall conform to IS: 456.

5.04.00 Load Test

Load tests of structural members as per IS:456 may be required by the Engineer, when the strength of test specimen results falls below the required strength.

If the member shows evident failure, the Contractor shall make the structure adequately strong free of cost to BHEL.

The entire cost of load testing shall be borne by the Contractor. If a portion of the structure is found to be unacceptable, it shall be dismantled and replaced by a new structure as per specification. The entire cost of

dismantling and replacement and restoration of the site being borne by the Contractor.

If, in the course of dismantling, any damage is done to the embedded items and or other adjacent structures, the same will be made good, free of charge by the Contractor to the satisfaction of the Engineer.

6.00.00 RATES AND MEASUREMENTS

6.01.00 Cast-in-situ Concrete

6.01.01 Rates

a) The unit rates shall include the cost of labour, materials, equipment, handling, transporting, botching, mixing, placing in position, vibrating, compacting, finishing, curing, testing, etc. at all elevations. This shall also include the cost of using curing compound, whenever used.

b) The unit rates shall include for all working conditions including in or under water, liquid, mud, in or under foul positions, under tides, and extreme weather conditions.

c) The unit rates for exposed concrete works (including machine foundations) shall include all incidentals, rendering, smoothening with carborandum stone, finishing with a paste of cement sand mortar, curing, etc.

d) The unit rates shall include for maintaining stability of structure during execution.

e) Nothing extra shall be payable for the handling/mixing of extra cement on account of any reason or pouring of second stage concrete.

f) Nothing shall be payable to the Contractor on account of facilities and arrangement provided by him for conducting ultrasonic pulse velocity tests or other relevant tests to ascertain grade and quality, etc. of the concrete, if required. In case of any defects, the Contractor shall rectify the same by cement/epoxy grout at his own cost.

g) The unit rates for controlling of the temperature of concrete shall include storing and mixing of ice, water, cooling of aggregate etc.

h) The quoted rate shall include the cost of making additional trial mixes, using the superplasticizer and mixing in concrete etc.

6.01.02 Measurements

a) Actual volume of concrete work as executed or as per drawings issued, whichever is less shall be measured in cubic metres.

- b) No deductions shall be made for the following:
 - i) Opening upto 0.1 sq.m.
 - ii) Volume occupied by reinforcement, sleeves, anchor bolts, and similar items.
 - iii) Volume occupied by pipes, conduits, sheathing, etc. not exceeding 100 sq.cm. each in cross sectional area.
- c) The concrete works of different grades; below and above ground floor finished level shall be measured separately, unless otherwise specified in the schedule of items. Accordingly rates shall be applied for concrete in foundation for concrete below ground floor finished level and concrete in superstructure for concrete above ground floor finished level.
- d) For temperature control measures, measurement shall be done in terms of quantity of concrete in cum. in concreting of which the ice have been used or cooling of aggregates has been done to keep the temperature of freshly laid concrete to less than 25°C.

6.02.00 Reinforcement**6.02.01 Rates**

- a) The unit rates shall include for cover block, providing binding wire, welding, separator pieces between two or more layers of reinforcement required for keeping the steel in position, etc. at all elevations.
- b) No extra will be paid for transportation from stores, cleaning, straightening of steel, cutting, bending, binding with annealed wire, welding, tack welding, placing the reinforcement modification of already embedded reinforcement, if required, due to faulty fabrication or placement and other cost of tools and plants, materials, labours, return of unused steel to the store, etc.
- c) No extra shall be paid for preparing and getting approved bar bending schedules (including all revisions).
- d) Generally members are straight and have straight edges. However, for bending, binding, placing of reinforcement in any curved member in length or cross section or both, no extra payment shall be made.

6.02.02 Measurements

- a) Bar or any other type of reinforcement used like hard drawn steel wire fabric etc. for reinforced concrete shall be measured by weight in tonnes. The weight shall be arrived at by multiplying the actual or

theoretical length measured alongwith standard hooks, cranks, bends, authorized laps, etc. whichever is less by the sectional weights. Claims for payment for this item shall be submitted with supporting documents giving the schedule of bars with sketches. The sectional weight to be adopted shall be IS Section weight. Nothing extra will be payable to the Contractor on account of, difference in weight, if any, due to different methods adopted for issue and measurement.

- b) Standard hooks, cranks, bends, authorised laps, supports, hangers and chairs which are covered in approved bar bending schedule shall be measured in tonnes.

6.03.00 Formwork and Staging

6.03.01 Rates

- a) The unit rates shall be inclusive of all staging, scaffolding, making the formwork watertight, etc. for all elevations and in all types of works.
- b) No separate payment shall be made for providing fillets, for rounding or chamfering at junctions, comers, etc.
- c) The unit rates shall include the cost of labour, materials etc. and the extra time, which shall be required for the removal of shuttering/ support for satisfactory completion of work.
- d) No extra payment shall be made on account of difficulty, wastage etc. for placement/removal of formwork between the network of closely placed steel beams or for the lacing/bracing portions and ribbed slab constructions.

Payment for curved shuttering shall be made for curved members/wall whose centerline radius in plan is less than 6m.

If the contact surface area in pockets is less than or equal to 0.1 sq.m in each case, payment shall be done under item for providing formwork in pockets.

6.03.02 Measurements

- a) Formwork for different classes (types) shall be measured separately as the actual surface in contact with the concrete and paid on area basis unless included in the rate for concrete. The unit of measurement shall be in sq.m.
- a) Bar or any other type of reinforcement used like hard drawn steel wire fabric etc. for reinforced concrete shall be measured by weight in tonnes. The weight shall be arrived at by multiplying the actual or theoretical length measured alongwith standard hooks, cranks, bends, authorized laps, etc. whichever is less by the sectional weights.

Claims for payment for this item shall be submitted with supporting documents giving the schedule of bars with sketches. The sectional weight to be adopted shall be IS Section weight. Nothing extra will be payable to the Contractor on account of, difference in weight, if any, due to different methods adopted for issue and measurement.

- b) Standard hooks, cranks, bends, authorised laps, supports, hangers and chairs which are covered in approved bar bending schedule shall be measured in tonnes.

6.03.00 Formwork and Staging

6.03.01 Rates

- a) The unit rates shall be inclusive of all staging, scaffolding, making the formwork watertight, etc. for all elevations and in all types of works.
- b) No separate payment shall be made for providing fillets, for rounding or chamfering at junctions, comers, etc.
- c) The unit rates shall include the cost of labour, materials etc. and the extra time, which shall be required for the removal of shuttering/ support for satisfactory completion of work.
- d) No extra payment shall be made on account of difficulty, wastage etc. for placement/removal of formwork between the network of closely placed steel beams or for the lacing/bracing portions and ribbed slab constructions.

Payment for curved shuttering shall be made for curved members/wall whose centerline radius in plan is less than 6m.

If the contact surface area in pockets is less than or equal to 0.1 sq.m. in each case, payment shall be done under item for providing formwork in pockets.

6.03.02 Measurements

- a) Formwork for different classes (types) shall be measured separately as the actual surface in contact with the concrete and paid on area basis unless included in the rate for concrete. The unit of measurement shall be in sq.m.
- b) Openings up to 0.1 sq.m or boxing left for inserts etc. for facility of Contractor's work, shall be neglected as if nonexistent for the purpose of formwork measurement of surface in which the openings occur.
- c) For suspended floor, no deduction shall be made for flange area of secondary steel beams.

- d) No measurement shall be taken for the formwork in pockets, openings, chases, blockouts, etc. in concrete, the contact surface area is less than or equal to 0.1 sq.m. in each case.
- e) For pockets, if the contact surface area is less than or equal to 0.1 sq.m in each case, measurement shall be done under item for providing formwork in pockets.
- f) Formwork, if required, for joints shown on drawing or instructed by the Engineer, shall be paid for the 'leading side' only.

6.04.00 Embedded Parts**6.04.01 Rates**

- a) The unit rate for erection of embedded steel parts, supplied by Engineer shall include transportation from Owner's store to the place of work, erection & installation including setting material in concrete, etc. complete.
- b) The unit rate for MS pipe embedments and PVC pipe embedments shall include cutting, welding, fabrication, erection, embedding, and transportation to site. Unit rate shall also include the cost of the pipes.
- c) Rate for expansion fasteners shall include cost of fasteners, installation, and fixing including cost of washers and nuts.

6.04.02 Measurements

- a) The measurement of the embedded steel parts fabricated and installed by the Contractor shall be based on the calculated weight of steel sections in tonne corrected to second place of decimal.
- b) Embedded steel parts supplied by Owner and installed by Contractor Measurement shall be done for the net weight of the embedments installed in tonnes correct to second place of decimal.
- c) For PVC pipes/conduits, measurements shall be in quintals correct to second place of decimal for the net weight.
- d) For mild steel pipes, measurement shall be in quintals, correct to second place of decimal, for the net weight of the steel pipe supplied, fabricated, and installed.
- e) The lugs shall be measured in Kg. correct to second place decimal for the net weight.
- f) The expansion fasteners shall be measured in number according to tension capacity.

- g) The rails shall not be treated as embedded steel part and the track shall be measured in running metres along the centre line and paid for under separate item of work as specified in schedule of items. Other related civil items associated with the laying of track shall be measured separately and paid under respective items of works.

6.05.00 Groutings**6.05.01 Rates**

Rate shall include the cost of surface preparation, admixtures, and curing.

6.05.02 Measurements:

- a) Measurement shall be in cubic decimeters.
- b) Measurement for grouting shall be by volume of the block out, pockets or bolt hole up to the top surface of foundation concrete and shall be calculated from the dimensions shown on the drawings.
- c) Measurement for underpinning shall be by volume between the top surface of the foundation concrete and the underside of the base plate, the plan dimensions being as indicated on the drawings.
- c) No deduction shall be made for shims, bolts, shear keys and such other embedments.

6.06.00 Joints**6.06.01 Rates**

The unit rate shall include all the activities described in the schedule of items.

6.06.02 Measurements

- a) Bitumen Board/Expanded polystyrene.
The measurement for bitumen board shall be based on actual finished surface area in square meters nearest to second decimal, for the specified thickness.
- b) Water Stops

The measurement for water stops shall be in running metres of actual length of the joint covered, for specified thickness, width, and shapes. No separate measurement shall be made for laps/splices for cross-joints and mitered joints.
- c) Metal Cover Strips

The measurement for Metal Cover Strips shall be based on actual finished surface area in square metres for the specified thickness.

d) Vibration Damping Resilient Pads

The measurement for this item shall be in square metres for the specified thickness, measured correct to the second place of decimal, of the actual finished surface area.

6.07.00 Dismantling/Demolishing Work – RCC and PCC and Chipping of Concrete

6.07.01 Rates

The unit rates shall include the cost of all necessary propping, shoring, underpinning scaffolding, safety measures, temporary enclosures, disposal/ stacking of serviceable/unserviceable materials, etc. for all types of work and for all grades of concrete.

In the case of dismantling/demolishing work, the cutting of reinforcement shall also be included in the rate.

In the case of chipping work, the cutting of reinforcement shall be paid separately.

6.07.02 Measurements

- a) Dismantling of PCC and RCC work shall be measured in cu.m separately. Measurement of all work, except hidden work shall be taken before execution of work and no allowance for increase in bulk shall be allowed. Specifications for deductions of voids, openings etc, shall be on the same basis as that employed for construction work.
- b) Chipping of concrete, making holes/pockets etc. shall be measured in cubic decimeters (i.e. 0.001 cu.m.).
- c) Cutting of reinforcement in chipping work for making of pockets and openings shall be measured in sq. cm. of cross-sectional area.

6.08.00 Precast Concrete

This clause shall be read in conjunction with relevant provisions specified elsewhere for cast in-situ Concrete.

6.08.01 Rates

a)The unit rate shall include cost of preparation of casting yard, formwork, concrete and its casting, finishing as specified, setting filling of gaps between adjacent pre-cast concrete units with concrete, or cement mortar, curing, handling, erection, grouting, welding, preparation of supporting surface, etc.

6.08.02 Measurements

The measurement of pre-cast concrete members shall be on the basis of volume of concrete in cubic metres nearest to second place of decimal. No deduction shall be made for volume occupied by reinforcement/inserts/sleeves and for openings up to 0.1 sq.m. The setting of element with cement mortar shall not be measured separately. The filling of concrete cement mortar between the gaps of adjacent pre-cast units shall be considered while computing the volume of pre-cast concrete work and shall be paid for under this item itself.

LIST OF IS CODES AND STANDARDS FOR REFERENCE

All work under this specification shall, unless specified otherwise, conform to the latest revisions and/or replacements of the following or any other Indian Standard Specifications and Codes of Practice. In case any particular aspect of work is not specifically covered by Indian standard Specifications, any other standard practice, as may be specified by the Engineer, shall be followed:-

- IS: 73 - Indian Standard Specification for Paving Bitumen
- IS: 216 - Indian Standard Specification for Coal Tar Pitch
- IS: 383 - Indian Standard Specification for Coarse and Fine Aggregates from Natural Sources for Concrete
- IS: 432 - Indian Standard Specification for Mild Steel and Medium Tensile Steel Bars and Hard Drawn Steel Wire for concrete Reinforcement
- IS: 455 - Indian Standard Specification for Slag Cement
- IS: 456 - Indian Standard Code of Practice for Plain and Reinforced Concrete
- IS: 457 - Indian Standard Code of Practice for General Construction of Plain and Reinforced Concrete for Dams and other Massive Structures
- IS: 516 - Indian Standard Specification for Methods of Test for Strength of Concrete
- IS: 702 - Indian Standard specification for industrial bitumen.
- IS: 1199 - Indian Standard Specification for Methods of Sampling and Analysis of Concrete
- IS: 1322 - Indian Standard Specification for Bitumen Felts for

Waterproofing and Damp-proofing

IS: 1489 - Cement	Indian Standard Specification for Portland Pozzolona
IS: 1566 -	Indian Standard Specification for hard drawn steel wire fabric for concrete reinforcement.
IS: 1609 -	Code of Practice for Laying Damp-proof Treatment using Bitumen Felts
IS: 1786 -	Indian Standard Specification for High Strength Deformed Steel Bars and Wires for Concrete Reinforcement.
IS: 1791 - Mixers.	Indian Standard Specification for Batch Type Concrete
IS: 1838 -	Indian Standard Specification for preformed fillers for expansion joints in concrete pavements and structures (non-extruding and resilient type).
IS: 2185 -	Indian Standard Specification for Hollow Cement Concrete Blocks
IS: 2210 -	Indian Standard Specification for Design of Reinforced Concrete shell Structures and Folded Plates
IS: 2386 -	Indian Standard Specification for Methods of Test for Aggregates for Concrete - Part-I to VIII
IS: 2502 -	Indian Standard Code of Practice for Bending and Fixing of Bars for Concrete Reinforcement
IS: 2505 -	Indian Standard Specification for Concrete Vibrators, Immersion Type
IS: 2506 -	Indian Standard Specification for Screed Board Concrete Vibrators
IS: 2514 - Tables	Indian Standard Specification for Concrete Vibrating
IS: 2571 -	Code of practice for laying in-situ cement concrete floors.
IS: 2645 -	Integral cement water proofing compound
IS: 2722 -	Indian Standard Specification for Portable Swing Weigh Batches for Concrete (Single and Double Bucket type)
IS: 2750 -	Indian Standard Specification for steel scaffoldings.

IS: 2751 -	Code of Practice for Welding of Mild Steel Bars used for Reinforced Concrete Construction
IS: 2770 -	Indian Standard Specification for Method of Testing Bond in Reinforced Concrete
IS: 4926 -	Indian Standard Specification for Ready Mixed Concrete
IS: 4990 -	Indian Standard Specification for Plywood for Concrete Shuttering work
IS: 4991 -	Indian Standard Specification for Blast Resistant Design of structure for Explosion above ground
IS: 4995 -	Indian Standard Specification for Design of Reinforced Part-I & II Reinforced Concrete Bins for the Storage of Granular and Powdery Materials
IS: 4998 -	Indian Standard Specification for Design of Reinforced Concrete Chimneys.
IS: 5256 -	Code of practice for sealing joints in concrete lining on canals.
IS: 5512 -	Indian Standard Specification for Flow Table for use in Tests of Cement and Pozzolanic materials
IS: 5513 -	Indian Standard Specification for vacate Apparatus.
IS: 5515 -	Indian Standard Specification for Compaction Factor Apparatus.
IS: 5525 -	Recommendation for detailing of reinforcement in reinforced concrete works.
IS: 5624 -	Indian Standard Specification for foundation bolts.
IS: 5751 -	Indian Standard Specification for Precast Concrete Coping Blocks.
IS: 5816 -	Indian Standard Specification for Method of Test for Splitting Tensile strength of Concrete Cylinders.
IS: 5891 -	Indian Standard Specification for Hand operated Concrete Mixers.
IS: 5892 -	Indian Standard Specification for transit mixer and agitators.

IS: 6452 -	Indian Standard Specification for High Alumina Cement for Structural Use
IS: 6909 -	Indian Standard Specification for Super sulphated Cement
IS: 6923 -	Indian Standard Specification for Method of Test for Performance of Screed Board Concrete Vibrators.
IS: 6925 -	Indian Standard Specification for Method of Test for Determination of Water Soluble Chloride in Concrete Admixtures.
IS: 7242 -	Indian Standard Specification for Concrete Spreaders.
IS: 7246 -	Indian Standard Specification for Table Vibrators for Consolidating Concrete.
IS: 7251 -	Indian Standard Specification for Concrete Finishers.
IS: 7293 -	Safety code for working with construction machinery.
IS: 7320 -	Indian Standard Specification for Concrete Slump Test Apparatus.
IS: 7861 -	Indian Standard Specification for Recommended Practice Part-I&II for Extreme Weather Concreting.
IS: 7969 -	Safety Code for Storage and Handling of Building Materials.
IS: 8041 -	Indian Standard Specification for Rapid Hardening Portland cement.
IS: 8112 -	Indian Standard Specification for high strength Ordinary Portland Cement.
IS: 8142 -	Indian Standard Specification for Determining Setting time of concrete by Penetration Resistance.
IS: 8989 -	Safety Code for Erection of Concrete Framed Structures.
IS: 9012 -	Recommended method for shotcreting.
IS: 9013 -	Indian Standard Specification for Method of Making, Curing, and determining compressive Strength of Accelerated-cured Concrete Test Specimens.

- IS: 9077 - Code of Practice for Corrosion Protection of Steel Reinforcement in RB and RCC Construction.
- IS: 9103 - Indian Standard Specification for Admixtures for Concrete.
- IS: 10262 - Recommended Guidelines for Concrete Mix Design.
- IS: 13311 - Non-destructive testing of concrete.
- SP: 34 - Handbook of concrete, reinforcement and detailing.

B3: GLASS AND GLAZING**1.00.00 SCOPE**

This section covers supplying and fixing of all glass and glazing including all clips, putty, mastic cement etc. wherever required as per specifications.

2.00.00 INSTALLATION**2.01.00 General**

The Contractor shall supply and install all glass and glazing as required for various doors, windows, sashes, ventilators and fixed louvers, miscellaneous glazing and partitions, from approved manufacturer like Hindustan Pilkinton or equivalent, having uniform refractive index and free from flaws, specks, and bubbles. The glass shall be brought to site in the original packing from the manufacturer and cut to size at site.

Materials

- a) Glare reducing or heat absorbing glass shall be "Calorex" of Hindustan Pilkinton or approved equivalent and special care shall be taken to grind smooth and round off the edges before fixing.
- b) Clear glass shall be flat draw sheet glass and shall be at least 4 mm thick. Sheet glass for doors shall be minimum 5.5 mm thick.
- c) Wired glass shall be thick- rolled glass with centrally embedded 42g wire mesh of Georgian type. This may be of clear or coloured glass, as required.
- d) Obscure glasses shall have a cast surface in one side.
- e) Coloured and figured glass shall be as per approved sample.
- f) In general, the putty shall conform to IS: 400 and be of best quality from approved manufacturer. It shall be brought to site in the manufacturer's original packing.
- g) Neoprene gaskets with snap-fit glazing beads shall be fixed as per manufacturer's instructions and shall sit snugly against glass to give a leak proof installation.

2.03.00 Glazing, Setting, and Finish

All glazing clips, bolts, nuts, putty, mastic cement etc. as required shall be supplied by the Contractor.

All glass shall be thoroughly cleaned before putting in position. Each glass pane shall be held in place by special glazing clips of approved type. As specified in relevant I.S. Codes, four glazing chips shall be provided per glass pane, except for large panes where six or more clips shall be used as per engineer's instructions. All holes that may be necessary for holding the clips glazing heads and all other attachments shall be drilled by the Contractor.

Glass panes shall be set without springing, and shall be bedded in putty and back puttied, except where mouldings or gasket are specified, putty, mastic cement etc. shall be smoothly finished to the even line and figured glass shall be set with smooth side out.

Where owner will supply glass, the Contractor shall cut it to size and fix them in the same as specified above.

The Contractor shall supply necessary glazing clips, putty, mastic cement etc.

After completion of glazing, the Contractor shall remove all dirt stains, excess putty etc. clean glass panes and leave the work in perfectly acceptable condition. All broken cracked or damaged glass shall be replaced by new ones at the contractor's own cost.

3.00.00 ACCEPTANCE CRITERIA

- a) All installation shall be free from cracked, broken, or damaged glass. Edges of large panes of thicker glass and heat absorbing glass shall be inspected carefully for chipped, cracked, or underground edges.
- b) Glazing shall be carefully done to avoid direct contact with metal frames.
- c) All glass shall be embedded in mastic or fixed by neoprene gaskets to give a leak proof installation.
- d) At completion, the panes shall be free from dirt, stains, excess putty etc. to the complete satisfaction of the Engineer.

4.00.00 I.S. CODES

Following are some of the important I.S.Codes relevant to this Section:

IS: 3548 - Code of practice for glazing in building.

IS: 1081 - Code of practice' for fixing and glazing metal doors, windows ventilators.

5.00.00 RATES

Rates of glass and glazing are included in respective items for supply and installation of window, ventilator, and partitions. No separate payment shall be made for glazing clips, mastic cement, putty, screws; rails, etc. nor for drilling holes in frames for inserting glazing clips.

B4: FENCING**1.00.00 Chain Link Fencing**

The material requirement shall conform to IS: 2721 latest edition. The chain link fencing shall be woven from 3.15mm dia. wire with mesh size of 50mm. The mesh wire shall not vary from specified dia. by more than ± 0.05 mm. all steel wire shall be hot dipped galvanised wire. The dia shall be measured over the galvanised coating. The line wire shall be 4.0mm dia. mild steel. The stirrup wire for securing the line wire to the intermediate post (RCC/structural steel) shall be 2.5 mm diameter mild steel. The tying wire for securing the chain link fencing to the line wire shall be 1.6mm diameter mild steel. Hair pin chain staples for fastening down the bottom of galvanised chain line fencing to the concrete sill shall be 3.15mm wire. The ends shall be bent outwards for securing anchorage.

Cleat for eye bolts shall be of uniform size and shall consist of mild steel angle of 75 x 50 x 8 mm. The eye bolts strainer shall consist of bolt with welded eye sufficiently threaded and fitted with a nut and washer. Two-way eye bolt strainer shall have suitable ring nuts fitted after the wires have been strained on one side. Stretcher bar shall consist of mild steel flats 25 x 4.75 mm. They shall be secured to the cleats by steel bolts.

The chain link fencing shall be strained between each pair of straining posts and secured to each straining posts by means of a stretcher bar. One of top line wire shall be threaded through appropriate adjacent row of mesh, care being taken that no meshes in the row are bypassed by the line wire except where deviation is necessary at the straining posts. The second top line wire shall be strained in front of the fencing. The fencing shall be attached to the top and bottom line wire by wire ties spaced at 150mm apart and to the other middle line wire by wire ties spaced at 450mm apart.

The bottom of fencing shall be treated as follows:

Continuous concrete sill 125mm wide x 225mm high for full length between posts shall be cast with the top 25mm above GL and 25mm below the chain link fencing. Hair pin staples shall be threaded through the bottom row of mesh at 750mm c/c and set in the sill to a depth of 150mm.

2.00.00 Barbed Wire Fencing

The barbed wire shall be conform to IS:278 latest edition. The barbed wire shall be galvanised and galvanising shall conform to the requirement laid down for 'light-coated wire' of IS:4826 and it shall be smooth and relatively free of lumps etc. Wire with excessive roughness blisters, salammoniac spots shall be rejected. The barbed wire shall be made from two line wire and two point wire of 2.5 mm thickness each. The barbs

shall have four point and shall be formed by twisting two point wires, each two turns, tightly around both or one line wire (Type A - around both line wire, Type B - around one line wire) making altogether four complete turns. The barbs shall be so finished that four points are set and located or locked as far as possible at right angle to each other. The barbs shall have a length of not less then 13mm and not more than 18mm. The distance between two barbs shall be 75±12mm.

Straining posts shall be provided at all ends and corners of fences or at changes in direction or acute variation in level and at intervals not exceeding 66 M on straight lengths of fence. Intermediate posts shall be spaced at regular intervals not exceeding 3.0m. Struts shall be fitted to all straining posts behind the chain link fabric in the direction of line of fence. There shall be four evenly spaced row of line wire in all. The top line wire shall be doubled, making five line wire in all. The bottom wire shall be closed to the ground. Each line wire shall be strained tightly by means of eyebolts strainers or winders at each straining points. Each line wire shall be secured to each intermediate post by a wire stirrup passed through a hold in the post and secured to the line wire by three complete turns on each sides of the post. The barbed wire shall be fitted with one dropper at the centre of each bay, secured to the wire so that they could not be bunched together. Droppers for barbed wire shall be of mild steel of not less then 25 x 4.75 mm thick with 38 x 4.85 mm half round staples for fastening the barbed wire to them. Bracing for the rows of barbed wire shall be approved by the Engineer.

3.00.00 ACCEPTANCE CRITERIA

- a) All items shall be correct shape, size, weight etc. shown on drawings and schedule of items.
- b) For installed items, the tolerances shall be as follows
 - i) Permissible deviation from, straightness – 1 in 1000.
 - ii) Seats, stiffener connections etc. shall be as per approved drawings and shall not interfere with architectural clearances.
- c) All castings shall be free from blowholes, cracks, and other blemishes.
- d) All MS wire fencing shall be in true vertical plain, and shall not bulge.

4.00.00 IS CODES

IS:278	Specification for Galvanised Steel Barbed wire for fencing.
IS:816	Code of practice for use of Metal Arc welding for general construction in mild steel.

IS:1367 Industrial Fasteners – Threaded steel fasteners - Technical supply condition.

IS:2721 Specification for Galvanised Steel Chain Link fence fabric.

IS:2812 Arc welding of Aluminum and Alloy

5.00.00 RATES AND MEASUREMENTS

5.01.00 Rates

Rates shall include supply, fabrication and installation for misc. metals works as required for completion of works like gates, fencing, handrails, ladders, hangers, anchors etc., unless otherwise specified in Schedule of Items.

Rate for fencing shall also include excavation, concreting and supply, erection & fabrication of post (post made of either structural steel or reinforced cement concrete), unless any specific item is excluded in BOQ.

5.02.00 Measurements

Measurement for MS gates shall be in MT.

Measurement for galvanised MS wire fencing shall be in Sqm.

Measurement for Anchors shall be in nos. for the type as specified in schedule of items.

Measurement of other misc. metals shall be done in MT unless otherwise specified in schedule of items.

B5: MASONRY AND ALLIED WORKS**1.00.00 SCOPE**

This section covers furnishing, installation including handling, transporting, batching, mixing, laying scaffolding, centering, shuttering, finishing, curing, protection, maintenance and repair of common building materials till handing over of masonry and allied works for use in structures and locations covered under the scope of this package.

2.00.00 MATERIALS**a) Brick**

Bricks for general masonry work shall be of class designation 7.5 of nominal dimensions as per standard specification under IS: 1077, well burnt, of uniform size, shape and colour, free from cracks, flaws or modules of free lime and emit clear ringing sound when struck. Fractured surface shall show uniform texture free from grits, lumps holes etc. Water absorption after 24 hours immersion shall not exceed 20% by weight for bricks. Dimensional tolerance shall not exceed 8% of the size shown in drawings for bricks. All bricks shall have rectangular faces and sharp straight edges. The bricks shall show no efflorescence after soaking in water and drying in shade.

Each brick shall have the manufacturer's identification marks clearly marked on the frog. Representative samples shall be submitted and approved samples shall be retained by the Engineer for further comparisons and reference. Any brick not found up to the specification shall be removed immediately from site at the Contractor's own cost.

Bricks shall not be dumped at site. They shall be stacked in regular tiers, even as they are unloaded; to minimize breakage and defacement of bricks. Bricks selected for different situation of use in the work shall be stacked separately.

b) Stone

All stones shall be obtained from approved quarries, hard, tough, durable compact grained, uniform in texture and colour and free from decay, flaws, veins, cracks and sand holes. The surface of a freshly broken stone shall be bright, clean, and sharp and shall show uniformity of texture, without loose grains and free from any dull, chalky, or earthly appearance. Stone showing mottled colours shall not be used for face work. A stone shall not absorb more than 5 per cent of its weight of water after 24 hours immersion. The type of stone shall be as specified on drawings and/or instructed by the Engineer. Samples shall be submitted by the Contractor and approved samples

shall be retained by the Engineer for comparison of bulk supply.

c) Cement

Cement used shall be Ordinarily Portland Cement or Portland Slag Cement or Portland Pozzolana Cement conforming to IS Codes and shall be fresh when delivered. In special cases, Rapid Hardening Portland Cement, Low Heat Cement etc. may be permitted or directed to be used by the Engineer. The Contractor shall submit the manufacturer's certificate for each consignment of cement procured to the Engineer. If at any time, the Engineer feels that the cement being used by the Contractor is not up to specification, he may stop the work and send the samples of the cement to a testing laboratory for standard tests and all expenses incurred thus shall be borne by the Contractor. The Contractor shall also have no claim for this type of suspension of work.

The cement shall be stored above the ground level in perfectly dry and watertight sheds. The bags shall be stacked in a manner so as to facilitate removal or first in first out basis. Any material considered defective by the Engineer shall not be used by the Contractor and shall be removed from the site immediately.

d) Coarse Aggregate

Coarse aggregates shall be as per IS: 383 latest editions, consisting of hard, strong and durable pieces of crushed stone and shall be free from organic or clay coatings and other impurities like disintegrated stones, soft flaky particles etc. and any other material liable to affect the strength, durability or appearance of concrete.

Aggregates other than crushed stone conforming to the provisions of specification may be used if permitted by the Engineer.

Washing of aggregates by approved means shall be carried out, if desired by the Engineer.

Grading of coarse aggregates shall generally conform to IS: 383 and shall be such as to produce a dense concrete or the specified proportions and strength and of consistence that will work readily into position without segregation.

Aggregates shall be stored on brick soling or an equivalent platform so that they do not come in contact with dirt, clay, grass, or any other injurious substances at any stage.

Aggregate of different size shall be kept in separate stacks. If so desired by the Engineer aggregate from different sources shall be stacked separately with proper care to prevent intermixing.

e) Sand

Sand shall be hard, durable, clean, and free from adherent coatings or organic matter and shall not contain clay balls or pellets. The sand shall be free from impurities such as iron pyrites, alkalis, salts, coal, mica, shale or other laminated materials in such forms or quantities as to affect adversely the hardening, strength, durability or appearance of mortar, plaster or concrete or to cause corrosion to any metal in contact with such mortar, plaster or concrete. All sand shall be properly graded and shall be as per relevant IS Code. Sand for concrete shall conform to IS: 383.

f) Water

Water shall be clean, fresh and free from organic matters, acids or soluble salts and other deleterious substances which may cause corrosion, discoloration, efflorescence etc.

g) Reinforcement

Reinforcement steel shall be clean and free from loose mill scales, dust, loose rust, oil and grease or other coatings, which may impair proper bond. Structural steel shall conform to IS: 2062. Mild steel and medium tensile steel bars and hard-drawn steel wire for concrete reinforcement shall conform to IS: 432. Cold twisted steel bars shall

conform to IS: 1786. Hand drawn steel wire fabric shall conform to IS: 1566. Hexagonal wire netting shall conform to IS: 3150. All steel bars including and above 10 mm diameter shall be of tested quality. All wire netting shall be galvanized.

Reinforcement bars shall be stored off the ground and under cover if so desired by the Engineer. If necessary, a coat of cement wash shall be given to the bars to guard against rusting.

3.00.00 INSTALLATION**3:01.00 Soling****3.01.01 Brick Soling**

The ground shall be dressed, consolidated by ramming, or by light rolling and a 12 mm thick cushion of sand laid. On the sand cushion the bricks shall be laid with fine joints and placed firmly in position by hammering with wooden mallet. The surface shall be free from undulations. The 'frog' side shall be on the underside. The joints shall be broken the in all direction and bricks cut as required. The pattern of laying and number of layers shall be as per Schedule of item. Orientation shall be as desired

by the Engineer. After laying of each layer of bricks sand shall be spread over and worked into the joints to pack the bricks tight.

3.01.02 Stone Soling

The stones for soling shall be selected on the basis of thickness of soling specified in the Schedule of Items. The larger stones shall be laid and the gaps filled by smaller stones. The interstices shall then be firmly packed with sand by flooding with water.

3.02.00 Brick-on-Edge

Excavation shall be done close to the brick dimensions and in perfect alignment. Bricks shall be firmly placed by hammering with wooden mallets and sides and joints packed firmly with earth so that the edging is not disturbed easily. Alignment and level shall be acceptable to the Engineer.

3.03.00 Masonry**3.03.01 General**

All masonry work shall be true to lines and levels as shown on drawings. All masonry shall be tightly built against structural members and bonded with dowels, inserts etc. as shown on drawings.

3.03.02 Cement Mortar

Cement mortar shall be prepared with materials specified in clause 2.00.00. Sand for masonry mortar shall conform to IS: 2116. Cement and sand in the specified proportion shall be mixed dry thoroughly and minimum water added to attain required workability.

Surplus mortar droppings from masonry, if received on surface free from dirt may be mixed with fresh mortar if permitted by the Engineer who may direct addition of additional cement without any extra payment. No mortar, which has stood for more than half an hour, shall be used.

3.03.03 Brick Masonry

Bricks shall be soaked by submergence in clean water for at least two hours in approved vats before use. Bricks shall be laid in English bond unless specified otherwise. Broken bricks shall not be used. Cut bricks shall be used if necessary to complete bond or as closers. Bricks shall be laid with frogs upwards over full mortar beds. Bricks shall be pressed into mortar and tapped into final position so as to embed fully in mortar.

Inside faces shall be buttered with mortar before the next bricks is placed and pressed against it. Thus all joints between bricks shall be fully filled with mortar. Mortar joints shall be kept uniformly 10 mm thick. All joints on face shall be raked to minimum 10 mm depth using raking tool while the mortar is still green to provide bond for plaster or pointing.

Where plaster or pointing is not provided, the joints shall be struck flush and finished immediately. Brickworks two bricks thick or more shall have both faces in true plane. Brickwork of lesser thickness shall have one selected face in true plane.

3.03.04 Exposed Brickwork

Brickwork in superstructures, which is not covered by plaster, shall be as shown on drawing and executed by specially skilled mason. Courses shall be truly horizontal and vertical joints truly vertical. Wooden straight edges with brick course graduations and position of window sills and lintels shall be used to control uniformity of brick courses. Masons must check workmanship frequently with plumb, spirit level, rule, and string. All brickwork shall be cleaned at the end of days work. If face bricks are specified, the brickwork shall be in composite bricks, with face bricks on

the exposed face and balance in routine bricks, but maintaining the bond fully. Where face bricks are not specified, bricks for the exposed face shall be specially selected from routine bricks. All exposed brickwork on completion of work shall be rubbed down, washed clean, and pointed as specified. Where face bricks are used carborandum stone shall be used for rubbing down.

3.03.05 Reinforced Brickworks

Reinforcements shall be as specified. All reinforcements shall be thoroughly cleaned and fully embedded in mortar. Where M.S. bars are used as reinforcement, these shall be lapped with dowels if left in R.C. columns or welded to steel stanchions.

3.03.06 Expansion & Separation Joints

location of joints shall strictly be as shown on drawings or as instructed by the Engineer. Expansion joints shall be as shown on drawings and specified. Expansion joint filler boards and sealing strips shall have minimum transverse joints. Transverse joints shall meet the approval of the Engineer. Separation joints shall be with standard waterproof paper or with alkathene sheets about 1 mm in thickness. Length and sealing of laps shall be to the satisfaction of the Engineer.

3.03.07 Mouldings, Cornices, Drip Course

These shall be made as shown in drawings. Bricks or stone shall be cut and dressed as required. If no subsequent finish is envisaged, these shall be rubbed to correct profile with Carborundum stone.

3.03.08 Curing

Masonry shall be cured by keeping it wet for seven days from the date of laying. In dry weather at the end of days work top surface of masonry shall be kept wet by ponding.

3.03.09 Embedding of fixtures

All fixtures shall generally be embedded in mortar and masonry units shall be cut as required.

3.03.10 Encasing of Structural Steel

This shall be done by building masonry work round flanges, webs etc., and filling the gap between steel and masonry by minimum 12 mm thick mortar. Encased members shall be wrapped with chicken wire mesh when shown on drawings or instructed by the Engineer. The minimum lap in chicken wire mesh shall be 50 mm.

3.04.00 Damp Proof Course (DPC)

Unless otherwise specified Damp-proof course shall be 40 mm thick 'artificial stone' in proportion 1:1 :3 cement sand stone-chips (10 mm down) with admixture of a waterproofing compound as approved by the Engineer. The percentage of admixture shall be as per manufacturer's specifications but not less than 2% by weight of cement. The top surface shall be double chequered and cured by ponding for seven days.

3.05.00 Damp Proof Membrane

Damp proof treatment using fibre or hessian base bitumen felt shall be 6, 8 or 10 course treatment as specified in IS: 1609. The number of courses shall be as shown as drawings or as specified. Sequence of work shall be as directed by the Engineer. Extreme care shall be taken to prevent damage to felt during and after laying. The Contractor shall be obliged, at his own expense, to rectify any leakage appearing within 5 years of installation by removing and renewing the coats at the point of leakage. Where shown on drawing, damp proof membrane with one layer bitumen paper or one layer alkathene sheet shall be laid with minimum 150 mm lap under slabs on grade.

3.05.00 Plinth Protection

Plinth of buildings shall be protected with brick-on-edge paving of minimum 750mm width unless otherwise shown on the drawings. The treatment shall consist of laying bricks in cement mortar 1:6 (1 cement: 6 sand) over a 75mm thick bed of dry graded brick aggregate, 40mm nominal size, grouted with sand. The top shall be finished with 1:2 cement mortar pointing (1 cement: 2 sand). Plinth protection shall be laid with a minimum outward slope of 1 in 50. The brick aggregate shall be well graded, broken from well burnt or slightly overburnt and dense brickbats. It shall be homogeneous in texture, roughly cubical in shape, clean and free from dirt or any other foreign matter.

The ground shall first be prepared to the required slope around the building. The high portions of the ground should be cut down; hollows and depressions filled up to the required level from the excavated earth and rammed so as to give uniform outward slope. The bed shall be watered and rammed with heavy iron square rammers. Surplus earth, if any, shall be disposed off beyond a lead of 50m or as directed by the Engineer.

Over this, 75mm thick bed of aggregate of 40mm nominal size, shall be laid with a minimum outward slope of 1 in 50. Aggregates shall be carefully laid and packed, bigger sized being placed at the bottom. The brick aggregates shall be consolidated dry with heavy iron rammers.

The aggregates shall then be grouted evenly with sand at the rate of 0.6 cubic metre per square metre area, adequately watered to ensure filling of voids by sand and again rammed with heavy iron rammers. The finished surface shall give uniform appearance. After the subgrade has been compacted thoroughly, brick flooring with bricks of specified strength in cement mortar 1:6 (1 cement: 6 sand) shall be laid.

The bricks shall be laid on edge in Diagonal/Herring Bone Bond or other pattern as specified or as directed by the Engineer. Bricks shall be laid on 12mm thick mortar bed and each brick shall be properly bedded and set home by gentle tapping with handle of trowel or wooden mallet. Its inside face shall be buttered with mortar before the next brick is laid and pressed against it. On completion of the portion of flooring, the vertical joints shall be fully filled from the top with mortar. The surface shall present a true plain surface with the required slope.

The pointing shall be done in cement mortar 1:2 (1 cement: 2 sand). The mortar shall be pressed into the joints and shall be finished off flush and level with the edges of the bricks so as to give a smooth appearance. The edges shall be neatly trimmed with a trowel and a straight edge. The mortar shall not spread over surface of the masonry.

Brick flooring & pointing shall be kept wet for a minimum period of seven days. These shall be protected from rain by suitable covering when the mortar is green.

4.00.00 I.S. CODES

Some of the important relevant codes for this section are:

IS: 1127: Recommendations for dimensions and workmanship of natural building stones for masonry work.

IS: 1597: Code of Practice for Construction of stone Masonry.

IS: 1609: Code of Practice for laying Damp proof treatment using bitumen felts.

IS: 2212: Code of Practice for Brickwork. IS: 2250: Code of practice for preparation and use of masonry Mortar.

IS: 5134: Bitumen Impregnated Paper & Board.

5.00.00 RATES AND MEASUREMENTS**5.01.00 Rates**

Unit rate for masonry work shall include the following:

- a) Raking out joints for plastering or pointing or finishing the joint flush as the work proceeds.
- b) Preparing top sand sides of existing wall for joining old with new work.
- c) Providing, dismantling and removing the scaffolding.

Unit rate for DPC shall be inclusive of formwork and bitumen painting.

5.02.00 Measurement

Brickwork in wall of half brick thickness shall be measured separately in Sqm stating the wall thickness and more than half brick thickness shall be measured by volume. Plaster thickness shall not be considered for computation of volume.

Masonry work in sub structure and super structure shall be measured separately, unless otherwise specified in the Schedule of items.

No deductions shall be made and no extra payment shall be made for following:

- a) Opening upto 0.1 Sqm each in area. In calculating the area of the opening lintels or sills shall be included along with the size of the opening.

- b) Drainage holes and recesses for cement blocks to embed holdfasts for doors, windows etc.
- c) Pipe and fixtures upto 300mm dia. and nothing extra shall be paid for the mortar used for fixing.

Reinforcement in masonry work shall be paid separately under respective items.

Damp proof course shall be measured in Sqm. No deduction shall be made and no extra shall be paid for opening upto 0.1 Sqm in area.

Plinth protection shall be measured under respective item of works executed required for completion of the work as specified.

B6: PLASTERING**1.00.00 Mortar**

Mortar for plastering shall be as specified.

For sand cement plaster, sand and cement in the specified proportion shall be mixed dry, on a watertight platform and minimum water added to achieve working consistency. The sand for plaster shall conform to IS: 1542.

No plaster, which has stood for more than half an hour, shall be used; plaster that shows tendency to become dry before this time shall have water added to it.

2.00.00 Application of Plaster

Plaster, when more than 12 mm thick, shall be applied in two coats a base coat followed by the finishing coat. Thickness of the base coat shall be sufficient to fill up all unevenness in the surface; no single coat, however, shall exceed 12 mm in thickness. The lower coat shall be thicker than the upper coat; the overall thickness of the coats shall not be less than the minimum thickness shown on the drawings. The undercoat shall be allowed to dry and shrink before applying the second coat of plaster. The undercoat shall be scratched or roughened before it is fully hardened to form a mechanical key. The method of application shall be 'thrown on' rather than 'applied by trowel'.

To ensure even thickness and true surface, patches of plaster about 100 mm to 150 mm square or wooden screed 75 mm wide and of the thickness of the plaster, shall be fixed vertically about 2000 mm to 3000 mm apart, to act as gauges. The finished wall surface shall be true to plumb, and the Contractor shall, without any extra cost to the Owner, make up any irregularity in the brickwork with plaster.

All vertical edges of brick pillars, doorjambes etc. shall be chamfered or rounded off as directed by the Engineer. All drips, grooves, mouldings and cornices as shown on drawing or instructed by the Engineer shall be done with special care to maintain true lines, levels and profiles. After the plastering work is completed, all debris shall be removed and the area left clean. Any plastering that is damaged shall be repaired and left in good condition at the completion of the job.

2.01.00 Finish

Generally, the standard finish shall be used unless otherwise Shown on drawing or directed by the engineer. Wherever any special treatment to the plastered surface is indicated, the work shall be done exactly as shown on the drawings, to the entire satisfaction of the engineer regarding the texture, color and finish.

a) Standard Finish

Wherever punning is indicated, the interior plaster shall be finished rough; otherwise the interior plaster shall generally be finished to a smooth surface. The exterior surface shall generally be finished with a wooden float.

b) Neat Cement Finish

Immediately after achieving a true plastered surface with the help of a wooden straight edge, the entire area shall be uniformly treated with a paste of neat cement at the rate of one (1) kg. per Sq.M. and rubbed smooth with a trowel.

c) Coloured Plaster Finish

This shall be done in the same way as specified in Clause 2.02.02 but using Coloured cement in place of ordinary cement. When coloured plastering is specified in more than one coat, the topcoat only shall be made with coloured cement.

Coloured cement shall be either ready mixed material or may be obtained by mixing pigments and cement at site, as approved by the Engineer. The pigments to be mixed with cement shall conform to Appendix-A of IS: 2114 latest editions.

Samples of colouring material shall be submitted to the engineer for approval and material procured, shall conform in all respects to the approved samples, which shall remain with the Engineer. All coloured cement and/or pigments shall be stored in an approved manner in order to prevent deteriorations.

d) Pebble-dash Finish

Mortar of required thickness consisting of 1 part cement and 4 parts sand by volume shall be applied in the usual manner as described under plastering Clause 2.02.02. While the mortar is still plastic small pebbles or crushed stone of size generally from 10mm to 20mm as approved by the Engineer shall be thrown on the plastered surface. The aggregate shall be lightly tapped into the mortar with a wood float

or the flat end of oil a trowel, in order to ensure satisfactory bond between the dashing and the mortar.

e) Rough-cast Finish

A wet plastic mix of 3 parts coloured cement 6 parts sand and 4 parts aggregate by volume (gravel or crushed stone of size from 6 mm to 12 as approved by the Engineer) shall be thrown on to the wall by means of a plaster's trowel and left in the rough condition.

f) Scraped Finish

Ordinary plaster as described under Clause 2.02.02 after being leveled and allowed to stiffen for a few hours, shall be scraped with a steel straight edge to remove the surface skin. The pattern shall be as approved by the Engineer.

g) Textured Finish

Mortar consisting of 1 part cement and 3 parts sand by volume shall be applied in a manner as specified under "Plastering" Clause 2.2.2 Ornamental treatments in the form of horizontal or vertical rib texture fan texture etc. shall be applied by means of suitable tools to the freshly applied plastered surface, as approved by the Engineer.

h) Sand Faced Plaster

The plaster shall be applied in 2 coats. The first coat or the scratch coat should be approximately 14mm and shall be continuously carried out without break to the full length of wall or natural breaking points such as doors, windows, etc. The scratch coat shall be dashed on the prepared surface with heavy pressure, brought to true and even surface and then lightly roughened by cross scratch lines, to provide bond for the finishing coat. The mortar proportion for this scratch coat shall be as specified in the respective item or work. The scratch coat shall be cured for at least 7 days & then allowed to dry. The second coat shall be 6mm thick and it shall not be applied until at least 10 days have elapsed after the application of scratch coat. Before application of the second coat, the scratch coat shall be evenly damped. This coat shall be applied from top to bottom in one operation & without joints; finish shall be straight, true, & even. The mortar of this coat shall be as specified under the respective item of work. White sand for finish shall be used for the second coat & for finishing work. Sand for finish shall be of even coarse size & shall be dashed on the surface & sponged.

2.02.00

Curing

All plastered surfaces after laying shall be watered, for a minimum period of seven days, by an approved method, and shall be protected from excessive heat and sunlight by suitable approved means. Moistening shall commence, as soon as the plaster has hardened sufficiently and not susceptible to damage. Each individual coat of plaster shall be kept damp continuously, for at least two days, and then dried thoroughly, before applying the next coat.

2.03.00 Pointing to masonry

All Joints of brickwork shall be raked out to a depth of 10 mm with a hooked tool made for the purpose while the mortar is still green. The brickwork shall then be brushed down with a stiff wire brush, so as to remove all loose dust from the joints and thoroughly washed with water. Mortar consisting of 1 part cement and 3 parts clean, sharp, well graded sand by volume shall be pressed carefully into the joints and finishes with suitably tools to shape as shown on the drawings. Any surplus mortar shall be scalped off the wall face leaving the surface clean.

The pointed surface shall be kept wet for at least three days for curing.

2.04.00 Plaster with Metal Lath

The supports, hangers, brackets, cleats etc. shall be as shown on drawings and/or as approved by the Engineer. These shall have a coat of prime paint before and another coat of approved paint after erection.

The metal lath shall be expanded metal, with 12 mm x 38 mm mesh, 16 thick and 3 mm wide strands. Side laps shall be minimum 12 mm and end laps 25 mm minimum. The plastering shall be minimum 20 mm thick measured from the back of lath and applied in two-layers. The mortar for plastering shall consist of 1 part cement and 4 parts sand by volume mixed as specified in plastering, Clause 2.02.01. The application, finish etc. shall be as specified under relevant clause above. Where called for a 2 mm Plaster of Paris punting shall be applied over plaster as a finishing coat to give perfectly smooth and even finish.

2.05.00 Lime Punning

For plastered surfaces, where an even smooth surface is specified, lime punning with 5 parts of shell lime properly slaked, strained and aged, mixed with 1 part clean, washed, sieved, fine sand by volume shall be done. The thickness of lime punning shall be not less than 2 mm and more than 3 mm. The plastered surface shall be saturated with water before application of the lime punning. The punting shall be applied by skilled workman and given a smooth and even finish free from undulations, cracks etc. and to the satisfaction of the Engineer.

2.06.00 Plaster of Paris Punning

Plastered surfaces, where specified shall be finished with Plaster-of-Paris punning. The material shall be from approved manufacturers and approved by the Engineer. The thickness of the punning shall be 2 mm and shall be applied by skilled workmen. The finish shall be smooth, even and free from undulation, cracks etc.

Before bulk work is taken in hand, a sample of punning shall be done on roughly 10 Sq M areas and approval of the Engineer taken. The work shall then be taken in hand as per approved sample.

3.00.00 RATES AND MEASUREMENT**3.01.00 Rates**

Rates shall also include providing, dismantling and removing of scaffolding, surface preparation, curing and all type of surface, shapes/profiles and at all elevations.

3.02.00 Measurement

All plastering shall be measured net (on surface area on which it is applied) in Sq M. Plaster work shall be classified according to the type used and shall be measured separately. Plaster on ceiling and walls shall be measured separately. Soffits of stairs shall be measured as plastering on ceiling.

No deduction shall be made for opening not exceeding 0.5 Sq M and for ends of beams, joints, etc. also no payment shall be made for reveals, jams, soffits, sills of these openings.

50% deduction shall be made for opening exceeding 0.5 Sq M but not exceeding 3.0 Sq M each and no addition shall be made for reveals, jams, soffits, sills etc.

In case of opening exceeding 3.0 Sq M each, deduction shall be made for opening but jams, soffits, and reveals shall be measured and paid for.

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TS-PART C

SECTION

PART-1	TECHNICAL SPECIFICATIONS- CIVIL WORKS
2.1	Excavation
2.2	Cast In-situ Concrete
2.3	Concrete Reinforcement
2.4	Formwork
2.5	Flooring
2.6	Structural Steel
2.7	Block work
2.8	Plastering
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2.10	Miscellaneous Items
PART-2	TECHNICAL SPECIFICATIONS- FINISHES
PART-3	BILL OF QUANTITIES – CIVIL WORKS (CORE AND SHELL)
PART-4	BILL OF QUANTITIES – FINISHES/ MISC. WORKS

2.1 Excavation

Site Work

2.1.1 Subsurface Investigation

2.1.1.1 General

Contractor shall be deemed to have visited the site prior to submitting his Bid and made all necessary inspection and investigations and to have decided for himself the means of access and working space, the nature of the ground and subsoil, if any, level of water table, extent of rock demolitions, alterations, support of neighboring properties, etc.

2.1.1.2 Related work

- a) Clearing, grubbing, removing all vegetation from the site.
- b) Excavation including getting out, and necessary dressing to make surface ready to receive blinding.
- c) Filling and back filling and compaction of fills
- d) Removal and disposal of surplus material.
- e) Stone soling to roads and paving.

The contractor shall provide all labours, equipment, materials and any incidentals necessary to complete all aspects of work included in the drawings and specifications.

2.1.1.3 Applicable Standards:

The following standards shall be followed:

- a. IS: 3764-1966 Safety Code for Excavation Work.
- b. IS: 1498-1970 Classification and identification of soils for general engineering purposes.
- c. British Standard 1377-Methods of test for Soils for Civil Engineering Purposes.
- d. British Standard 5930- Code of Practice for Site Investigations.
- e. SP27 Handbook of method of measurement of building works.
- f. Local Building Regulations and Statutory Regulations.

2.1.1.4 Definitions

Clear:	The removal of trees, scrub and artificial obstructions including fences, concrete slabs, kerb and channel, remains of old buildings and the like.
Grub :	The removal of tree stumps and roots.
Topsoil:	Topsoil is all surface soils, which have sufficient humus to support plant growth without resort to artificial fertilization.
Cut:	A general term for 'in place' material removed by digging from the ground. The term 'excavation' or derivatives thereof may be used interchangeably.
Fill:	A general term for material spread and compacted over the ground to make up finished levels or levels to sub-grade. The term 'Embankment' or derivatives thereof may be used interchangeably.
Sub-Grade:	The finished, trimmed and prepared surface of the earth works after completion of all cut and fills operations. The term 'formation level' or derivatives thereof may be used interchangeably.
Sub-Base:	A selected filling layer spread and compacted over the sub-grade to make up levels to the underside of the base course or floor slab.
Base course:	A selected filling layer spread and compacted to levels immediately below road wearing course.
Spoil:	Excess cut material remaining at the end of filling operations.
Bulk Earthworks:	Earthworks to create, by excavation and/or filling and compacting, building platforms, road formations, parking areas, reservoir, embankments, drainage canals or any other formation where the unimpeded use of large earthmoving

equipment is possible. This is distinct from backfill of trenches, foundations or other earthworks immediately adjacent to completed or partially completed structures.

2.1.2 **Site Preparation**

2.1.2.1 **Site Inspection - Preamble**

Any Site details or site information included in the contract documents or Drawings are provided for the Contractor's guidance only. The information provided may not be a complete or accurate description of conditions existing below the surface of the ground. The correctness of the information is not guaranteed and the contractor shall be responsible to make its own interpretation of sub-surface conditions.

The contractor shall visit the site, examine the boreholes, and decide for himself the nature of the ground and the subsoil to be excavated. No claim for extra payment will be entertained because of any misunderstanding, incorrect information, assumptions, or ignorance of existing conditions.

2.1.2.2 **Site Quality Control**

The contractor shall provide in his quality assurance programme information to show that a system will be used to ensure that all works carried out under this section (including any done by subcontractor) will comply with all the requirements of this section.

2.1.3 **Antiquities**

Any ancient carvings, relics, coins or other curiosities discovered during the excavation or other work shall remain the property of the owner and shall be handed over to the owner as required under the General Conditions of Contract.

2.1.4 **Setting Out and Clearing of the Site - Rates to Include.**

The contractor shall set out the centre line of the building or other involved works after clearing the site and get the same approved from Project Manager. It shall be the responsibility of the contractor to install substantial reference marks, bench marks etc and maintain them as long as required by the Project Manager. The contractor shall assume full responsibility for proper setting out, alignment, elevation and dimension of each and all parts of the work.

2.1.5 **Benchmarks and Setting Out**

The contractor shall engage a qualified surveyor to establish permanent benchmarks in suitable locations around the site. These benchmarks shall enable the contractor to set out the location of all buildings, paths, roads, utility lines, storm water drains and all other portions of the Contract work.

If an error in setting out causes some portion of the work to be constructed in the wrong location, or to the wrong dimensions, the contractor shall make good the incorrect work at his own expense to the satisfaction of the Project Manager. The contractor shall be liable for any consequential loss experienced by the Client.

2.1.6 **Excavation Classification**

- a) Excavate foundation from existing ground level to the formation levels shown in drawing.
- b) Excavation to pit working level.
- c) Earthworks outside property line.
- d) Excavation, compaction and backfill to plinth and service trenches.

2.1.6.1 **Related Works**

- a) Site clearance, layout and preparation
- b) Dewatering, shoring and strutting.
- c) Cast-in-Situ Concrete

2.1.6.2 **Blasting /Excavation in Hard Rock**

1. When blasting operations are considered necessary, the contractors shall intimate about the same and shall obtain license from District/Public authorities for carrying out blasting work as

well as for obtaining, transporting and storing explosives as per 'Explosive Rules 1940' or as amended. The Contractor shall be responsible for safe custody and accounting of explosives.

2. Blasting operations shall be carried out under the supervision of a responsible licensed operator of the contractor during certain specified hours preferably during lunch break 'on approval in writing.' The operator shall be conversant with the rules of blasting. The operator should have the valid blasting license.
3. All proper precautions for safety shall be taken. All persons shall be moved to a distance not less than 200. All entries to the blasting zone shall be sealed and red flags displayed at prominent places.
4. The Contractor shall be responsible for any accident / death to those working on the site, to the public or to the property due to blasting operations, and that the Contractor shall keep the Client fully indemnified against such accidents / death.
5. The Project Manager shall be informed about all misfires, their causes and the remedial steps taken.
6. The contractor shall obtain license from District Authorities for undertaking blasting work and explosive storing as per Explosives Rules. 1940, and as updated Explosives shall only be procured from an authorised dealer. He shall be responsible for the safe custody and proper accounting of explosives. The Project Manager shall have access to the store.

2.1.6.3

Classification of Soil / Rocks:

- a) Soils: Material such as sand, gravel, loam, clay, mud, black cotton, moorum, shingle, river or nullah bed boulders, disintegrated rock, soling of roads, paths, hardcore, macadam surface of any description (water bound, routed tarmac etc.) lime concrete mud concrete or any combination of these. This class of material will yield to the application of picks, shovels, or any other manual digging implements.
- b) Ordinary Rock: Material such as limestone, sand stone, laterite, hard conglomerate. This is any material that will not yield to manual implements, but is capable of being excavated by conventional earthmoving plant applicable to the site and the distances that material has to be moved. The use of a pusher unit or small crawler tractor with ripper to facilitate excavation shall be considered as part of conventional plant.

The contractor may with the written permission of the Project Manager resort to a small amount of blasting to loosen any of this material but this action will not in any way entitle the material to be classified as 'Hard Rock'.
- c) Hard Rock: Any rock or boulder the excavation of which requires blasting. Such materials include quartzite, granite, basalt, reinforced cement concrete (reinforcement to be cut through but not separated from concrete) located below ground level.
- d) Hard Rock (blasting prohibited): Hard rock as described at c) above but where the blasting is prohibited for any reason and excavation has to be carried out by chiseling. Wedging or any other method agreed to by the Project Manager.

2.1.6.4

Classification of Soils - Rates to Include:

Excavation in all types of soil comprising any of the following:

- Vegetable or Organic soil, turf, sand, silt, loam, clay, mud, peat, black cotton soil, soft shale or loose murrum.
- Any mixture of soils in above.
- Mud concrete below ground level.
- Generally any material which yields to the ordinary application of excavation equipment.
- Stiff heavy clay, hard shale, or compacted murrum requiring close application of excavation equipment.
- Soft rock
- Gravel and cobble stone usually rounded, having maximum dimension in one direction of 300mm.

2.1.7

Method of Excavation - Rates to Include:

If the excavation is carried out to a greater depth than specified, extra depth shall be made up by filling with lean concrete in a ratio of 1:4:8 (1 cement: 4 coarse sand: 8 stone graded aggregate of 40 mm size) as directed by the Project Manager. The cost of such extra excavation and of the filling therein as specified, shall be borne by the Contractor. No extra claims whatsoever will be entertained in this regard. The bottom of excavation shall be trimmed, leveled, rammed and sides dressed and trimmed in accordance with the drawings/directions of the Project Manager. The Contractor shall ensure that excavation is to be carried out as indicated on the drawings with sufficient working space to permit erection of forms, shoring, inspection of foundations and any other activity likely to be carried out below ground level. All ramps for excavation except one will be cleared before completion (unless specifically noted otherwise) and made good before final completion. One ramp as directed by the Project Manager will be left to enable access for the other Contractor. Contractor shall advise Project Manager when excavation is ready to receive concrete. No concrete shall be placed in foundation until the Contractor has achieved Project Manager's approval that a secure foundation has been prepared.

The Contractor shall ensure proper methods are adopted to control the creation of Dust. Method adopted shall be approved by the Project Manager.

2.1.8 **Excavation and Preparation for Concreting:**

Excavation shall include removal of all materials of whatever nature at all depths and whether wet or dry necessary for the construction foundation and substructure (including mass excavation for under ground reservoir where applicable) exactly in accordance with lines, levels grades and curves shown in the drawing or as directed by the Project Manager. The bottom of excavation shall be leveled both longitudinally and transversely or Sloped as directed by the Project Manager.

Should the contractor excavate to a greater depth or width than shown on the drawings or as directed by the Project Manager he shall at his own expense fill the extra depth or width in cement concrete in proportion as directed by the Project Manager but in no case with concrete of mix leaner than 1:4:8 cement concrete.

The contractor shall report to the Project Manager when the excavations are ready to receive concrete. No concrete shall be placed in foundations until the contractor has obtained Project Manager approval in case, the excavation is done through different strata of soil and if the same is payable as per provision in the Schedule of Quantities the Contractor shall get the dimensions of the strata decided by the Project Manager for payment. If no specific provisions are made in the Schedule of Quantities it will be presumed that excavation shall be in all types of soil and other material and the Contractor's rate shall cover for the same.

After the excavation is passed by the Project Manager and before laying the concrete, the contractor shall get the depth and dimensions of excavation and levels (and nature of strata as applicable as per Schedule of Quantities like hard rock, soft rock etc) and measurements recorded from the Project Manager. Excavated pit should have adequate clearance from the face of concrete at all faces to have adequate working space.

2.1.9 **Stacking of Excavated Materials:**

All materials excavated will remain the property of the Project Manager and rate for excavation including sorting out of useful materials and stacking them on site as directed but with a safe distance from the edge of excavation to avoid collapse/ shielding of excavated area. Materials suitable and useful for back filling, plinth filling or leveling of the plot or other use shall be stacked in convenient place but not in such a way as to obstruct free movement of men, animals and vehicles or encroach on the area required for constructional purposes.

2.1.10 **Disposal / Carting of Surplus Earth - Rates to Include:**

Top layer of hard soil free from vegetation, spoils, rocks, boulders for a quantity of approximately 15% of the total excavated earth quantity shall be stocked at locations as directed by the Project Manager for re-use up to a distance of 300m from the periphery of the buildings. The remaining excavated earth, except for the hard rock excavated, shall be disposed off including lifting out, transportation to locations approved by local bodies, Government agencies or as directed by the Project Manager, as the case may be.

The Contractor is responsible for finding suitable dumping yard outside **IGI Airport Premises** and for the removal of all sub grade obstructions, whether indicated or not, wherever it is likely to interfere with execution and completion of the Project is deemed to be included in its rates.

All surplus and unusable earth shall be carted out and disposed off outside **IGI Airport Premises** but at a location approved by local authority and confirming to their specifications. The Contractor shall quote its rate for disposing off or carting away the item considering requirements and standards of the local authority with whose permission surplus and unusable earth shall have to be disposed off.

2.1.11

Dewatering:

Rate for excavation shall include bailing or pumping out which may accumulate in the excavation during the progress of work either from seepage, rain water or any other cause and for diverting surface flow, if any by bunds or other means. Pumping out water shall be done in such approved manner as to preclude the possibility of any damage to the foundation trench, concrete or masonry or any adjacent structure inside or outside the wall front. When water is met in foundation trenches or in tank excavation, pumping out water shall be from auxiliary pit of adequate size dug slightly outside the building excavations. The depth of auxiliary pit shall be more than the working foundation trenches / levels. The auxiliary pit shall be refilled with approved excavated materials after the dewatering is over.

The Contractor shall adopt an appropriate method of dewatering work and shall submit its proposal for carrying out the dewatering work for the approval of the Project Manager. The water shall be pumped continuously to keep the water level at a minimum of two 2' (feet) below the lowest point of excavation level. The operation shall be continued until the entire excavation has been completed so as to ensure the excavation is always dry.

- Adequate number of pumps shall be deployed to ensure a continuous dewatering process.
- Power / Fuel required for the operation of pumps etc shall be provided and paid for by the Contractor.

Softening of the bottom of excavation will not be allowed. If softening occurs due to weather or any other source, the Contractor shall remove the affected area and replace as specified and directed by the Project Manager at no extra cost.

Necessary grading, trenching and temporary sumps shall be made around excavations as required to prevent water runoff into excavation and to ensure proper protection to slopes from erosion.

The excavation shall be kept free from water:-

- a) During inspection and measurement
- b) From start to completion of concreting till they come above existing ground.
- c) Till the Project Manager considers that the concrete is sufficiently set.
- d) Till the underground reservoir is tested for water tightness.

2.1.12

Shoring and Strutting - Rates to Include:

The Contractor shall uphold the faces of excavation work to retain the earth, if required, at locations where considered necessary. Shoring and strutting shall be erected depending on nature of soil and the work. The arrangement of shoring and strutting including sizes and spacing of member used shall be approved by the Project Manager. All such necessary work, including but not limited to making / preserving / maintaining adequate slopes, necessary precautions, etc for ensuring safety of workmen below natural ground level shall be the responsibility of the Contractor. No extra charges shall be admissible on this account. Similarly the Contractor shall be responsible to protect the bottom of excavation from weather.

2.1.13

Protection - Rates to Include

The excavated area shall be surrounded by strong barricaded safety barriers made of wooden posts three to four (3 to 4) inches in diameter and cross planks/ runners shall be erected to a height of 1.2m all around the excavation with reflective tapes and necessary lighting at night all as shown on drawings. The Contractor shall take all necessary measures for the safety of the excavation, persons working, tools and plants working in and near the excavation pits, property and people in the vicinity.

Protection and maintenance of all bench marks axis points and other similar reference points if disturbed and/ or damaged, to be replaced by the contractor at no extra cost to the Developer.

Location of existing utility lines; if shown on the drawings, is only approximate and only for interpretation. The Contractor shall be responsible of their protection during the duration of the contract without causing any damage, dislocation, injury and/ or interruption to these utility services. If so, to be replaced/ restored to their original status at the contractor's own cost.

All the temporary roads, constructions etc shall be made and maintained according to the provisions of this contract and as per the instructions of the Project Manager upon the completion of this contract, the contractor shall remove after getting the approval from the Project Manager all such temporary roads, structures, etc. and restore the area in its original condition without any extra cost.

2.1.14 **Surplus Excavated Materials**

All excavated materials certified as surplus and not useful shall be removed by the contractor from the site in an approved manner to his own dump and shall be paid as a separate item as in the Schedule of Quantities.

The item of removal of surplus excavated material shall only be undertaken by the Contractor when specific instruction in this regard has been obtained from the Project Manager. The contractor must also secure the approval of the Project Manager. Regarding the quantity of surplus materials to be removed prior to commencement of this item of work.

2.1.15 **Earthwork - Fills**

2.1.15.1 **General filling:**

1. Deposit in horizontal layers not exceeding 300 mm thick before compaction.
2. Where material is dry, wet each layer to its optimum moisture content for compaction purposes.
3. Where material is wet, delay compaction and placement of additional fill until optimum moisture content is attained.

2.1.15.2 **Structural filling:**

1. Deposit in horizontal layers not exceeding 200 mm thick before compaction.
2. Each layer shall be uniformly moist and at the optimum moisture content for compaction purposes.

2.1.15.3 **Crushed stone:**

1. Deposit in horizontal layers not exceeding 200 mm thick.
2. Deposit material so that it is free from lenses, pockets, streaks and other imperfections.
3. Consolidate using hand tamping, vibratory tampers or other approved methods.

2.1.15.4 **Testing of fill materials:**

- i) Tests shall be executed by an independent testing agency.
- ii) In executing tests comply with the following IS Standards.
 - a. Sampling
 - b. Sample preparation
 - c. Sieve analysis
 - d. Liquid limits
 - e. Plastic limit and plasticity index
 - f. Moisture content
 - g. Moisture density relationship
 - h. Sand equivalent
 - i. Specific gravity
 - j. Sand core density
 - k. Rubber balloon density
 - l. Classification
- iii) Carry out moisture density tests on representative samples prior to placing.
- iv) Carry out gradation of materials prior to placing as the work proceeds.
- v) Carry out site density tests of materials as the work proceeds and as follows:

2.1.15.5 **Frequency of Tests**

Structural Fill:

1. One test for each 500 Cum. placed.
2. One tests whenever there is a change of gradation or placement conditions.

General Fill:

1. One test for each 3000 Cum. placed.
2. One tests whenever there is a change of gradation or placement conditions.
3. Execute site density tests for compaction at a minimum depth of 100 mm below compacted surface.
4. Execute a full compaction test or a one-point compaction test in conjunction with each site density determination.
5. Execute a gradation test with each site density test and whenever there is an apparent change in material being placed.
6. Execute the following site density tests and laboratory moisture density tests to evaluate compaction achieved:
7. (i) One test for every 200-400 cu.m. of backfill in trenches or surrounding structures.
(ii) One test for every full shift of compaction operations on mass earthwork.

2.1.15.6 **General and Structural Fill:**

- To conform to gradation of well graded soil.
- To be free from plastic fines and weakly elemented lumps of sand.
- To be homogeneous and at the optimum moisture content for compaction purposes when placed.

2.1.15.7 **Crushed stone:**

To consist of either:

- Durable crushed rock comprising angular fragments obtained by breaking and crushing solid or shattered natural rock, or
- Durable crushed gravel stone obtained by artificial crushing of gravel, boulders, or fieldstone.
- Rubble soling 20 cm in height consisting of random granite stone/ available laterite stone including filling in voids with durable crushed rock comprising angular fragments and consolidating with mechanical ramming.

2.1.15.8 **Water**

- Water used for compacting fill or for washing crushed stone shall be clean and free from oil, grease, organic matter, suspended sediments and other deleterious substances.

2.1.15.9 **Adjacent excavations:**

- Where an excavation encroaches below a line drawn at an angle of 60 Deg. from the horizontal from the nearest formation level of another higher excavation, the lower excavation, all work within it and backfilling thereto shall be completed before the higher excavation is done.

2.1.15.10 **Excavated formations:**

1. In made up ground excavate foundations down to a natural bearing formation of undisturbed subsoil, unless otherwise instructed.
2. Obtain instructions if a natural bearing formation of undisturbed subsoil:
 - Is obtained at a lesser depth than shown on the Drawings.
 - Is not obtained at the depth shown on the drawings.
3. If, after inspection, formation becomes unsuitable for any reason, excavate further and backfill with approved material all at the Contractor's expense.

2.1.15.11 **Treatment of formations generally:**

1. Trim excavations to required profiles and levels.
2. Remove all loose material.

2.1.15.12 **Excess excavation:**

1. Backfill any excavations taken wider or deeper than required with mass concrete.

2. Where such excess excavation is carried out without approval, necessary extra backfilling shall be at the Contractor's expense.

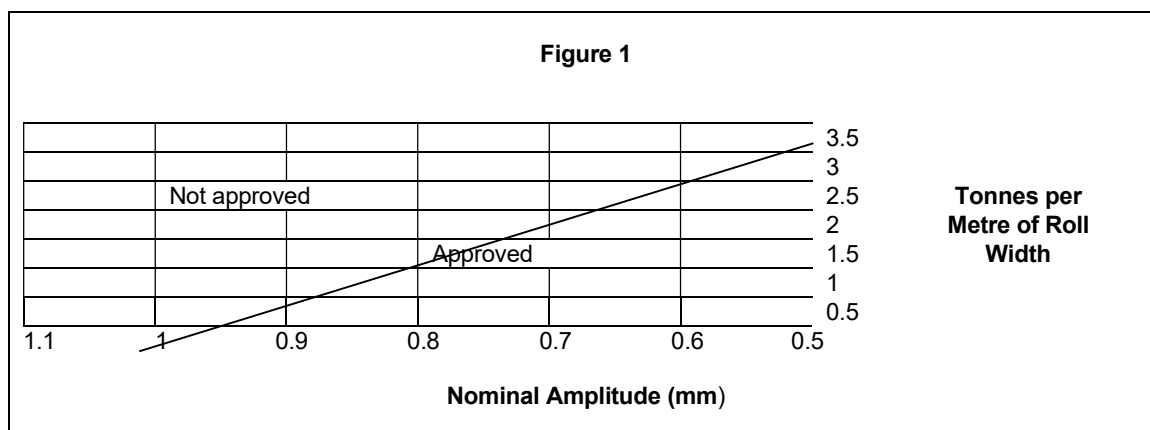
2.1.15.13 Proof Rolling under Fill Embankments

After removal of topsoil, the existing natural ground that will be under fill embankments shall be scarified to a depth of not less than 150mm and compacted so that the criteria called for on the specification are met.

2.1.15.14 Compaction Requirement

The required compaction of fills which are deemed to be part of bulk earthworks shall be achieved by a minimum number of passes of compaction plant. This plant shall unless the Project Manager specifically allows in writing, include type

- a) For primary compaction, and may include either or both types.
- b) Of the following listed types for the final compaction of the surface.
 - 1 Vibratory roller of either double or single vibrating drum of not more than 3.2 tonne mass per metre of roll width having a vibration frequency of not less than 37 Hz. Vibrating roller not exceeding the above weight limit but of frequency less than 37 hz are approved providing the nominal amplitude does not exceed that shown relative to the weight in tonnes per meter roll width in figure1 any other vibrating roller specifically approved by the Project manger. Vibrating rollers of less than 1 tonne per metre of roll width shall not be used to compact any layer of fill of more than 175mm of un-compacted thickness.
 - 2 Three wheel steel- tired rollers having rear rolls each at least 0.50m wide and having not less than 4.5 tonne per metre of roll width.
 - 3 Pneumatic tyred roller having a minimum weight when operating of not less than seven tonne, spread over at least seven pneumatic tyred wheels.



For filling in inaccessible places or against structures, hand tamping or small vibratory compaction equipment may be used with the approval of the Project Manager.

Care must be taken during compaction to ensure that no gaps are formed between adjacent layers.

Fill material shall be compacted to attain the densities as called for in the specifications.

As filling proceeds, test to verify the compaction being achieved shall be conducted. Tests shall be done at a minimum frequency no less than one test per 150 cum. of fill volume. Testing locations shall be distributed evenly throughout the fill volume and each layer area. The locations shall be to the satisfaction of the Project Manager and copies of the results of all tests shall be submitted to them whether successful or not.

In the event that tests do not verify the minimum compaction requirements, the whole of the area for which the test is representative shall be reworked and retested, unless otherwise directed by the Project Manager.

Where the Project Manager is of the opinion that a specific area within an embankment cannot compact to the specified density, he shall order alternative improvement works.

The following references shall be used to confirm compliance:

Sampling	BS 5930 (or as updated), IS 2720
Field Dry Density:	BS 1377: 1975 Clause 4.4 Test 15 (or as updated) "Determination of the dry density of soil on the site – Sand replacement test"

Standard Maximum Dry Density:	BS 1377: 1975 Clause 4.1 Test 12 (or as updated) "Determination of dry density / moisture content relationship" using 2. Kg rammer

Moisture Content:	BS 1377: 1975 Clause 2.1 Test 1 (or as updated) "Determination of the moisture content – Standard"

1. Remove all suitable and excess material from areas to be filled.
2. Surface of ground with a gradient exceeding 1 in 5, which is to receive filling must have horizontal benches cut to match the depths of compacted layers of filling.
3. Do not place fill until the formation has been inspected by the Project Manager. Give the Project Manager at least 24 hours notice of when formations will be ready for inspection.

Compact filling after grading and leveling surfaces. Compact filling in layers, adding any necessary extra fill and water, to attain the minimum dry densities as tabulated in the table appended at the end of this Section.

Backfilling and compaction shall be undertaken under full-time presence of the Contractor's Supervisor, and each layer shall be got checked by the Project Manager. Further layers are not to be placed without the approval of the Project Manager.

Compact filling using vibratory plate, roller or other approved (mechanical) equipment, making the required number of passes with the equipment to obtain specified densities. Each trip of equipment shall overlap the previous trip by 500mm.

If selected earth kept aside as per the provisions of the Clause 3 / 2.110 is not sufficient for the back filling, the contractor, with its own cost, shall bring in good quality earth, murrum etc. from borrow pits, either approved at the site and/ or elsewhere by the Project Manager. The cost of developing and reinstating the same after use as per the directions of the Project Manager and/or local laws prevailing for such borrow pits, loading, transporting and re-handling of earth/ murrum etc. deemed to have been included in its rates by the Contractor.

The Contractor at its own cost rectify and / or restore the damage (s) occurred due to improper backfill and compaction done by it.

If any settlement occurs due to improper backfill and compaction and/ or cracks developing in the sub-structure/ super structure works due to the same, the Contractor shall make good its damages/ defects at no extra cost to the Developer.

The Contractor at its own cost protect by bracing the basement walls till the proper back filling and compaction are completed with the satisfaction of the Project Manager and complying with the conditions of the Contract and Technical Specifications. The Contractor shall also undertake and execute the patching of the basement wall after removal of such bracing at no extra cost.

All the back filling and compaction works shall be of acceptable standard to both the Project Manager and the Structural Engineer.

The Contractor shall include in its rates the cost of removal of debris/ rubbish etc. from the bottom of the basement wall prior to back filling.

Schedule:

Curve No. 1: To be referred.

Table for compaction requirements

Fill Materials	Min. Passes	Min. Energy*	Min. Compaction
General Fill	3	4550 Kg	90%
Structural Fill:			
Confined spaces	4	1150 Kg	95%
Open spaces	3	4450 Kg	95%
Crushed stone:			
Confined spaces	4	1150 Kg	-
Open spaces	3	4450 Kg	-
Catch	3	4450 Kg	95%

Notes:

- Forces applied for compaction shall be dynamic or impact loads.
- Specified percentages of compaction shall be related to the maximum dry density at the optimum moisture content as established by and verified on site by.
- Correct field density to account for stone material larger than 19 mm in accordance with suggested methods.

2.1.16 Excavation in Rocks - Rates to Include:

Excavation in all kinds of-rocks shall be carried out by using the chisel/ hammer & drill bits using pneumatic driller. The Contractor shall deploy necessary numbers of mechanical equipment so as to achieve the Construction Schedule and no extension or delay whatsoever will be entertained on account of this. The excavated rock will be Developer's property and shall be stacked properly at locations as directed by the Project Manager in a measurable manner and the dimensions measured upon along with the Project Manager.

2.1.17 Measurements:

The rock stacked shall be measured and the volume computed and 50% of the total volume will be deducted for voids and other materials mixed, from the volume computed for making payment against the relevant Bill of Quantities.

2.1.18 Back Filling and Compaction - Rates to include:

Filling shall be done with approved quality of selected earth from the provisions of Clause 3 / 2.110 and or borrowed from the approved locations free from roots, grass, organic materials, spoils, rubbish and lumps and clots exceeding 8 cm in any direction shall be broken down. Filling shall be done layers not exceeding 30 cm at a time. Each layer shall be watered with optimum moisture content to achieve 90% consolidation. Consolidation shall be done with mechanical rammer or roller of minimum half-ton weight. Where roller cannot work, wooden or steel rammer of seven to ten kg weight with back of 20 cm diameter should be used.

Contractor shall not fill over any work until it is approved by the Project Manager.

If selected earth kept aside as per the provisions of the Clause 3 / 2.110 is not sufficient for the back filling, the contractor, with its own cost, shall bring in good quality earth, murrum etc. from borrow pits, either approved at the site and/ or elsewhere by the Project Manager. The cost of developing and reinstating the same after use as per the directions of the Project Manager and/or local laws prevailing for such borrow pits, loading, transporting and re-handling of earth/ murrum etc. deemed to have been included in its rates by the Contractor.

The Contractor at its own cost rectify and / or restore the damage (s) occurred due to improper backfill and compaction done by it.

If any settlement occurs due to improper backfill and compaction and/ or cracks developing in the sub-structure/ super structure works due to the same, the Contractor shall make good its damages/ defects at no extra cost to the Developer.

The Contractor at its own cost protect by bracing the basement walls till the proper back filling and compaction are completed with the satisfaction of the Project Manager and complying with the conditions of the Contract and Technical Specifications. The Contractor shall also undertake and execute the patching of the basement wall after removal of such bracing at no extra cost.

All the back filling and compaction works shall be of acceptable standard to both the Project Manager and the Structural Engineer.

The Contractor shall include in its rates the cost of removal of debris/ rubbish etc. from the bottom of the basement wall prior to back filling.

2.1.19

Rates to Include for Excavation Items

Apart from other factors mentioned elsewhere in this contract, rates for the item of excavation shall also include for the following:

- i) Clearing site.
- ii) Setting out works as required.
- iii) Providing shoring and shuttering to avoid sliding of soil and to protect adjacent structures and subsequently by removing the same.
- iv) Collection of excavated spoil and Sorting out useful excavated materials and conveying beyond the structure and stacking them neatly on the site for back filling or re-use as directed.
- v) Bailing and pumping out water as required and directed.
- vi) Excavation at all depth (unless otherwise specified in the Schedule of Quantities) and removal of all materials of whatever nature wet or dry and necessary for the construction of foundation underground reservoir etc and preparing bed for laying concrete.
- vii) Necessary protection including labour, materials, and equipment to ensure safety and protection against risk or accident.
- viii) Drilling of small holes as directed to explore the nature of substratum if necessary.

2.1.20

Measurement for Excavation

Excavation for foundation of columns, beams, walls and the like shall be measured and paid net as per drawing, dimensions of concrete (bed concrete where so specified) at the lowest level in regard to length and breadth and depth shall be computed from the concerned excavation levels and ground levels taken before excavation. Any additional excavation required for working space, planking dewatering and strutting etc. shall not be measured and paid for separately but rates quoted for excavation shall include for all these factors. No increase in bulk after excavation shall be made.

Prior to start of Project the Contractor shall verify and approve the block levels and benchmarks established for the entire Site and sign in acceptance of the same. In case of any discrepancy the same shall be checked and will be recorded and agreed after cross verification at the Site jointly by the Contractor and the Project Manager. The above established benchmarks and ground levels will be the basis for computing the quantum of excavation.

After site clearance a joint survey by the Contractor and the Project Manager will be carried out to establish ground levels before excavation which will be the basis for computing quantities.

On completion of excavation, a joint survey will be carried out at the Contractor's cost to establish the excavated levels and ascertain if the work is as per Drawings and Specifications with respect to depth and area.

The method adopted for computing volumes shall be as per Simpson's Rule. Deductions for rock excavation quantity computed as specified in **Clause 3 / 2.1.21** will be made from excavation in soil.

2.1.21 Rates to include for Backfilling Item

Apart from other factors mentioned elsewhere in this contract, rates for the item of backfilling item of work shall also include for the following:

- i) Backfilling the trenches along side masonry or concrete with approved excavated materials up to the natural ground level in layers as specified including watering and ramming.
- ii) Earth filling in plinth: If there is approved surplus earth after backfilling the sides of excavations, the same will be used for plinth filling if required. Any additional approved earth if required for plinth filling the same shall be brought on the site, by the contractor from outside. No borrow pits shall be opened on the Site, Filling in plinth shall be done in layers of 15cm thick each layer being consolidated by ramming and watering. The payment of back filling item shall be made on measurement of finished consolidated quantity.

2.1.22 Soling used as sub-base

2.1.22.1 Location

Soling shall be constructed under floors and other areas where shown in the drawings.

2.1.22.2 Soling Materials

The size of stones to used soling shall not be more than 120mm, nor less than 50 mm when measured in any direction, and their height shall be equal to the proposed soling course depth of 75mm +/-25mm.

2.1.22.3 Preparation of the Sub-grade before laying soling

The top level of the sub-grade shall be lower than the level of the underside of the floor or other structure, to be built over it, by a distance equal to the combine depth of soling and metalling (due allowance being made for consolidation). The depth of the soling shall be 75mm but to achieve this finished depth, an initial loose layer of approximately 100mm will be necessary.

2.1.22.4 Laying and packing the soling stones

A layer of sand or small size gravel 50mm thick shall be spread and consolidated on the sub-grade surface prepared

The stones for soling shall be of a height equal to the required thickness of soling. Their length or breadth shall not be greater than twice the soling thickness. This means that the stones would pass through a ring 180mm in diameter but not a ring 100mm in diameter.

Soling stone shall be hand packed as close as possible with their broadest side downward and greatest length across the road. Gauge pegs shall be driven at close intervals to indicate the required thickness of the soling. The joints between stones shall be placed at the edges of the area to be covered. All interstices between stones shall be wedged in with smaller stones, well driven into achieve tight packing and complete filling of the interstices.

2.1.22.5 Consolidation of the soling

The soling shall be thoroughly consolidated with mechanical rollers of 8 to 10 tonne weight starting at the edges and working towards the center. If the soling is to have a cross fall the rolling shall commence at the lowest edge and work over and up to the upper edge. Rollers shall pass over the same surface at least 8 times to ensure that the soling is well consolidated. The top surface shall be checked frequently to make sure that it conforms to the design grade and level.

Vibratory compactors may be used, if approved by the Consultants / Project Manager instead of mechanical rollers. For areas where access is difficult or restricted heavy hand rammers and hand rollers may be used if approval for this has been obtained from the Consultants / Project Manager.

2.2 Cast in-situ Concrete

2.2.1 Related Work

- a. Concrete Formwork
- b. Concrete Reinforcement
- c. Concrete Finishing
- d. Sealants

2.2.1.a

Applicable Standards

IS - 299	Specification for Ordinary, rapid hardening and low heat Portland Cement
IS - 455	Specification for Portland blast furnace slag Cement
IS - 1489	Specification for Portland pozzolona Cement
IS - 4031	Method of physical tests for hydraulic Cement
IS - 650	Specification for Standard sand for testing of Cement
IS - 383	Specification for Coarse and Fine aggregate for use in mass concrete
IS - 515	Specification for natural and manufactured aggregate for use in mass concrete.
IS - 2387	Method of test for aggregates for concrete.
IS - 516	Methods of test for strength of concrete.
IS - 1199	Methods of sampling and analysis of concrete
IS - 3025	Methods of sampling and test (physical and chemical) for water used in industry.
IS - 2645	Specification for integral cement water proofing compounds
IS - 1791	Specification for batch type concrete mixers
IS - 2438	Specification for roller pan mixer
IS - 2505	Specification for concrete vibrators, immersion type
IS - 2506	Specification for screed board concrete vibrator
IS - 2514	Specification for concrete vibrating tables
IS - 3344	Specification for pan vibrators
IS - 4656	Specification for form vibrators
IS - 2722	Specification for portable swing weigh batchers for concrete (single & double bucket type)
IS - 456	Code of practice for plain and reinforced concrete
IS - 1343	Code of practice for prestressed concrete
IS - 457	Code of practice for general construction of plain and reinforced concrete for dams and other massive structures.
IS - 3370	Code of practice for concrete (Part I to IV structures for storage of liquids
IS - 3935	Code of practice for composite construction
IS - 3201	Criteria for design and construction of precast concrete trusses.
IS - 2204	Code of practice for construction of reinforced concrete shell roof.
IS - 2210	Criteria for the design of R.C. shell structures and folded plates.
IS - 3558	Code of practice for use of immersion vibrators for consolidating concrete
IS - 3414	Code of practice for design and installation of joints in buildings
IS - 2571	Code of practice for laying insitu cement concrete flooring

2.2.2

Definitions

- a. Water / Cement Ratio:

The ratio by weight of water to cement in a mix expressed as a decimal fraction. Water being that which is free to combine with cement, including free water in aggregate but excluding that.

- b. Hot Weather:

Shade air temperature of 37° C and higher.

2.2.3

Quality Assurance

- a. Supervising staff shall have qualifications and experience specified in the contract.
- b. The following tests shall be carried out by the approved agency:
 - i. Testing preliminary test cubes;
 - ii. Testing work test cubes;
 - iii. Testing in situ concrete at site by hammer test, ultrasonic tests and core tests.
- c. Standards:

Comply with the following codes, specifications and standards and as shown on the drawings.

 - i. IS 456: 2000 - Specifications for plain and reinforced concrete.
 - ii. IS 269:1976 or latest amendment - Specifications for ordinary and low heat Portland cement.

2.2.4

Submittals

Samples:
Slide bearings

2.2.5 **Materials**

2.2.5.1 **Quality**

All materials used in the works shall be of best quality of their respective kind as specified herein, obtained from suppliers and sources approved by the Structural Consultant and shall comply strictly to tests instructed by the Structural Consultant / Project Manager, and where tests are not laid out, with the requirements of the latest issue of the relevant Indian Standard.

2.2.5.2 **Test Certificate**

All manufacturer's test certificates, proof sheets, etc showing that the materials have been tested in accordance with the requirements of the specification and of the approved Indian Standard(s) are to be supplied free of charge on request to the Project Manager.

2.2.5.3 **Cement**

Cement shall be of Portland type and shall comply of IS: 269. The cement used shall be of approved manufacture and the sources of supply shall not be changed without approval of the Consultants / Project Manager.

It shall be received in bags of 50 kg each confirming to IS 2580-1982 IS 11652-1986 or IS-11633-1986 or IS-12174-1987. The bags shall be marked with the manufacturer's name or its registered trademark, if any, type of cement and grade legibly and each batch shall be accompanied by a Test Certificate from the factory.

Samples shall be taken immediately on receipt of cement at about one sample per 1000 bags. Tests shall be carried out on fineness, initial and final setting time and compressive strength as per IS:4031 and result verified by the Project Manager before use in the permanent works. Samples shall be taken immediately on receipt of cement at site. Sampling shall be as per IS 3535.

Stacking and Storage of Cement

Cement shall be stored in such location so as to prevent deterioration due to moisture. A dry and waterproof shed called as "cement godown" shall be best suited for this. Bags shall be stacked on rigid waterproof platforms about 15 to 20 cm clear above the floor. Flooring of the shed shall consists of the two layers of dry bricks laid on a well consolidated earth to avoid contact of cement bags with the floor. It shall also be 35 to 45 cm clear from the surrounding walls. A maximum high stack of Ten (10) bags is permitted. The bags, shall be arranged in header and stretcher fashion. Stacks shall be so arranged that the first batches are used first, and so that they permit easy access for inspection and handling.

The size and dimensions of the cement godown shall got to be approved, before its construction, from the Project Manager.

For extra safety during monsoon, or when cement is expected to be stored for an unusually long period, each stack shall be completely enclosed by a waterproofing membrane, such as polyethylene which shall cover the top of the stack. Care shall be taken to see that the stored cement is not damaged at any time during the use.

Storage of the cement at the Site shall be at the Contractor's expense and risk. Any damage occurring to cement due to faulty storage in the cement godown or on account of negligence on its part, shall be the liability of the Contractor.

2.2.5.4 **Aggregate**

- a. To be crushed naturally occurring materials conforming to IS: 383-1970. All physical properties and grading parameters must conform to this code.
- b. Aggregate, 95% of which shall be retained on 4.75 mm test sieve.
- c. Aggregate shall be from crush granite, quartzite, trap, and basalt quarries.
- d. Free from soft friable thin porous laminated or flaky pieces.
- e. Free and clean from dust and foreign matters, namely injurious amounts of disintegrated pieces, alkali, vegetable matters and other deleterious substances.
- f. Shall be chemically inert when mixed with cement.

- g. The aggregate shall not contain any material that will attack the reinforcement. The maximum quantities of deleterious materials in coarse aggregates shall not exceed the limits laid down as per IS:2386 (Part I & II)
- h. Shall be angular in shape
- i. Maximum size of the aggregate shall be 20mm.
- j. Shall have a minimum Specific gravity of 2.6(Standard surface dry basis)
- k. When stone aggregate or gravel is brought to the site single sized (ungraded), it shall be mixed with single sized aggregates of different sizes in the proportion to be determined by the field tests to obtain graded aggregate or specified nominal size. The Contractor is deemed to have included the cost for above in its rates.

Course aggregates shall be measured in stacks and adjustment shall be made by deducting seven and half (7.5) per cent of gross measurements of stacks in respect of aggregate of nominal size 40 mm and above. No deduction from the gross measurements of the stacks is to be made in respect of aggregates of nominal size below 40 mm.

Course aggregates brought to site shall be washed clean if required and as directed by the Project Manager.

2.2.5.5 Fine Aggregate

- a. Shall be washed dry sand and shall confirm to IS: 383-1970 between Grading Zone I and II for structural concrete.
- b. Shall pass through IS sieve 4.75mm test sieve leaving a residue not more than 5%
- c. Shall not contain any traces of silt, and the sand shall be thoroughly washed with water so as to bring the percentage of silt content within the prescribed limit. Nothing extra is payable to Contractor on this account.
- d. Fine aggregates shall be so stacked as to prevent dust and foreign matter getting mixed up with it as far as practically possible.
- e. Since fine aggregates bulk to a substantial extent when partially wet, measurements shall be taken when the stacks are dry or an appropriate allowance has been made for bulking.

2.2.5.6 Water

- a. Water for mixing shall be from potable supply system or from bore well supply.
- b. Water for curing shall be from potable supply or from bore well supply.
- c. Water shall be tested in accordance with IS:3025-1986. Maximum permissible limits of deleterious materials in water shall be as given in IS:456-1978.
- d. The pH value of water shall not be less than 6 and more than 9.
- e. Water which may erode or discolour concrete or which has got more than 1000 ppm of chloride content shall not be used.
- f. The Contractor shall make its own arrangements for storing of water if necessary in drums, tanks or cisterns to the satisfaction of Project Manager. Care shall be taken to ensure that water is not contaminated anyway.

2.2.5.7 Expansion and Contraction Joints

- a. Joint filler shall be Bitumen impregnated shalitek board 25mm for expansion joint.
- b. Poly sulphate based joint sealants shall be provided in expansion joint.
- c. Sliding type neoprene bearing pad of structural grade for expansion joints.

2.2.5.8 Miscellaneous

- a. Chemical curing compound of approved make to form a membrane or surface which will disintegrate and flake from that surface over a period of days commencing at least 7 days after application.
- b. Vapour barrier and separation layer to underside of concrete slab, as and when necessary, and grade 10 mil (.25 mm) thick polyethylene sheets with laps 100mm on sides and ends.

2.2.6 Proportioning, Batching & Mixing of Concrete

2.2.6.1 Proportioning

- a. Aggregate

The proportions, which shall be decided by conducting preliminary tests shall be by weight. These proportions of cement, fine and coarse aggregates shall be maintained during subsequent concrete batching by means of weight batchers conforming to I.S. 2722 capable of controlling the weights within one percent of the desired value. Except where it can be shown to the satisfaction of the Project Manager that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate shall be controlled by obtaining the coarse aggregate in different sizes and blending training the coarse aggregate in different sizes and blending them in the right proportions. The different sizes shall be stocked in separate stockpiles. The grading of coarse and fine aggregate shall be checked as frequently as possible, as determined by Project Manager to ensure maintaining of grading in accordance with the samples used in preliminary mix designs. The material shall be stockpiles well in advance of use.

b. Cement

The cement shall be considered by weight, for design mix.

c. Water

Only such quantity of water shall be added to the cement and aggregates in the concrete mix as to ensure dense concrete, specified surface finish, satisfactory workability, consistent with the strength stipulated for each class of concrete. The water added to the mix shall be such as not to cause segregation of materials or the collection of excessive free water on the surface of the concrete.

d. Definition of Water/Cement Ratio

The water cement (W/C) ratio is defined as the weight of water in the mix (including the surface moisture of the aggregates) divided by the weight of cement in the mix.

e. Water/Cement Ratio

The actual water cement ratio to be adopted shall be determined in each instance by Contractor and approved by the Project Manager.

f. Proportioning by Water/Cement Ratio

The W/C ratio specified for use by Project Manager shall be maintained. Contractor shall determine the water content of the aggregates as frequently as desired by the Project Manager as the work progresses and as specified in IS 2386 (Part III) and the amount of mixing water added at the mixer shall be adjusted as directed by the Project Manager so as to maintain the specified W/C ratio. To allow for the variation in their moisture content, suitable adjustments in the weights of aggregates shall also be made.

2.2.6.2

Batching and mixing of concrete

- a. The proportions of the materials for the concrete mix as established by the preliminary test for mix design shall be followed for all the concrete in the works and shall not be changed except when specifically permitted by the Project Manager.
- b. If approved by the Project Manager concrete may be produced by volume batching the ingredients except the cement. Fine and coarse aggregate shall be proportioned volumetrically by subsequent conversion of the weights of volumes knowing their bulk densities as stipulated in Para 9.2.2 or I.S. 456-2000. All concrete shall be mixed in mechanically operated batch mixers complying with I.S. 1791 of approved make with suitable provisions of correctly controlling water delivered to the drum. The quality of water actually entering the drum shall be checked with reading of gauge or valve setting before starting the job. The test shall be made while mixer is running. The volume of the mix material shall not exceed the manufacturer's rated mixer capacity. The batch shall be charged into the mixer so that some water will enter the drum in advance of cement and aggregates. All water shall be in the drum by the end of 15 seconds of the specified mixing time. Each batch shall be mixed until the concrete is uniform in colour for the minimum period of 2 minutes after all the materials and water is in the drum. The entire contents of the drum shall be adjusted in one operation before the raw materials for succeeding batches are fed into the drum. The entire contents of the drum shall be adjusted in one operation before the raw materials for succeeding batches are fed into the drum. The weighing gauge of mix shall be periodically checked or as directed by the Project Manager. The contractor should carry out rectifications immediately if found necessary.

Mixer and the weight batcher shall be maintained in clean and serviceable condition. The accuracy of the weight batcher shall be periodically checked. Both mixer and the weight batcher shall be set up level on firm base and the hopper shall be loaded evenly. The needle shall be adjusted to zero when the hopper is empty. Fine and coarse aggregates shall be weighed separately.

Each time the work stops, the mixer shall be cleaned out and the next commencing he mixing, the first batch shall have 10% additional cement to allow for striking in the drum.

2.2.6.3 Batching Aggregate by Volume

- a. Obtain approval before using this method.
- b. Batch cement by weight and water by either weight or volume.
- c. Measure aggregate in metal container whose depth is not less than their greater width and the size of which is such as to enable the whole to be easily checked.
- d. Concrete shall be mixed in concrete mixers until a uniform distribution of the material, and a uniform colour and consistency is obtained.
- e. Concrete mixing shall in no case be less than two minutes.
- f. Each batch shall be so charged into the mixer that approximately 10% of the water enters the drum before the cement and aggregate. Water shall be added gradually while the drum is in motion, so that all the water is in the drum until the first quarter of the minimum time.
- g. The amount of concrete mixed in drum shall not exceed the rated capacity of the mixer and the whole of the material shall be removed before a fresh batch enters the drum.
- h. Do not modify the mixed concrete either by addition of water or cement or other means.

2.2.6.4 Cleanliness

- a. Clean mixer and handling plant by washing with clean water at the end of the work and at intervals of 30 minutes during mixing.
- b. If old concrete mix remains in the mixer drum, rotate the drum with clean aggregate and water before mixing the cement.

2.2.6.5 Planning of Concrete

- a. Consultant shall be informed 24 hrs in advance before the pour of each concrete to allow for inspection of reinforcement, sizes and levels of the members to be concreted, concrete cover, cleanliness, filling of gaps and wide and supporting props.
- b. Ensure that the spaces to revive concrete are clear free from debris and free from water.
- c. Transportation: Use approved method to identify that the grade of concrete to be placed in proposed location.
- d. Use suitable stools, walkways, barrow runs, for traffic over reinforcement or freshly placed concrete.
- e. Clean the transportation equipment immediately after use or whenever cement and aggregate is used by using clean water.

Following issues are to be noted while planning of concrete pours:

- Slabs: to be cast in strips and not in alternate bays.
- Walls: to be cast in successive pours working away in both directions from the center with not shrinkage gaps except for final closure.
- Starters: shall be the same as for the main member and shall be vibrated / rammed into place and prepared as for other joints. Starters to be cast for walls monolithically with foundation. In case of columns, they can be cast after concreting of foundation / slab.

2.2.6.6 Ordinary Concrete

- a. Ordinary cement concrete where specified shall be used
- b. Proportions 1:3:6, 1:2:4, 1:1.5:3, etc., in the specification refers to the quantity of cement by volume, dry coarse sand by volume, quantity of coarse aggregate by volume.
- c. Cement shall be weighed based on 1 cum. of cement weighs 1440 kgs or 1 full bag of cement 50 kgs corresponding to 35 lts. by volume.
- d. Correction factors to be applied for bulking of sand when the sand is either wet or moist.
- e. Water cement ratio used shall be just sufficient for the workability of concrete.
- f. Minimum strength of concrete shall be obtained as below:

S No	Proportion of concrete	Preliminary tests	Work tests
1.	1:3:6	135 kg/sq.cm.	100 kg/sq.cm.
2.	1:2:4	200 kg/sq.cm.	150 kg/sq.cm.

3.	1:1.5:3	265 kg/sq.cm.	200 kg/sq.cm.

Comprehensive strength of concrete shall be obtained by testing 15 cm. cubes at 28 days curing.

- g. Testing: 6 cubes shall be taken from any mix, 3 of them to be tested at 7 days, 3 at 28 days.
- h. Strength of concrete at 7 days shall be 2/3rds of the strength of concrete at 28 days.
- i. Strength of concrete at 28 days shall be as mentioned in table above and the criteria for accepting concrete is only the strength of concrete at 28 days.

2.2.7

Reinforced Cement Concrete

RCC comprises of formwork, reinforcement and concrete. Payment of Reinforced Cement Concrete shall be item wise as specified in the BoQ. Concrete shall be classified by its compressive strength at the 28th day. The concrete grade shall be as designated in Table 2 of IS: 456-2000.

Bill of Quantities shall specify various types of concrete aimed to be used in the Project. It shall be the Contractor's responsibility to carry out Design mixes and approval of the same from the Developers Representative well in advance of the actual pouring of concrete at the Site in the permanent works.

The basic aim of Mix Design shall be to find the most economic proportion of cement, aggregate and water which will give the desired target mean strength of concrete, workability and durability for specified grade of concrete. Also it is important that the Mix should be easily worked with the help of equipment available at the Site. The operations involved are measurement of materials, their mixing, placing, compacting, finishing required and curing. The design shall be carried out strictly to IS Specifications and IS Codes of Practice, namely IS: 456-2000 and S P –23-1982.

In order to ensure that not more than the specified proportion of test results are likely to fall below the characteristic strength, the concrete mix has to be designed for higher average compressive strength for a specified grade of concrete is defined a target mean strength.

2.2.7.1

Design Mix and Trial Mixes

Design Mix and weigh batching at the works of readymade mix concrete (RMC) supplier(s) will be done as approved by the Project Manager. The Contractor shall submit to the Project Manager the tentative Mix Design it proposes to use at the site.

On receipt of the above, the Project Manager may immediately order to carry out work or site test before the final approval. This shall be done only at the RMC plant of approved mix design.

This shall give the Contractor additional chance to check for itself actual workability and make sure that the mix proposed by it will be satisfactory with regards to slump, water-cement ratio and workability.

Test cubes shall be of size 150mm x 150mm x 150mm. These are to be legibly marked with location and date of concreting. Where concrete (in works) is to be vibrated or not vibrated, the cubes are to be casted as per IS Standards.

Where the concrete in the works is un-compacted, pour the concrete into the mould in three layers and compact each layer with a 16mm dia tamping rod.

Six (6) cubes shall be taken from each of the three batches to test the mix. Cube shall be cast, stored, cured, transported and tested as per IS:516-1959. The test may be carried out at the Site or at laboratory as approved by the Project Manager.

Trial mix

- a. Within 7 days of signing the contract and before commencing work on site, prepare trial mixes for each type of concrete and submit 6 preliminary test cubes from each mix to the testing authority.
- b. The testing authority shall test three test cubes at 7 days and three at 28 days for each type of mix where the difference between the higher and the lowest test results from any one trial mix at 7 days exceeds 15% of the average and any cube weaker than the minimum requirement, make a further trial mix, increasing the proportion of cement if necessary to obtain the required strength.
- c. If any test results from any one-trial mix fail to exceed the minimum strength at 28 days:

- i. Remove from site materials from which the trial mix was prepared.
- ii. Provide new materials and prepare and test further trial mixes until specified requirements are achieved.

The Design Mix shall hold good so long as the materials continue to be of the same quality and from the same source. Minor adjustments are to be done daily based on the tests of materials used.

Compression strength on 150mm. Cubes

Grade of concrete at 28 days	Preliminary test minimum kg/sq.cm	Work test minimum kg/sq.cm.
(1)	(2)	(3)
M10	135	100
M15	200	150
M20	260	200
M25	320	250
M30	380	300
M35	440	350
M40	500	400

Control concrete shall be proportioned to obtain the required strength by conducting lab tests using the coarse aggregate, sand and cement based on the design mix.

Control concrete shall have suitable workability for proper consolidation.

At places having heavy reinforcement when compacting concrete is a problem, the control concrete shall be designed with special care to the required strength and workability at no extra cost.

Testing facilities to access the moisture content of aggregate at frequent intervals, testing of concrete cubes and testing of aggregate shall be done at the site by establishing testing laboratories.

Concrete shall be weighed batched. The dials of weigh-batching units shall be checked with standard weights periodically.

Under special circumstances the conversion of weights to volumes will be allowed by the Consultants / Project Manager.

The minimum cement content to be used for the job is as follows:

	43 GRADE	53 GRADE
M 15	280 Kg/cum	280 Kg/cum
M 20	318 Kg/cum	290 Kg/cum
M 25	350 Kg/cum	300 Kg/cum
M 30	388 Kg/cum	335 Kg/cum
M 35	423.5 Kg/cum	375 Kg/cum
M 40	459 Kg/cum	410 Kg/cum

Note: These are minimum quantity of cement to be used irrespective of the design mix.

Further the Contractor has to provide and maintain all the equipment and stock at the Site throughout to carry out the following tests in a small Site laboratory or get these tests done from approved laboratories without extra cost to the Contract.

- Grading of aggregate
- Silt content of sand
- Moisture content of aggregate
- Slump test of concrete mix
- Concrete cube test

The Contractor shall maintain full records for all above tests in a register. The format of the records shall be prepared in consultation with the Project Manager. It shall have full access to the Contractor's site laboratory. The Contractor shall include charges for these in its rates and no extra whatsoever shall be payable on this account of designing, testing, maintaining laboratory, etc.

2.2.7.2 Assumed Standard Deviation

Where sufficient test results for a particular grade of concrete are not available, the value of standard deviation given in Table below may be assumed.

Grade of Concrete	Assumed Standard Deviation N/Sq.mm
M 10	2.3
M 15	3.5
M 20	4.6
M 25	5.3
M 30	6.0
M 35	6.3
M 40	6.6

However, when adequate past records for a similar grade exists and justify to the designer a value of standard deviation different from the shown in table above, it shall be permissible to use that value.

2.2.7.3 Standard Deviation Based on Test Results

- i. Number of test results - Total number of test results required to constitute an acceptable record for calculation of standard deviation shall be not less than 30. Attempts should be made to obtain the 30 test results, as early as possible, when a mix is used for the first time.
- ii. Standard deviation to be brought up to date - The calculation of the standard deviation shall be brought up to date after every change of mix design and at least once a month.

2.2.7.4 Determination of Standard Deviation

- i. Concrete of each grade shall be analysed separately to determine its standard deviation.
- ii. The standard deviation of concrete to a given grade shall be calculated using the following formula from the results of individual tests of concrete of that grade obtained as specified for test strength of sample.
- iii. Estimated standard deviation $S = \sqrt{\frac{\text{sum of squared deviations of the individual strength of } n \text{ samples}}{n-1}}$ where n = number of sample test results.
- iv. When significant changes are made in the production of concrete batches (for example changes in the materials used, mix design, equipment of technical control), the standard deviation value shall be separately calculated for such batches of concrete.

2.2.7.5 Not Applicable.

2.2.7.6 Consistency

The concrete which will flow freely into the forms and around the reinforcement without any segregation of coarse aggregates shall be used. The consistency shall depend upon the type of vibrator etc. to be used. The controlling factor for the same is the Slump Test.

When considered necessary by the Project Manager, the workability of the concrete shall be ascertained by compacting factor test and VEE BEE consistometer method as per IS:1199-1959. The computing of values of workability of concrete by above two methods, IS:456-2000 have to be referred to.

2.2.7.7 Temperature of Concrete

The placing temperature of concrete shall not be more than 38 degrees Celsius. If it is more, the Project Manager may order addition of ice or chilled water to the concrete. Also the Contractor shall take following precautions:

- Mixer and Weigh Batchers shall be painted white color.
- Aggregate storing bin shall not be exposed to the sun.
- Water shall be sprinkled on aggregate well before concreting to keep the temperature low.

Similarly, during the cold weather, concreting shall not be done when the temperature falls below 4.5 Degrees Celsius. The concrete placed shall be protected against by suitable covering. The concrete damaged by frost shall be removed and work redone with no extra cost.

2.2.7.8 Shrinkage Cracks

Concreting shall be avoided in very warm weather. Under such circumstances, the placed concrete shall be covered with damp hessian cloth within two hours of placing of concrete.

To achieve good result the concrete shall be immediately covered with a plastic sheet and not allowed to any direct wind contact to eliminate shrinkage cracks.

2.2.7.9 Workmanship

All works shall be true to level, plumb and square and all corners and edges in all cases shall be unbroken and neat.

Any work not to the satisfaction of the Project Manager or the Design Consultant will be rejected and the same should be rectified or removed and replaced with work of the required standard of workmanship at no extra cost.

2.2.7.10 Transportation

Concrete shall be transported with the help of pumps of sufficient capacity to achieve necessary heights wherever required from the mixer to the place of laying as rapidly as possible by methods which will prevent the segregation or loss of any of the ingredients and maintaining the required workability. The pumps can be either compressor type or boom type. All the pumping equipments have to be maintained and kept operational by the contractor.

2.2.7.11 Placing of Concrete

Placing of concrete shall be done using pumps only at all levels. The pumps shall be of sufficient capacity to achieve necessary heights wherever required.

The slump of concrete placed with the help of pumps shall not be more than 100mm unless otherwise instructed by the Project Manager. Concreting shall commence only after formwork is approved reinforcement is recorded and permission to proceed with concreting has been approved in writing from the Project Manager.

Formwork should be clean, free from dust, pieces of wood or any other foreign material. It should be treated by form releasing agent prior to the laying of reinforcement and concrete, based on sample approved by the Project Manager prior to start of construction at Site. Concrete shall be as gently deposited as is practically possible, in its final position to avoid rehandling and shall be so deposited that segregation of aggregates do not occur. In case of deep trenches and footings, it may be done with the help of chutes. Concrete from wheelbarrows shall not be dumped away from the face of concrete already been placed. It shall be dumped into the face of concrete already in place. Concrete shall be laid during normal working hours. Concreting at night or on holidays shall be permitted only on the written approval of the Project Manager. No concreting shall be done within half an hour of the closing time of the day, unless permitted by the Project Manager.

For concreting of slabs and beams wooden plant or catwalks of chequered MS plates or bamboo mats or any other suitable materials supported directly on the centering by means of wooden blocks or lugs shall be provided to convey the concrete to the place of final deposition without disturbing the reinforcement in anyway. In no case labour or any other persons are allowed to walk over the reinforcement.

In case of columns and walls, it is desirable to place concrete without any construction joints. The progress of concreting in the vertical direction, shall be restricted to one meter per hour.

2.2.7.12 Compaction of Concrete

Concrete shall be thoroughly compacted into a dense mass as depositing shall proceed by means of suitable vibrators. The vibrator shall maintain the entire concrete under treatment in an adequate state of agitation and shall continue during whole period occupied by placing of concrete. Care should be taken not to over-vibrate the concrete. While vibrating no holes should be visible in concreting. Compaction should be completed before the initial setting time. Compaction shall be done till air bubbles cease to appear. Concrete already set shall not be disturbed by successive vibration.

Hand tamping shall not be permitted. But only in exceptional cases, depending on the thickness of the members and feasibility of vibrating the same, the Project Manager may permit hand tamping. Hand tamping or compaction shall be done with the help of tamping rods so that concrete is thoroughly compacted and completely worked around the reinforcement embedded fixtures, and into the corners of the form work.

The layers of concrete shall be so placed that the bottom layer does not finally set before the top layers are placed. The vibrators are so applied so that the centre of mass being compacted at the time of placing of concrete.

Vibrator shall be of immersion type with frequency of 100 Hz minimum when operating in concrete, or the exterior with a frequency of 50 Hz minimum.

Care shall be taken to ensure that at no time the vibrators and /or vibration action is used to push the concrete ahead. Vibrators shall be applied systematically to overlap zones of influence.

It shall be ensured that the needle vibrators are not applied directly on the reinforcement on the formwork which may destroy the bond between concrete and reinforcement.

When electric vibrators are in use the standby petrol, diesel or kerosene vibrator should always be available at the concreting point.

2.2.7.13

Construction Joints

Construction joint shall be avoided as far as possible. If provided, concreting shall be carried out continuously up to the construction joints as directed by the Project Manager and/or at the location and arrangement shown in the structural drawings. However, the number of such joints shall be kept to a minimum and they shall be as straight as possible.

Proposed location of construction joints shall be submitted by the Contractor well in advance for approval of Project Manager/Structural Consultant. The joints shall be at places where shear force is nil or at a minimum (normally at 1/3rd to 1/4th point of a span) and these shall be straight and at right angles to the direction of the main reinforcement. Stop ends provided shall be with necessary slots for reinforcement bars to pass freely without bending or other obstructions. They should be supported firmly so that the concrete can be properly vibrated and compacted at these points.

Before commencement of concreting after a break, adjacent concrete stopper and surfaces shall be cleaned, chipped free of any loose mortar and roughened to expose the aggregate and then brushed and cleaned. The concrete surface shall be sprayed with water for 24 hours before casting and kept wet until casting.

Horizontal joints in walls

- a. Form horizontal joints in walls designed to be continuous with floor slabs at the top of an integrally cast kickers minimum 25mm high. No other horizontal joints will be allowed.

Form horizontal joints in walls other than in (a) above

- a) At the top of footings
- b) At the top of slabs
- c) At a minimum 20mm above the soffit of beam or girders connecting into columns.
- d) 15mm above soffit of suspended floors.

Construction joints in ground slabs

- a. To comply with IS codes
- b. To align with column or grid lines where practicable.

Isolation joints

- a. Form diamond shaped or circular separations around columns.
- b. Ensure all edges of slabs are isolated from adjoining construction.

Control joints

- a. Space at 4 - 7 meter in width for one panel.

- b. Form by either:
 - i. Sawing a continuous straight line in the top of the slab
 - ii. Grooving fresh concrete with hand grooves
 - iii. Placing strips of wood, metal or pre-moulded joint material at joint locations. Top edges of strips shall be flush with concrete.
 - iv. Control joints shall be extended 1/5 to 1/4 times slab thickness into the slab.

Construction joints in suspended slabs

- a. Locate near the middle of slabs, beams, or girders, unless a beam intersects a girder at the middle location, in which case offset joints in girders a distance equal to twice the width of the beam.
- b. Make provision for transfer of shear and other forces through construction joints.

Vertical joints in walls

- a. Space not exceeding 5m centers and also locate where abrupt changes in thickness or height occur, at least 2m from corner.

2.2.7.14 Expansion Joint

As indicated in drawing or as directed by the Structural Consultant / Project Manager.

2.2.7.15 Curing

Curing of concrete is most important. There shall be no compromise on this activity as it is for the Contractor to arrange for everything necessary to make sure that the concrete is cured to the complete satisfaction of the Project Manager. As said above after concrete has begun to harden, i.e. about 1 to 2 hours after laying. It shall be protected from quick drying with moist or damp hessian cloth or any other material approved by the Project Manager. After 24 hours of laying of concrete, the surface shall be cured by flooding with water or covering with moist hessian cloth for period of 7 days to keep it moist. For the next seven days surface shall be kept wet all the time by sprinkling water continuously.

In order to properly monitor the curing activity, the Contractor shall write legibly with paint, the date of casting the concrete of each member of the structure which shall remain clearly visible atleast till the completion of curing atleast.

2.2.7.16 Finishing

Concrete surface shall be finished keeping in mind the next operation to be carried out over the surface. For guidance the following points shall be noted:

- Roof shall be trowelled even and smooth with a wooden float, before the concrete begins to set.
- Surface that will receive plaster shall be roughened immediately.
- Surfaces that will be in contact with masonry shall be roughened immediately
- Surfaces that will receive floor finishes, tiling, etc. shall be roughened while it is still green.
- Every care shall be taken not to disturb the freshly laid concrete.
- For Ramps and Basements concrete shall be broom-finished.

On finishing standards and quality / workmanship, the decision of the Project Manager shall be final and binding on all parties.

2.2.7.17 Inspection and Corrective Measures

Immediately on removal of formwork, the RCC surface shall be examined by the Project Manager. Till such time, no remedial measures shall be carried out by the Contractor. All remedial actions including breaking, if any, shall be on the instructions of the Project Manager. In case of any violation of this rule, the concrete poured stands rejected. The decision of the Project Manager in this regard shall be final and binding to all parties.

Sagged, bulged, patched, honeycombed work to an extent detrimental to structural safety or architectural concept shall stand to be rejected and Contractor shall rectify by breaking or redoing, if required, as directed by the Project Manager/Structural Consultant and all expenses incurred due to this shall be to the Contractor's account.

Surface defects minor in nature may be accepted as a special case by the Project Manager/Structural Consultants whose decision in this matter is final and binding on the Contractor. Once accepted, the defects shall be rectified as follows and all expenses incurred due to the rectification process, shall be to the Contractor's account.

- (a) Surface defects which require repair when forms are removed, usually consist of bulges due to the movement of forms, ridges at form joint, honey combed areas, damage, resulting from the stripping of forms and bolt holes, bulges and ridges are removed by careful chipping or tooling and the surface is then rubbed with a grinding stone. Honey combed and other defective areas must be clipped out, the edges being cut as straight as possible and perpendicularly to the surface, or preferably slightly undercut to provide a key at the edge of the patch.
- (b) If permitted in writing by the Developer' Representative/ Structural Consultant, shallow patches are first to be treated with a coat of thin grout composed of one part of cement and one part of fine sand added with polymer modified cementitious material as per manufacturer's specification, and then filled with mortar (mixed with non-shrink additives) similar to that used in concrete. The mortar is placed in layers not more than 10 mm thick and each layer is given scratch finish to secure a bond with the succeeding layer. The laid layer is finished to match with the surrounding concrete by floating, rubbing or tooling on formed surfaces by pressing the form material against the patch while the mortar is still plastic.
- (c) Or as an alternative to para (b) above, as directed by the Project Manager/Structural Consultant, the patch-work shall be treated with epoxy based proprietary items like non-shrinking grouts etc. available in the market. In such cases, the methodology as indicated by the manufacturer of the item shall be followed. It permitted in writing by the Project Manager/Structural Consultant.
- (d) Large and deep patches require filling up with concrete held in place with try forms. Such patches are reinforced and carefully drawled to the hardened concrete.
- (e) Or as an alternative to para (d) above, epoxy based proprietary items like grouts as directed by the Project Manager / Structural Consultants, shall be used. The methodology as specified by the manufacturers of the proprietary item shall be strictly adhered to.
- (f) Holes left by bolts are to be filled with non-shrink grouts, as specified and directed by the Project Manager/ Structural Consultants carefully packed in to places in small amounts. The mortar is mixed as dry as possible to allow enough water to go into it, so that it will be tightly compacted when forced into the place.
- (g) Tiered holes extending right through the concrete may be filled with mortar or non-shrink grout, as the case may be, a pressure gun similar to the gun used for greasing motorcars.
- (h) Normally, patches appear darker than the surrounding concrete when uniform surface colour is important, this defect shall be remedied by adding 10 to 20 percent of white portland cement to the patching mortar, the actual quantity being determined by trial.
- (i) The same amount of care shall be taken to avoid the material in the patches as with the whole structure. Curing shall be started immediately after packing is done to prevent early drying. A membrane curing compound in these cases will be most convenient.

2.2.7.18

Cracks

Cracks observed shall be examined. It shall be kept under observation and a record shall be maintained for a period of 45 days. It shall be shown to the Project Manager/the Structural Consultant and the following procedure shall be followed:

- Cracks not propagating/developing further and according to the Structural Consultant not detrimental to the strength of the construction shall be grouted with non-shrinking epoxy based cement slurry or as directed by the Project Manager/Structural Consultant.
- Cracks developing further and felt detrimental to the strength of construction shall be tested as per the relevant Indian Standards.

- Based on results, the structural consultant in consultation with the Project Manager shall order remedial measures or order the contractor to dismantle construction, cart away the debris, replace the construction and carry out all the consequent works thereto as directed/specified.
- Cost of above shall be borne by the contractor if the failure is on its part unless it is due to a design fault, decided at the discretion of the Project Manager.

Decision of the Project Manager in the matter shall be final and binding on all parties. This decision shall not be open for arbitration.

2.2.7.19 Quantum of Cube Testing

The minimum frequency of cube testing shall be as follows. Each set of sample shall consist of 6 cubes.

Concrete Quantity	Number of Sample sets
Up to 5 cum a day	1
5 cum to 15 cum a day	2
15 cum to 30 cum a day	3
30 cum to 50 cum a day	4
More than 50 cum per day	4 + one additional for each 50 cum or part thereof.

Three cubes shall be tested on the 7th day and three cubes on the 28th day.

2.2.7.20 Acceptance of Work

It shall be in accordance with in IS:456-2000, SP-23 and SP-24. The guidance brief is elaborated below. Part or element of work shall be deemed to be accepted, provided the results of the 28th day cube testing confirm to the criteria stated as under:

- The average of the three consecutive cubes strength shall not be less than specified strength.
- No individual cube strength shall be less than 90% of the specified strength.
- If the individual cube strength exhibit more than 133% of the specified strength such a cube shall be specified as freak and the criteria in above two points shall be applied to remaining two cubes and their acceptability determined.
- If cubes fail at 7 days, defective concrete can be dismantled, removed and replaced without awaiting 28 day test results.
- If the concrete tests fail to meet the acceptance strength required for respective grades of concrete, the Project Manager may take one of the following actions:
- Instruct Contractor to carry out such additional tests (e.g. Core tests, load tests, ultrasound, etc.) and/or remedial measures to ensure the soundness of the structure at the Contractor's expense
- The work will be rejected and any consequential action as needed shall be taken at the Contractor's expense, including cutting out and replacing a part or whole of work.

2.2.8 Concreting under Special Conditions

During hot or cold weather concreting should be done as per the procedure set out in IS:7861 Part I or IS:7861 Part II or as directed by the Project Manager.

Fixtures

Any fixture, steel angles, holdfasts etc shall be embedded according to the drawing or as instructed by the Project Manager.

2.2.9 Precast Concrete

Refer Clause 3 / 2.10.4

2.2.10 Ready Mix Concrete

Reference - IS 4926-1976

2.2.10.1 Terminology

- 2.2.10.1.1 Ready Mixed Concrete - Concrete delivered at site or into the purchaser's vehicle in a plastic condition and requiring no further treatment before being placed in the position in which it is to set

- and harden. All provisions for good workmanship, quality control and treatment, as stated in previous clauses shall be applicable.
- 2.2.10.1.2 Agitation - The process of continuing the mixing of concrete at a reduced speed during transportation to prevent segregation.
- 2.2.10.1.3 Agitator - Truck mounted equipment designed to agitate concrete during transportation to the site of delivery.
- 2.2.10.1.4 Truck mixer - A mixer generally mounted on a self-propelled chassis capable of mixing the ingredients of concrete and of agitating the mixed concrete during transportation.
- 2.2.10.2 **Types**
- Concrete-mix - Concrete shall be produced by completely mixing cement, aggregates, admixtures, if any and water at a stationary central mixing plant and delivered in containers fitted with agitating devices.
- 2.2.10.3 **Materials**
- Cement - The cement used shall be ordinary Portland cement or low heat Portland cement conforming to IS-269-1976* or Portland slag cement conforming to IS 455-1976+ or Portland-pozzolana cement conforming to IS: 1489-1976+ or rapid hardening Portland cement conforming to IS 8041E-1976## as may be specified by consultant at the time of placing the order. If the type is not specified ordinary Portland cement shall be used.
- 2.2.10.4 Fly ash when used for partial replacement of cement, shall conform to the requirements of IS: 3812 (part I)-1966.
- 2.2.10.5 Water used for concrete shall conform to the requirement of IS: 456-1964.
- 2.2.10.6 Admixtures shall only be used when so agreed to between the purchases and the manufacturer. The admixtures shall conform to the requirements of IS 456-1964 and their nature, quantities and methods of use shall also be specified. Fly ash when used as an admixture for concrete shall conform to IS: 3812 (Part II)-1966.
- 2.2.10.7 Measurement and Storage of Materials - Measurement and storage of materials shall be done in accordance with the requirements of IS: 456-2000.
- 2.2.10.8 **Basis of Supply**
- The ready mixed concrete shall be manufactured and supplied on the following basis.
- a) Specified strength based on 28-day compressive strength of 15-cm cubes tested in accordance with IS: 456-1964.
- When the concrete is manufactured and supplied on the basis of specified strength, the responsibility for the design of mix shall be that of the manufacturer.
- 2.2.10.9 **General Requirement**
- 2.2.10.9.1 In addition to the requirements specified in this standard and subject to such modifications as may be agreed to between the purchaser and the manufacturer at the time of placing order, the ready-mixed concrete shall generally comply with the requirements of IS: 456-2000.
- 2.2.10.9.2 The minimum quantity of cement and the details regarding proportioning and works control shall be as per Clause 3 / 2.2.7.1.
- 2.2.10.9.3 When a truck mixer or agitator is used for mixing a transportation of concrete, no water from the truck-water system or from elsewhere shall be added after the initial introduction of the mixing water for the batch, except when on arrival at the site of the work, the slump of the concrete is less than that specified; such additional water to bring the slump within required limits shall be injected into

the mixer under such pressure and direction of floor that the requirements for uniformity specified in Appendix A are met.

- 2.2.10.9.4 Unless otherwise agreed to between the purchaser and the supplier, when a truck mixer of agitator is used for transporting concrete, the concrete shall be delivered to the site of the work and discharge shall be complete within 1.5 hours (when the prevailing atmospheric temperature is above 20°C) and within 2 hours (when the prevailing atmospheric temperature is at or below 20°C) of adding the mixing water to the dry mix of cement and aggregate or of adding the cement to the aggregate, whichever is earlier.
- 2.2.10.9.5 Temperature - The temperature of the concrete at the place and time of delivery shall be not less than 5°C. Unless otherwise required by the purchaser, no concrete shall be delivered, when the site temperature is less than 2.5°C and the thermometer reading is falling.
- 2.2.10.9.6 The temperature of the concrete shall not exceed 5°C above the prevailing shade temperature, when the shade temperature is over 20°C. The temperature of concrete mass on delivery shall not exceed 40°C.
- 2.2.10.9.7 Sampling and testing: Adequate facilities shall be provided by the manufacturer for the purchaser to inspect the materials used, the process of manufacture and the methods of delivery of concrete. He shall also provide adequate facilities for the purchaser to take samples of the materials used.
- 2.2.10.9.8 Sampling and testing - Unless otherwise agreed to between the purchaser and the supplier, the sampling and testing of concrete shall be done in accordance with relevant requirements of IS: 456-1964, IS: 1199-1959 and IS: 516-1959.
- 2.2.10.9.9 Consistency or workability - The tests for consistency or workability shall be carried out in accordance with requirements of IS: 1199-1959 or by such other method as may be agreed to between the purchaser and the manufacturer.
- 2.2.10.9.10 Strength Test - The compressive strength and flexural strength tests shall be carried out in accordance with the requirements of IS: 516-1959 and the acceptance criteria for concrete whether supplied on the basis of specified strength or on the basis of mix proportion, shall conform to the requirements of Table 5 and other related requirements of IS: 456-1964.
- 2.2.10.9.11 Cost of Testing - Unless otherwise agreed to between the purchaser and the manufacturer, the cost of the tests carried out in accordance with the requirements of this specification shall be borne as follows:
- a) By the manufacturer if the results show that the concrete does not comply with the requirements of this standard.
 - b) By the purchaser if the results show that the concrete complies with the requirements of this standard.
- 2.2.10.9.12 Manufacturer's Records and Certificates - The manufacturer shall keep batch records of the quantities by mass of all the solid materials, of the total amount of water used in mixing and of the results of all tests. If required by the purchaser, the manufacturer shall furnish certificates, at agreed intervals, giving this information.

The concrete quality shall meet all requirements and Specifications of concrete as stated hereof. Contractor shall be allowed to use own Batching Plant or procure concrete, but Quality Tests will be the responsibility of the Contractor and off-site Batching Plants shall be open for inspection to the Project Manager throughout the Project.

2.2.11 **Admixtures**

2.2.11.1 **General**

Admixtures may be used in concrete only with the approval of Consultant / Project Manager based upon evidence that, with the passage of time, neither the compressive strength nor its durability get reduced. Calcium chloride shall not be used for accelerating set of the cement for any concrete containing reinforcement, or embodied steel parts. When calcium chloride is permitted to be used, such as in mass concrete works, it shall be dissolved in water and added to percent of the weight of the cement in each batch of concrete. When admixtures are used, the designed concrete mix shall be corrected accordingly. Admixture shall be used as per manufacturer's instructions and in the manner and with the control specified by Consultant / Project Manager.

2.2.11.2 **Air Entraining Agent**

Where specified and approved by Consultant / Project Manager, neutralized vinsol resin or any other approved air entering agent may be used to produce the specified amount of air in the concrete mix and these agents shall conform to the requirements of ASTM Standard 6 - 260, Air Entering admixtures for concrete. The recommended total air content of the concrete is 4% plus or minus 1%. The method of measuring air content shall be as per IS 1199.

2.2.11.3 **Retarding Admixtures**

Where specified and approved by Consultants / Project Manager retarding agents shall be added to the concrete mix in quantities specified by Consultants / Project Manager.

2.2.11.4 **Water Reducing Admixtures**

Where specified and approved by Consultants / Project Manager water reducing lignosulfonate mixture shall be added in quantities specified. The admixtures shall be added in the form of a solution.

2.2.11.5 **Water Proofing Agent**

Where specified and approved by Consultants / Project Manager, chloride and sulphide free waterproofing agent shall be added in quantities specified.

2.2.11.6 **Other Admixtures**

- a. The Consultants / Project Manager may at his discretion instruct the contractor to use any other admixtures in the concrete.
- b. If the Contractor so wishes to use admixtures, then the following should be adhered to (subject or Project Manager's approval).
- c. No reduction will be allowed to target mean strength when compared to admixture free concrete of the same class.
- d. Dosage of admixture shall be strictly in accordance with the manufacturers instruction.
- e. The following information about the admixture shall be submitted to the Consultants / Project Manager for record and approval.
 - Long and short term effects of the admixture in the concrete.
 - Effect of admixture of concrete permeability.
 - Effects of over and under dosage.
 - Shortage life and special storage requirements.
- f. The Contractor when requested shall provide the services of a full time field technician of the admixture manufacturer to advise the proper addition of the admixture to the concrete or adjustment of concrete mix proportions to meet changing conditions.
- g. The Contractor shall furnish a statement of responsibility from the admixture manufacturer for their products.
- h. If the use of admixture is approved by the Consultants / Project Manager, it shall be constructed as a constructing part of the concrete without any extra payment.

2.2.12 **Measurement**

Formwork and reinforcement shall be paid separately. Volume of concrete measured shall include that occupied by:

- Reinforcement of other metal sections
- Cast in components more than 0.01 m³ in
- Rebates or internal each less than 0.005 m² is 0005 sectioned area
- Pockets and holes not exceeding 0.01 m³ in volume

All works shall be measured in the Decimal system.

- Dimensions shall be measured to the nearest 0.01 metre except for thickness of slabs that shall be measured to the 0.005 metre.
- Areas shall be worked out to the nearest 0.01 Sqm.
- Cubic contents shall be worked out to the nearest 0.01 cum.

Formwork and reinforcement shall be paid for separately.

The price of concrete shall include all labour, material, equipment, mixing, pumping, gangways, tools, transporting, hoisting to any height and lowering to any depth, pouring or laying,

consolidating, leaving pockets, holes, disconnecting them till the next operation or completion of work, hacking the surface, to provide key for providing further work including cleaning wetting surfaces, etc preparing construction joints as described, and all other activities required as per good construction practice.

Unit rates shall allow for chamfers, grooves, lines etc. in reinforced concrete members as well as necessary slope, drops, drip models etc.

No deductions shall be made for:

- Ends of dissimilar materials (for example beams, posts, girders, corbels, purlins and steps) up to 500 sq cm. in section.
- Opening up to 0.1 sq m.
- Volume occupied by drainage, water, pipes, conduits, etc. not exceeding 100 sq cm. each in cross-section.
- Small voids not exceeding 40 sq cm. in cross-section.
- Small moulds, drip moulds, chamfers, splays, rounded or covered angles, beads, grooves, rebates up to 10 cm in depth and width.

Minimum cement content per cubic meter of cement concrete has been specified in each item of cement concrete work, refer **Clause 3 / 2.2.4**. However, if cement is required to be used so as to obtain the minimum strength specified for the grade of cement concrete, the Contractor will not be paid for extra cement used.

2.2.13

Scope of Works

The following item are not intended to exclude any other items of works required by the Design Consultants, or that may be required by local code or good construction practice. The following work shall be included by the Contractor in its Tender and Contract Sum as they may not have been detailed specifically on the architectural and engineering drawings and specifications but we required in order that a complete job in every respect can be.

- (1) The supply, maintenance and removal of all temporary rungs, and ramping as necessary on the site
- (2) Placing of concrete will be pumps only or as approved by the Project Manager.
- (3) All finishes and to the concrete work as shown or specified.
- (4) Allowed for the removal of constructions encountered.
- (5) The excavation and concrete construction of all sump pits, manholes, drains under slabs, etc as described in the specifications and shown on the drawings.
- (6) Formwork, reinforcing, embedded items and layout for concrete tank cradles.
- (7) All roof mechanical and other building services equipment pads and kerbs at the HVAC and Electrical openings, concrete including dowels, formwork and roughing of concrete
- (8) All fire grading and removal of standing water before the placing of concrete.
- (9) Included for all below slab, surface water and drainage, including brickfill, within the Tender.
- (10) Points and in steel below slabs lightening protection systems as detailed.
- (11) The Contractor, in the preparation of his Tender, is to allow for watertight construction.
- (12) Allow for keeping the works clear and tidy at all times and for the removal of debris arising from the works, and to be disposed off at locations designated by the Project Manager, and frequent removed off the site. Any surplus concrete deposited at the workfront of on the site (**concrete droppings**) must be removed by the Contractor at its own expense.
- (13) Provisions, hoisting, distribution and fixing of all embedded items required.

- (14) Leaving all necessary holes and pockets for steel work beams for lifts and for making good after installation by other contractors. Casting in all slots and inserts for fixings to guides and runners to lift shafts.
- (15) All trench drain box-cut with necessary recesses and casting in all anchor bolts and providing and installing trench drains and other embedded items as shown on the drawings.
- (16) Include design mix weight and storage box for samples and test cylinders.
- (17) Levelling of the floors to proper elevations as shown on the drawings to the tolerances and cambers and slopes specified including all changes of slab elevation.
- (18) All means of transportation of concrete.
- (19) Providing and casting into concrete slots to receive masonry or blockwork ties to support all such walls as shown on the drawings or as directed by the Project Manager.
- (20) Forming holes to riser ducts.
- (21) Forming necessary cutouts at pipe locations to accommodate electrical, plumbing, sprinkler and electrical services.
- (22) Forming in the concrete members chases for any asphalt "track-in" and/ or flashing and the like.
- (23) Provide grout for lift saddle and floor closures prior to setting (setting by others).
- (24) Grout pumps and other mechanical equipment as required.
- (25) Provide temporary shoring and strutting as required due to the operations of the Contractor.
- (26) Provide and maintain ladders until stairs are usable.
- (27) Provide adequate lighting at all areas
- (28) Erect sufficient safety signs, posters and maintain high level of safety during the entire construction period.

**Annexure 1
Course Aggregate Grading
IS : 383 Table 2**

IS Sieve Sizes	Percentage passing for single size Aggregate						Percentage passing for Graded Aggregate Nominal Size			
	63mm	40mm	20mm	16mm	12.5mm	10mm	40mm	20mm	16mm	12.5mm
80mm	100	-	-	-	-	-	-	-	-	-
63mm	85 to 100	100	-	-	-	-	100	-	-	-
40mm	0 to 30	85 to 100	100	-	-	-	-	-	-	-
20mm	0 to 5	0 to 20	85 to 100	100	-	-	95 to 100	100	-	-
16mm	-	-	-	85 to 100	100	-	30 to 70	95 to 100	100	100
12.5mm	-	-	-	-	85 to 100	100	-	-	90 to 100	-
10mm	0 to 5	0 to 25	0 to 20	0 to 30	0 to 45	85 to 100	-	-	-	100
4.75mm	-	-	0 to 5	0 to 5	0 to 10	0 to 20	10 to 35	25 to 55	30 to 70	40 to 85
2.36mm	-	-	-	-	-	0 to 5	0 to 5	0 to 10	0 to 10	0 to 10

Annexure 2
Grading of Fine Aggregates
IS : 383 Table 4

IS Sieve Designated	Grading Zone I	Grading Zone II	Grading Zone III	Grading Zone IV
10mm	100	100	100	100
4.75mm	90 to 100	90 to 100	90 to 100	95 to 100
2.36mm	60 to 95	75 to 100	85 to 100	95 to 100
11.18mm	30 to 70	55 to 90	75 to 100	90 to 100
600 microns	15 to 34	35 to 59	60 to 79	80 to 100
300 microns	5 to 20	8 to 30	12 to 40	15 to 50
150 microns	0 to 10	0 to 10	0 to 10	0 to 15

2.3 Reinforcement**2.3.1 Related Works**

- A. Concrete Formwork
- B. Cast in-situ Concrete

2.3.1.a Applicable Standards

IS - 432	Specification for Mild steel and medium tensile bars and hard drawn steel wire.
IS - 1139	Specification for hot rolled mild steel, medium tensile steel and high yield strength steel deformed bars for concrete reinforcement.
IS - 1566	Specification for plain hard drawn steel wire fabric for concrete reinforcement
IS - 1785	Specification for plain hard drawn steel wire for prestressed concrete.
IS - 1786	Specification for cold twisted steel high strength deformed bars for concrete reinforcement.
IS - 2080	Specification for high tensile steel bars used in prestressed concrete
IS - 2751	Code of practice for welding of mild steel structures are folded plates
IS - 2502	Code of practice for bending and fixing of bars for concrete reinforcement

2.3.2 Steel Grades

Reinforcements for concrete may be from any of the “grades” of steel indicated below, conforming to the relevant Indian Standards and their latest amendments mentioned against each:

Grade	Description	Conforming to
Fe 250	Mild Steel	IS 432 (Part I)
Fe 490	Hard drawn steel wire	IS 432 (Part II)
Fe 415	High strength deformed/ ribbed steel	IS 1786
Fe 500	High strength deformed / ribbed steel	IS 1786
Fe 550	High strength deformed / ribbed steel	IS 1786

Reinforcing steel may be any of the following types:

Type I	Plain round bars (PR)
Type II	Welded wire Fabrics (WWF)
Type III	Cold Twisted Deformed Bars / Corrosion resistant bars. (CTD-CR)
Type IV	Thermo-Mechanically Treated Ribbed bars (TMT)
Type V	Thermo-Mechanically Treated Ribbed Corrosion Resistant bars (Copper) Bearing (TMT-CR)

2.3.3 BIS Certification

Material received at the Site shall have BIS Certification mark. Such bundle or coil containing the bars shall be suitably marked with BIS Certification mark. Bars shall also be marked to identify categories. This shall be done as per IS: 1387.

In case bars are without BIS Certification mark, the manufacturer shall give a certificate stating the process of manufacture, chemical composition and mechanical properties. Each certificate shall indicate the number or identification mark of the cart to which it applies, corresponding to the number or identification mark to be found on the material.

All reinforcements shall be free from loose mill scale, excessive rust, loose rust, pitting, oil, grease, paint, mud or any other foreign deleterious material present on the surface. Cleaning should be done to the satisfaction of the Project Manager.

Each batch of steel brought to the Site shall be tested prior to use. Cost of all tests shall be borne by the Contractor.

Material acceptable as per IS Specifications will be allowed into the Project. All rejected material shall be removed from the Site by the Contractor within 30 days of its rejection. If the same is not done, the Project Manager can get work done by third party at the contractor's risk and cost shall impose a penalty of Rs 500 (Rupees Five Hundred only) per metric ton per day. This will be without any appeal and shall not be subjected to arbitration.

2.3.4 Storage

Reinforcement bars received at the Site shall be stored on hard, concreted platform and clear of the ground to a minimum of 300 mm with the use of timber sleepers or any other means. Reinforcements shall be kept covered by tarpaulins or plastic to avoid excessive corrosion or any other contamination. It is advised to follow storage methods as described in IS: 4082. **The Contractor shall comply with the instruction of the Project Manager on method of stacking of steel.**

Reinforcement steel shall be stored in such a manner as to avoid distortion and to prevent deterioration and corrosion. Prior to assembly of reinforcement on no account any oily substance shall be used for removing the rust.

2.3.5 Quality Assurance

- a. Supervisory staff shall have qualification and experience in the above field.
- b. Welders qualified and having approved certificates for welding shall be employed.

2.3.6 Handling

- a. Bend test requirements shall conform to the following and shall be based on 1800 bends of full size bars around pins.

Bar diameter (mm)	Pin diameter for test bend
10, 12, 16	3.5 x bar dia
20, 22, 25	5.0 x bar dia
28, 30, 32	7.0 x bar dia

- b. Spacers shall be of any of the following:
 - i. Wire
 - ii. Precast concrete
 - iii. Moulded plastic

Spacer material shall be of durable quality and shall not lead to corrosion of reinforcement or spilling of concrete.

Precast concrete spacers shall be of the same mix as that of surrounding concrete.

- c. Tying wire shall be of 18 G black annealed mild steel wire or other approved type double fold to tie the reinforcements.
- d. Cover blocks shall be non-corrosive material such as plastic, but not wooden or broken bricks or stone. Specially made concrete blocks shall be used. Such cover blocks shall be cast from concrete and not from cement mortar; strength of these blocks shall be equal to the concrete in use.
- e. Tying wire shall be of 18G black annealed mild steel wire or other approved type double fold to tie the reinforcements. It shall be free from rust, oil, paint, grease, loose mill scales or any other deleterious material undesirable for concrete or reinforcement or which may prevent adhesion of concrete to reinforcement.

2.3.7 Unit Weights:

Unit weights payable per meter shall be as follows:

6 mm Ø	0.22 kg/ m
8 mm Ø	0.39 kg/ m
10 mm Ø	0.62 kg/ m
12 mm Ø	0.89 kg/ m
14 mm Ø	1.21 kg/ m
16 mm Ø	1.58 kg/ m
18 mm Ø	2.00 kg/ m
20 mm Ø	2.47 kg/ m
22 mm Ø	2.98 kg/ m
25 mm Ø	3.85 kg/ m
28 mm Ø	4.83 kg/ m

32 mm Ø	6.31 kg/ m
36 mm Ø	7.99 kg/ m
40 mm Ø	9.86 kg/ m

2.3.8 Execution**2.3.8.1 Cutting and Bending**

- a. Flame cut and hot bending is absolutely forbidden.
- b. Cut and bend reinforcement to approved shop drawings and details shall be used.
- c. Bars to be cold-bend, either mechanically or by hand, but to correct radius using proper tools, machine and platform and confirming to IS 2502-1963.
- d. Do not rebend without approval. In case of re bending, care shall be taken that the rating of bend is not less than 4 x bar dia at construction joints for plain steel bars and 6 x bar dia for high strength bars.
- e. Reinforcement projecting from concrete shall not be bent without approval.
Bar bending schedule to be submitted for approval of the Structural Consultant to the Project Manager prior to commencement of any cutting, bending and binding of steel at site.
- f. Cracked end of bars shall not be used on this Project.
- g. Bars should be inspected for visible defects such as cracks, brittleness, excessive rust, loose mills scale, etc.

2.3.8.2 Welding

- a. Do not weld reinforcement unless authorized by the Consultants / Project Manager and recommended by the manufacturers.
- b. Site welding shall be done with suitable safeguards and techniques.
- c. Welding, if approved, may be used for:
 - i. Lapping reinforcement in position
 - ii. Fixing reinforcement to other steel members.
- d. The length of run deposited in a single pass shall not exceed 5 x bar diameters. If a longer welded length is required divide into sections with the space between runs not less than 5 x bar diameters.
- e. Welded joints:
 - i. Shall not be made at bends in reinforcement.
 - ii. Stagger joints in parallel bars of principal reinforcement unless otherwise approved.
 - iii. The distance between staggered joints shall not be less than the end anchorage length joints.

2.3.8.3 Mechanical Splicing

- a. To comply with ISI 456-2000. ACI 318-1983 and ACI 439-3R-83
- b. Use as indicated in structural drawings.
- c. Consultant has to approve mechanical splices before using it at site.

2.3.8.4 Inspection

- a. Ensure that the reinforcement placing is checked by Project Manager.
- b. Ensure that the Formwork to receive the reinforcement is clean and free from debris.
- c. Cracked end of bars to be cut out.

2.3.8.5 Anchoring

Anchoring of bars and stirrups shall be provided exactly as detailed in the structural drawings or as directed by Project Manager/ Structural Consultant.

In case of reinforcement steel in tension, deformed bars may be used without end anchorage provided the development length requirement is satisfied. Hooks shall normally be provided for plain bars in tension. Development length of the bars shall be determined as per relevant clauses of IS: 456 - 2000.

The anchorage length of straight bar in compression shall be equal to the Development length of the bars in compression as specified in relevant clause of IS: 456 - 2000.

2.3.8.6 Lapping of Bars

Laps shall be strictly as per the structural drawing or as directed by the Project Manager/Structural Consultant. For general guidance the following principles shall be followed as given in IS: 456 - 2000

- As far as possible bars of the maximum length available shall be used.

- Laps shown on drawings or otherwise specified by the Structural Consultant will be based on the Contractor using bars of maximum length.
- In case Contractor wishes to use bars of shorter length, laps shall be provided at the Contractor's expense in the manner and the locations approved by the Structural Consultant.
- Splices shall be provided as far as possible away from the sections of maximum stress and be staggered.
- Not more than half of the bars shall be spliced at a section
- If more than half of the bars shall be spliced at a section, special case shall be ensured such as increasing length of lap or closer spacing of stirrups around the length of splice.
- Lap splice shall not be used for bars having diameter larger than 36 mm. For larger diameters bars it may be welded. Lap length including anchorage value of hooks in flexural tension shall be L_a (as defined in Article 25.2.1 of IS: 456-2000) or 30 times the diameter of the bar whichever is greater and for direct tension $2L_a$ or 30 times the diameter of the bar whichever is greater. The straight length of lap shall not be greater than 15D or 20 cm, whereas D is the diameter of the bar.
- Lap length in compression shall be equal to the development length in compression calculated as described in relevant clause of IS: 456-2000 or as specified in the structural drawing but not less than 24 times the diameter of the bar.
- Overlapping bars shall not touch each other and these shall be kept apart with concrete between them by 25mm or 1.25 times the maximum size of the coarse aggregate, whichever is greater.
- When above is not possible, the overlapping bars shall be bound together at intervals not exceeding twice the diameter of such bars with two strands of annealed binding wire of 0.90mm to 1.6mm diameter twisted together tightly.
- As and when necessary welded laps shall be provided as specified by the Structural Consultant.

2.3.8.7 **Securing Reinforcement**

- a. Adequately secure with tying wire or approved steel clips.
- b. Bend the tying wires well back clear of forms.

2.3.8.8 **Concrete Cover**

- a. Shall be in accordance with IS: 456-2000 and as per the instructions in structural drawings.
 - i. Footings, retaining walls and Similar members in contact with earth but not cast against earth - 50 mm
 - ii. Slabs - 20 mm
 - iii. Walls, ribs - 20 mm
 - iv. Beams:
 - For main bars - Min.25 mm or dia. of the bar
 - For stirrups - 15 mm
 - v. Columns - 40 mm
 - Columns less than 20 cms - 25 mm
 - vi. Water tanks:
 - In contact with water - 40 mm
 - In contact with air - 20 mm
 - vii. Walls in contact with water / Earth - 40mm

2.3.8.9 **Spacers Chairs and Other Supports**

- a. Provide necessary supports to maintain reinforcement in its correct position.
- b. Provide spacer bars of same diameter as longitudinal bars but not less than 25mm diameter between two layers at 1.5 m centers except where bundled bars are detailed.

2.3.8.10 **Precautionary Measures**

- a. Do not insert bars into placed concrete.
- b. Do not damage forms and form linings, if any when fixing reinforcement.

2.3.8.11 **Adjustment and Cleaning**

- a. Check reinforcement prior to and during placing concrete with particular attention to the top reinforcement in Cantilever sections.
- b. Ensure that reinforcement is clean and free from corrosive pitting, loose rust, loose mill scale, oil and other substances, which may adversely affect reinforcement concrete or the bond between the two.

- c. Protect the projecting reinforcement from weather where the rust staining of exposed concrete surfaces may occur.

2.3.9

Measurements

Reinforcement shall be measured as follows (Contractor shall account for all these in his quoted rates):

- Length of different diameters of bars actually used including laps shall be measured nearest to a centimeter and their weights calculated as shown on the drawings or as instructed by the Structural Consultant
- Weights per metre shall be as mentioned in **Clause 3 / 2.3.7**
- Rolling margin to be considered in quoted rates.
- Rate build-up shall include, in addition to cost of material (ie will not be measured and paid for separately):
 - Cover blocks (PVC or concrete) of required thickness for keeping reinforcement bars in position
 - Unauthorised overlaps (allowed for Contractor's convenience), spacer bars, chairs and ties.
 - Cutting, bending, placing and fixing in position in any size and shape and placing in position as per detailed drawings
 - Binding wire as approved (will not be measured and hence not paid separately)
 - Wastage
 - Cleaning of bare reinforcement
 - Welding where required as shown in drawings and specifications

2.3.10

Approved Makes

Reinforcement bars shall be procured from one of the following manufacturers only. **(Reinforcement bars from other sources will not be approved)**

Name of Makes

1. SAIL
2. TATA

2.4 Formwork

2.4.1 Related Work

- Concrete
- Reinforcement

2.4.2 Applicable Standards

IS - 303	Specification for Plywood for general purposes
IS - 4990	Specification for plywood for concrete shuttering work
IS - 1629	Rules for grading of cut size of timber
IS - 2750	Specification for steel scaffoldings.
IS - 4014	Code of practice for steel tubular, scaffolding

2.4.3 Section Includes

Design, Fabrication, erection and striking of formwork for in - situ concrete

2.4.4 Quality Assurance

Design and construction shall be executed and supervised by fully qualified personnel.

In accordance with quality assurance programme, the contractor shall provide the Consultants / Project Manager with information demonstrating that a system will be used to ensure that the work carried out under this section (including that done by sub-contractors) will comply with the requirements of the specifications.

2.4.5 Formwork

Related Work

- Concrete Form Work
- Concrete Reinforcement
- Cast - in situ Concrete

2.4.5.1 Quality Assurance

- a. Supervisory staff shall have qualification and experience in the above field.
- c. IS Standards – Note: Latest amendments shall be followed.

2.4.5.2 Design Criteria

Formwork system shall be executed and designed by a specialist qualified to the shapes, lines, forms and dimensions shown on drawings. The Contractor shall submit to the Project Manager a method statement backed by design calculations. Required drawings and sketches shall be enclosed along with the statement for the proposed area to be taken up for working at a time. The number of repetitions expected, type of material used, etc shall be detailed therein.

Formwork shall start only after written approval from the Project Manager & Structural Consultant has been received. Approval of the proposal in submitted form a acceptance of modification does not relieve the Contractor of its obligation to achieve its required line finish within accepted tolerance limits in terms of quality of works completed and safety. Neither it will diminish the Contractor's responsibility for the satisfactory performance of formwork.

Basic points to be understood in designing of formwork is stated below:

- a) Erected Form work shall be watertight, shall conform to shape, lines, dimensions, verticality, rigid during placing, vibrating and configuring the concrete
- b) Formwork system shall be of steel or timber or 12mm thick water resistant Ply board, and shall be continuous, straight and without any warping.
- c) Design of formwork shall take into account:
 - Height of pour
 - Thickness of member
 - Rate of pour
 - Concrete slump
 - Texture of finish

- Placing temperature
- Concrete density
- Construction joints
- Wind load
- Method of Discharge
- d) Form work design shall have
 - Dimensional tolerance
 - De mountable without shock, disturbance or damage to concrete
- e) All construction joints in beams and slabs shall be provided as shown in drawings.
- f) Ties shall be provided where required
- g) Cambers shall be provided where shown.
- h) Props / supports of extra ceiling height shall be specially designed.

2.4.6 Form Work Material

Construction formwork with smooth faced plywood, steel or timber to produce smooth straight level and sharp profiles shall be used for the works. Panels to be in largest practicable sizes to reduce the number of joints.

- a) Form material shall have strength adequate to withstand pressure of newly placed concrete without excessive and adjustable bow or deflection.
- b) Factory fabricated, adjustable length removable or snap of metal form ties, design to prevent from deflection and to prevent spilling concrete surfaces on removal.
- c) Ties shall be such that
 - A portion remaining within the concrete shall be at least 38mm from the outer concrete surface.
 - That will not leave a hole larger than 25mm dia meter on the concrete surface.
- d) Form coating compound that will not bond with, stain, not adversely effect concrete for required bond or adhesion not hamper the wetting of surface to be covered with water or curing compound.

All propping and centering shall be of adjustable steel supports (built-up sections of rolled steel) and tubular props to full height without joints, and with sufficient bracing to take into account the construction loads, namely full load of concrete with any live load and impact load likely to occur during concreting.

Steel shuttering used for concreting shall be sufficiently stiffened. The steel shuttering shall also be properly repaired before sue and properly cleaned to avoid stains and defects in concreting.

2.4.7 Workmanship

Formwork shall be classified based on the ultimate finishes required of the concrete surface as:

- Textured or decorative finish
- Fair-faced finish
- Rough finish

2.4.7.1 The Contractor shall account for all material and labour to achieve the above finishes to the satisfaction of the Project Manager in his quoted price.

2.4.7.2 Guidelines for Good Workmanship

Following are a few points as guidelines for good workmanship in formwork and shall be accounted for in his quoted price.

- Erection of formwork may be from pre-moulded, pre-fabricated, pre-assembled plates or form reasonable enough to transport and erect at site to correct lines and levels as set at site.
- Supports shall be firm and maintained in position by nails, cross bracing, tie-rods, locking bolts, nuts, etc. It shall be rigid and stiff so as to retain its shape during and after concreting.
- Joints shall be water-tight and no cement slurry shall be allowed to get through
- Pre-fabricated or site forms shall be assembled so as to deshutter without any jerk to the green concrete. For this double wedges shall be used. The wedges shall be nailed. The heads left with, allowing easy removal while deshuttering.
- Pre-fabricated or site formwork shall be sufficient thickness with supporting spans in both directions. These shall be standardised in size for easy replacement and universal use at site
- Props shall be of steel only. Its spacing shall be as per design. It shall be vertical and plumbed. Base shall be of proper steel plate or timber plank for equal distribution of load

- In case of multi-storied buildings, any upper floor shall be suitably supported on at least one floor below the same, or as approved by the Project Manager.
- Props shall be adequately cross-braced horizontally
- At the design and erection stage following additional points shall be considered and be incorporated into the setting
- Opening of cleaning prior to the start of concreting
- Pouring points shall avoid high drops and provide easy access to vibrating needles
- Surfaces shall be treated with suitable releasing oil or emulsion prior to the reinforcement laying. Such releasing oil shall be got approved from the Project Manager.
- Ensure that forms and adjacent surfaces are thoroughly cleaned to receive concrete and debris.
- Locate construction joints in a manner so as not to impair strength and appearance of structure.
- **Without absolving the details on the above, the Contractor shall comply with instruction of the Project Manager regarding formwork designing, erection, execution, rotation, maintenance and reuse.**

Following points shall be observed very carefully:

- Joints of formwork shall be watertight. It is easy to check from the bottom and make sure no light is visible
- Props shall be on solid base, plumbed, in straight line, braced horizontally and cross
- Tie-bars, bracing and spacers in beams, walls and columns shall be at correct place/location and fully tight
- Wedges shall be fully secured and nailed with heads left out for easy removal
- All saw dust, dirt, shavings and any other unwanted material shall be cleaned and hosed out
- Provision shall be made for watching formwork while concreting and any other platform needed for movement of workers without any disturbance to the reinforcement
- Provision is made for traffic on formwork : not to bear directly on reinforcing steel.
- Number of reuses shall be decided by the Project Manager on examining the condition of formwork after each use. If during concreting any weakness develops or formwork shows any distress, the work shall be stopped and remedial action taken.

2.4.7.3 Finishing Formed Surfaces

The Contractor shall:

- Repair and patch defective areas with fins and other projections completely removed or smoothed.
- To smooth concrete where fins and other projections have formed moisten concrete surface within a day after forms have been removed and rub with carborundum brick until surface is a uniform colour and texture within the projection limits.
- Not apply cement ground other than that produced by the rubbing process.
- Remove and replace concrete having defective surfaces if defects cannot be repaired to the satisfaction of the superintendent.

Surface defects shall include colour and texture irregularities, cracks, spills, air bubbles, honeycombs, rock pockets, fins and other projection on the surface, stain and form tie holes.

The contractor shall:

- Undercut voids larger than 25mm diameter and fill with fresh concrete after thoroughly wetting concrete surfaces.
- Fill small holes and irregularities using 2:1 (Portland cement to fine sand by volume) grout mixed with approved bonding admixture according to manufacturer's specification.
- Blend standard Portland cement with white Portland cement if necessary so that final colour of dry grout will match adjacent surfaces.
- After applying grout to repair area, wipe with Hessian cloth to match adjacent texture and within the specified surface tolerances.
- Keep concrete patch damp with fog *spray for at least 36 hours.

2.4.8 Measurements

Formwork shall be measured as the area (in square metres) of shuttering in contact with the concrete including covers, angles, splays, mitres, bevels, etc. for which no special rate shall be allowed.

- It shall be measured to the nearest centimeter and the area worked out correct to two decimal places
- No deduction shall be made for openings up to 0.4 square metre in plan
- Area of voids shall deducted from the face area of shuttering.

- No deductions shall be made from formwork of main beams where a secondary beam intersects it. Formwork for secondary beams shall be measured up to sides of the main beams.
- No deduction shall be made from the formwork to column casings at intersection of beams.
- Lapping of formwork with previously laid out concrete will not be measured and will not be paid for.
- The quoted rate shall be applicable for all working conditions and at all heights and depths or lifts specified in the drawings. The rate shall include the cost of materials and labour for various operations involved including, but not limited to the following:
- Provision of formwork, its erection and treatment of the concrete surface immediately after removal of the formwork
- Holes to be made in the formwork for inserting electrical conduits, piping for plumbing works, etc
- Centering, bracing, tightening with bolts and nuts, staging, etc.
- Splayed edges, notchings, allowance for overlaps, centering, shuttering, strutting, bolting, nailing, welding, casing striking and removal.
- Filling to form stop chamfered edges or splayed external angles to footings, beams, columns and the like.
- Temporary openings in the forms for pouring concrete and removing rubbish.
- Dressing with oil/approved emulsion to prevent adhesion of concrete with shuttering.
- Raking or cutting.
- Fixing inserts and openings at the correct line and level and at any stage to support the same at the directed height and place.
- Platforms if any to check forms while concreting is in progress.
- Filling and making joints watertight to the satisfaction of the Project Manager.
- Cleaning of the shuttering.
- Cleaning the complete floor immediately on deshuttering complete to enable the start of next activity.
- Cleaning and washing of the complete floor during and after concreting to avoid any damage to finished surface. It will be responsibility of the contractor to protect and retain all finished surfaces.

Should there be any laitance due to concreting of upper floors or other construction activities within the said floor the Contractor shall be responsible to do all that is required to bring the finish back to the original or as specified in the Technical Specification/ directed by the Project Manager.

No payment shall be made for temporary formwork used in concreting nor for formwork required for joints or buttheads, in floors or elsewhere whether such joints are to be covered late with concrete or mastic or other material.

2.4.9 Tolerances

Tolerance is a specified permissible variation from lines, grades or dimensions given in drawings. No tolerances are specified for horizontal or vertical encroachments beyond the legal boundaries. Unless otherwise specified, tolerances given in the following sections shall be permitted.

2.4.9.1 Tolerance for RCC Buildings

Variation from plumb should be as follows:

- In the lines and surface of columns, walls, and other vertical members, viz inside face of lift shaft, etc.
3 mm per 3.0 metre but not exceeding 10mm for the full height of the building.
- For exposed corner column and other conspicuous lines

In any bay up to 5 m maximum	3 mm
In 10 m or more bays	5 mm
- Soffits of slabs, ceilings and beams

2.5 m bays	3 mm
5.0 m bays	3 mm
10.0 m or more	10 mm
- Lintels, sills, parapets, grooves and other conspicuous lines

In any bay up to 5 m maximum	3 mm
In 10 m or more	5 mm
- Variation of the linear building lines from established positions in plan and related position of columns, wall and partitions

In bay up to 5 m maximum	5 mm
In 10 m or more	10 mm

- Deviation from dimensions of footing / foundation:
 - (i) Dimension in plan (+) 50mm
 - (ii) Eccentricity in plan: 0.02 times the width of the footings in the direction of deviation but not more than 50mm
 - (iii) Thickness: (+) 0.05 times the specified thickness.
 - (iv) Surface of foundation against ground: -5mm, +10mm
 - (v) Top surface of foundations, bases, piers: +5mm, -20mm
- Variation in sizes and location of sleeves, opening in walls and floors to be 5 mm (except for anchor bolts)
- Variation in cross-sectional dimension of columns and beams and thickness of slabs and walls -5 mm, +10 mm
- Variation in steps

In a flight of stairs	Risers	Treads
In flight of stairs	3 mm	5 mm
In consecutive steps	1.5 mm	3 mm

All the tolerances mentioned above shall apply to concrete dimensions only, and not to positioning of vertical steel or dowels.

2.4.10

Removal of Formwork:

Formwork shall not be struck until the concrete has reached a strength at least twice the stress to which the concrete may be subjected at the time of removal of formwork.

- Formwork shall be removed carefully without jarring the concrete and curing of the concrete shall commence immediately. Sudden shocks / vibrations during removal of wedges shall be avoided. Where finished edges have re-entrant angles, remove formwork as early as possible to avoid shrinkage cracks.
- Concrete surfaces to be exposed shall where required by the Project Manager, be rubbed with carborandum stone to give a smooth and even finish.
- Where concrete requires plastering or other finish later, the concrete surface shall be hacked as directed.
- No extra charge will be allowed to the Contractor for such work.

2.4.10.1

Minimum time Requirements

For other cements the stripping time shall be suitably modified in consultation with the Project Manager.

For precast moulds the stripping time shall be 24 hours.

Striking time shall be as follows:

Type of Formwork	Minimum period before striking (excluding the day of casting)
i. Walls, columns	12 hrs
ii. Vertical faces	12 hrs
iii. Removal of formwork with props fully left under spanning over 6m	7 days
iv. Between ribs not more than 1 to 2 m	7 days
v. Ribs, joists, beams, soffits	
- Up 3m clear span - Beams	7 days
- Between 3m to 6m - Beams	14 days
- Above 6m clear span beams	21 days
vi. One way floor slabs - up to 3m	7 days
vii. One way floor slabs - between 3m to 6m	10 days
viii. One way floor slabs - over 6m	14 days
ix. Beams and Girder Sides	12 days
x. Removal of props below slabs spanning over 6m	21 days

Striking of Formwork within the time limits listed above is subject to successful crushing of tubes compressive strength results. However re-shuttering and re-propping can be done if the required strength is attained as per the instructions of Structural Consultant / Project Manager.

2.4.11 **Cleaning and Oiling of Forms**

The contractor shall ensure that the surface of the forms that will touch the concrete shall be free from encrustations of mortar, grout, or other foreign material. Temporary openings shall be left at the bottom of formwork to enable sawdust, shavings, wire off-cuts and other foreign material to be removed from the interior of the forms before the concrete is placed. Compressed air shall be used to clean the complete formwork and remove all traces of duct and debris before pouring concrete the temporary holes shall then be closed.

The surface of the forms to be in contact with the concrete shall be coated with a reliable coating that will effectively prevent the adherence of concrete and will not stain the concrete surfaces. After each use, the surfaces of forms which have been in contact with concrete shall be cleaned of mortar and any other material sticking to them, then well wetted and treated with form oil approved by the Project Manager.

The Contractor shall provide commercial form release agent that will not bond with, stain or adversely affect concrete surfaces and will not impair subsequent treatment of concrete surfaces.

2.4.12 **Openings / Inserts**

Contractor shall provide all required openings, pockets, inserts as detailed in drawings. The Contractor shall provide required material and labour for fixing and supporting during concreting. In its quoted price, it is imperative to consider that all openings and pockets shall be deshuttered with care and all corners of openings shall be preserved, ie shall be in correct line and level. After concreting the openings shall be secured against any accident by proper covering and guard rail, warning notice, lighting, etc for which no extra cost is payable to the Contractor.

2.4.13 **Fair Face Finished Concrete**

Scope

These are additional requirements for fair faced concrete and includes all visible concrete surfaces that are not specified or called for on drawings as plastered, including foundations and edges of slabs on ground.

2.4.14 **Related work**

The contractor shall coordinate the work with masonry, electrical, mechanical, plumbing and other trades.

2.4.15 **Samples**

The contractor shall provide samples of fair face cast in place concrete colour finish showing the limits of colour variation. These shall be kept with the Project Manager for reference.

2.4.16 **Concrete**

The contractor shall ensure that only one brand of cement and only one source for aggregates is used throughout all fair face concrete work unless otherwise approved by the Project Manager. Limits of deleterious materials permissible in aggregates shall be as for aggregates listed in **clause 5.2**.

2.4.17 **Formwork**

The contractor shall ensure that plywood, metal and other approved panel type material joined to provide continuous, straight, smooth surfaces in the largest possible practical sizes to minimise the number of joints and to conform to the location of movement joints shown on the drawings. Timber is to be finished instead of rough sawn to provide the concrete finish tolerances specified below. Chamfer exposed edges and water drips where shown to produce straight smooth lines and tight edge joints. Tolerances for irregularities such as fins and offsets in the form finish are 5mm for abrupt changes in level and 10mm over 1500mm for gradual surface irregularities.

2.4.18 **Form Ties**

Form ties may be used to prevent form deflection. They shall evenly spaced for appearance. Form ties, steel reinforcement and tie wire to have sufficient cover as called for in clause 7.10 to prevent any spilling of concrete. The contractor shall provide form ties that, when removed will not leave holes larger than 25mm diameter in the concrete surface.

2.5 Flooring**2.5.1 Vacuum Dewatered Concreting & Flooring****2.5.1.1 Preparation**

1. The surface to receive flooring shall be clean, free from dirt and free from foreign material.
2. Any undulations or mortar remaining on the floor shall be trimmed.
3. Base course shall be trimmed.
4. The base shall be cleaned and watered before laying the floor.
5. Work includes at all depths and heights.
6. The finished surface shall be kept wet for a maximum period of one week.

2.5.1.2 Concreting**General**

1. Concreting shall have a concrete base of M20 of specified thick.
2. Flooring shall have hardtop on the concrete base.
3. Flooring shall be laid in strips, the size of which is mentioned on the drawings.

2.5.1.3 Materials

Cement	- Portland
Sand	- River sand
Aggregate	- Max. size 10 to 20mm
Water	- Potable
Nito hardener (Optional)	- @ 3kg/sqm
Poly Sulphide sealant	- At all control joints of size 10mmx6mm at every 200 sqm area

2.5.1.4 Execution

- a) Mix cement, sand and aggregates in proportion 1:1.5:3 thoroughly with water to get an appropriate consistency.
- b) Prepared concrete shall be laid immediately after mixing.
- c) The base shall be free from water and other foreign materials, dust and dirt.
- d) A coat of cement slurry of the consistency of thick cream shall be brushed on the surface of the base course.
- e) The concrete shall then be spread over this base evenly and leveled carefully.
- f) Low areas shall be filled with concrete and humps removed. Devacumisation shall be done for removing the voids.
- g) The whole concrete surface shall be leveled, compacted by ramming and trowelling.
- h) Prepared surface shall be allowed to set.
- i) **Hardener screed:**
 - Hardtop to be prepared as per the specifications with Nito hardner and one part of dry cement.
 - The heard top shall be provided over concrete base immediately after it is set, compacted and leveled with a steel trowel.
 - The surface shall be trowelled to bring the hardener coat to a leveled surface.
 - Excessive trowelling shall be avoided.
 - After the initial set, further compaction shall be done by steel trowelling.
 - Final brushing shall be made before the floor top becomes too hard.

2.5.1.5 Curing

1. Curing shall commence as soon as the surface is hard enough to receive the water.
2. The surface shall be covered with sacks or sand and shall be kept continuously wet for a period of at least one week.

2.6 Structural Steel**2.6.1 General****2.6.1.1 Description****2.6.1.1.1 Extent and Intent**

The contractor shall furnish all materials, labour operation, equipment, tools and plant and incidentals necessary and required for the completion of all metal work in connection items of metal work as called for in the drawings. The drawings and specifications cover the major requirements only. The supplying of additional fastenings, accessory features and other items not mentioned specifically herein but which are necessary to make a complete installation shall be a part of the contract.

Works Include anchorages in cast-in-situ concrete.

2.6.1.1.2 Related Work

- i. Grouting base plates and bearing plates
- ii. Metal fabricators
- iii. Roofing sheets

2.6.1.1.3 Applicable Standards

IS-226-1975	-	Structural Steel (standard quality) (fifth revision)
IS-456-1978	-	Code of practice for plain and reinforced concrete (third revision)
IS-696-1972	-	Code of practice for general engineering drawings (second revision)
IS-786-1967	-	(Supplement) SI supplement to Indian Standard conversion factors and conversion tables (first revision)
IS-812-1957	-	Glossary of terms relating to welding and cutting of Metals
IS-813-1961	-	Scheme of symbols for welding
IS-814	-	Covered electrodes for metal arc welding of structural steels: 814 (Part 1)-1974 Part 1 for welding products other than sheets (fourth revision)
IS-816-1969	-	Code of practice for use of metal arc welding for general construction in mild steel (first revision)
IS-817-1966	-	Code of practice for training and testing of metal arc welders (revised)
IS-819-1957	-	Code of practice for resistance spot welding for light assemblies In mild steel
IS-875-1964	-	Code of practice for structural safety of buildings: Loading standards (revised)
IS-919-1963	-	Recommendations for limits and fits for engineering (revised)
IS-961-1975	-	Structural steel (high tensile) (second revision)
IS-962-1967	-	Code of practice for architectural and building drawings (first revision)
IS-1024-1979	-	Code of practice for use of welding in bridges and structures subject to dynamic loading (first revision)
IS-1030-1982	-	Carbon steel castings for general engineering purposes (second revision)
IS-1148-1973	-	Hot-rolled steel rivet bars (up to 40 mm diameter) for structural purposes (second revision)
IS-1149-1982	-	High tensile steel rivet bars for structural purposes
IS-1261-1959	-	Code of practice for seam welding in mild steel
IS-1278-1972	-	Filler rods and wires for gas welding (second revision)
IS-1323-1962	-	Code of practice for oxy- acetylene welding for structural work in mild steel (revised)
IS-1363-1967	-	Black hexagon bolts, nuts and lock nuts (diameter 6 to 39 mm) and black hexagon screws (diameter 6 to 24 mm) (first revision)
IS-1364-1967	-	Precision and semi-precision hexagon bolts, screws, nuts and lock nuts (diameter range 6 to 39 mm) (first revision)
IS-1367-1967	-	Technical supply conditions for threaded fasteners (first revision)
IS-1393-1961	-	Code of practice for training and testing of oxy-acetylene welders
IS-1395-1982	-	Molybdenum and chromium molybdenum vanadium low alloy steel electrodes for metal arc welding (second revision)
IS-1477	-	Code of practice for painting of ferrous metals in buildings: 1477 (Part 1)-1971 Part 1 Pretreatment (first revision)(Part 2)-1971 Part 2 Painting
IS-1929-1961	-	Rivets for general purposes (12 to 48 mm diameter)
IS-1977-1975	-	Structural steel (ordinary quality) (second revision)
IS-2062-1984	-	Weld able structural steel (third revision)
IS-2155-1962	-	Rivets for general purposes (below 12 mm diameter)
IS-3613-1974	-	Acceptance tests for wire-flux combinations for submerged-arc welding of structural steels (first revision)

IS-3757-1972	-	High-tensile friction grip bolts (first revision)
IS-4000-1967	-	Code of practice for assembly of structural joints using high tensile friction grip fasteners
IS-5369-1975	-	General requirements for plain washers and lock washers (first revision)
IS-5370-1969	-	Plain washers with outside diameter 3 x inside diameter
IS-6419-1971	-	Welding rods and bare electrodes for gas shielded arc welding of structural steel
IS-6623-1972	-	High tensile friction grip nuts
IS-6649-1972	-	High tensile friction grip washers
IS-7205-1974	-	Safety code for erection of structural steel work
IS-7215-1974	-	Tolerances for fabrication of steel structures
IS-7280-1974	-	Bare wire electrodes for submerged arc welding of structural steels
IS-8500-1977	-	Weld able structural steel (medium and high strength qualities)

2.6.1.2

Shop Drawings

Include

- Shop drawings for trusses, bracings, purlins, columns, ties, base plates, crane girders, etc.
- Indicate profiles, sizes, spacing and locations of structural members, connections, attachments, fasteners, cambers, loads and designs of joints.
- Indicate welded connections using standard welding symbols and net weld lengths.
- Indicate the method of erection, shop and field joints.
- Indicate and identify all transportable parts and sub assemblies, associates with special erection instructions, if any.
- Provide design calculations for splices, joints, other details not specifically detailed in design drawings on fabrication drawings considering standard detailing practices and developing full member strengths.
- Submit 3 sets of shop drawings to Project Manager for approval.
- Allow three weeks for Project Manager to approve Shop Drawings.

2.6.2

Products

2.6.2.1

Materials

- Structural steel members.
- Structural tubing.
- Bolts, nuts and washers.
- Welding materials.
- Primer.
- Shear studs.

All metal materials shall be free from defects impairing strength, durability and appearance and they shall have structural properties that comply fully with the standards set out in clause 3 / 2.6.1.1.3, which follows. All ferrous metal shall be free from rust, scale and other defects. All non-ferrous metal shall have uniform finished surfaces, machined and buffed, free from defects. All sections shall conform accurately to sizes and shapes required.

2.6.2.2

Fabrication

- Fabricate structural steel members in accordance with IS Specifications 800 Section V and approved shop drawings.
- Defective material used shall be replaced by the Contractor.
- Fabricated items delivered at site shall be suitably protected from any damages.

2.6.2.3

Finish

- Clean, prepare and shop prime structural steel members. Do not prime surfaces to be field welded or bolted or in contact with concrete.

2.6.3

Execution

- Erect structural steel in accordance with IS Specifications.
- Make provision for erection loads and for sufficient temporary bracing to maintain the structure in proper plumb and in true alignment until completion of erection and installation of permanent bracing.
- Do not field cut or alter structural members without approval of Project Manager.
- After erection, prime welds, abrasions and surfaces not shop primed, except surfaces to be in contact with concrete.

- e. Members shall be cut mechanically by saw or shear or by oxy acetylene flame and not by electric metal arc.
- f. Cut edges shall be ground as per IS 823.
- g. Cutting tolerances shall be
 - Members connected at bolt ends: + or - 1 mm.
 - Other members: + or - 3 mm.
- h. All bolt holes shall be drilled and to the sizes specified in drawings.
 - Tolerance for spacing between two holes: + or - 1 mm.
 - Tolerance between two perpendiculars of any oval hole: + or - 1 mm.
 - Bolt holes for field joints shall be drilled in the shop to the required diameters and tested.
- i. Drilling holes for standard sizes if varies can be reamed to next higher sizes. The tolerance for hole reaming shall not exceed 15% of the total number of holes for one joint.

2.6.3.1 Preparation of members for welding

- a. Proper jigs and fixtures shall be used to ensure correct positioning of structural members during assembly.
- b. Sharp edges, rusting of cutting edges, notches, irregularities, and fissures due to faulty cutting shall be chipped and ground.
- c. Edge preparation for welding shall be done properly taking care of cleaning, providing dry surface, removing grease, dust or dirt, foreign matter, etc.
- d. Finished dimensions of structure shall be ensured after taking into account the shrinkage and distortions during welding.

2.6.4 Welding

2.6.4.1 Personnel:

- a. Welders shall be fully trained, experienced and certified by the recognised welding institutes.
- b. Welders' qualification tests shall be as per IS 823 and approved by Project Manager.

2.6.4.2 Execution:

- a. Welding shall be done in accordance with IS 823.
- b. Welded parts shall be marked with welders' identification.
- c. Protect the welded parts, electrode wires against wind and rain.
- d. Discontinued seams shall be melted before resuming welding operation.
- e. Welding seams shall be cooled slowly and not by any other quick methods.
- f. Before welding a second layer over the existing layer of weld, the layer shall be cleaned metal bright by light chipping and wire brushing.
- g. Execution shall proceed in strict compliance with Section 2/ 7 Safety Procedures.

2.6.4.3 Approval:

- a. Welded parts shall not have any deformations.
- b. Welded joints should compensate for contractions due to welding.
- c. Defective welds must be rectified.
- d. Weld seams shall correspond to design shapes and dimensions.
- e. Weld seams shall not have cracks, fusion, under cuts, rough surfaces, burns, blowholes, and incomplete penetration.
- f. Approval of finished elements, inspections and tests shall be as per Annexure

2.6.5 Bolting

2.6.5.1 Material

- a. Bolts, nuts shall be in accordance with IS 1367 and tested as per IS 1608.
- b. Washers shall be as per IS 2016.

2.6.5.2 Preparation

- a. Members shall be assembled for bolting with proper jigs and fixtures to sustain the assemblies without deformation and bending.
- b. All sharp edges, shavings, rust, dirt, etc. shall be removed before assembly.
- c. Before assembly the contacting surfaces of the members shall be cleaned and given a coat of primer.
- d. Temporarily the assembly shall be done and checked for co-axiality of the holes after which the assembly shall be finally bolted.

2.6.5.3

Execution

- Bolts shall be fixed after all the defects have been rectified and approved by Project Manager.
- Bolts shall be tightened from the centre of joint towards the edge.

2.6.5.4

Identification

- Structural members prior to dispatch for erection shall be marked with a weather proof light coloured paint. The size and thickness of members shall be so chosen as to facilitate easy identification.
- Structural members small in size shall be bundled or crated and shall be marked with metal tags for bundles and painted on crates for identification with particulars of the bundle / crate size, weight, etc.

2.6.6

Shop - approvals

2.6.6.1

Pre Assembly

2.6.6.1.1

Pre assembly of bolted structures shall be done for all elements as well as for the entire structure in conformity with the 'holes for field joints'.

2.6.6.1.2

Steel structures having same type of welding the shop test pre assembly shall be performed at least one member out of ten members.

2.6.6.2

Inspection

2.6.6.2.1

Contractor to provide facilities for Project Manager to inspect the steel assembly, welding, bolting, painting etc. at any time during fabrication of members.

2.6.6.2.2

Project Manager shall have the access to the fabrication shop at all times for satisfying himself regarding the fabrication of steel items to the drawings and specifications.

2.6.6.2.3

Shop approval by the Consultants / Project Manager is only mandatory.

2.6.6.2.4

Contractor to bear all the expenses for testing required by the Consultants / Project Manager for satisfying regarding the quality of workmanship.

2.6.6.2.5

Contractor to furnish necessary tools, gauges, instruments, technical and non-technical personnel for shop tests at his own cost.

2.6.6.3

Approvals

2.6.6.3.1

Intermediate approvals

- a. For part of the work that cannot be inspected later.
- b. For part of the work that will be difficult to perform inspection and even if done results are not satisfactory.

2.6.6.3.2

Partial approvals

- a. To the structural steel members and assemblies before the primer coat is applied.
- b. of materials used for fabrication.
- c. of test erection.
- d. of markings.
- e. of fillet joints.
- f. of plain surfaces.
- g. of special features such as rollers, etc.

2.6.6.3.3

Final approval

- a. To all elements and assemblies of steel structures after having a shop primer coat and ready for delivery.
- b. Includes partial approval
- c. Of shop primer coat.
- d. Of mode of loading and transport.
- e. Of storage of materials.

2.6.6.3.4 Approved Fabricators

All metal work fabricated shall be approved by the Structural Consultant / Project Manager. The entire work shall be carried out by workmen skilled in this kind of work in a shop fully equipped to carry out all phases of fabrication in accordance with the best-accepted trade practices.

2.6.6.4 Painting**2.6.6.4.1 Preparation:**

- a. Surface to receive primer coat shall be sand blasted / wire brushed, free of dust, oil, rust, etc.
- b. Surfaces not accessible to painting shall be filled with approved type of oil and putty.
- c. Surface shall be completely dry.
- d. Surfaces where water or aggressive agents may collect during transportation, storage, erection and operation shall be filled with putty and provided with drainage holes.
- e. Structural steel members are inspected and approved.
- f. Welds are approved.
- g. After satisfying the above criteria the surfaces are to be provided with one coat of red oxide / zinc chromate primer to the satisfaction of Project Manager before the material is dispatched for erection.

2.6.6.4.2 Do not prime the following areas:

- a. Surfaces to receive weld at site.
- b. Surfaces bearing markings.
- c. Surfaces as indicated in drawings.
- d. Planned surfaces shall receive a coat of hot oil or any approved resistant lubricant only.
- e. To coat the surfaces with hot oil to holes for links.
- f. To give a coat of cement wash for any members either embedded or in contact with concrete.
- g. To give a bituminous coat for members in contact with ground, gravel, brickwork and moisture.
- h. Contractor to give a further coat of red oxide paint after erection and placing in position of the assembly if called for by the Project Manager.

2.6.6.4.3 Packing, Transportation, Delivery:

- a. Structural steel members shall be marked and approved in shop before packing and loading for transportation.
- b. Adequate packing must be done for all the steel members to protect them against warping during loading and unloading.
- c. Suitable lifting devices to be used for loading and unloading.
- d. Additional steel bracing to be provided for all slender projecting members to prevent any warping during transportation loading and unloading.
- e. Loading and transportation shall be done as per the transportation rules.
- f. To provide additional splice joints where required in consultation with Consultants / Project Manager in case the members to be transported are beyond the limitations of transporting system.
- g. To secure all small parts including gusset plates fish plates by securing them with wire to their respective parts.
- h. To crate all bolts, nuts and washers.
- i. All structural parts to be delivered in the order required for construction and as per instructions of Project Manager and shall accompany the following documents.
 1. Quality and quantity of structure or members.
 2. Location of members in the structure
 3. Description of structure
 4. Identification number
 5. Building/job symbol

2.6.6.4.4 Storage and Preparation of Members Prior to Erection

- a. Place for storage of steel member shall be prepared in advance and got approved by the Project Manager.
- b. To provide concrete platform at the site for preliminary erection work.
- c. To verify the quality of material obtained at site and for workmanship to the specifications and drawings.
- d. To verify whether the parts obtained at site is free from defects due to loading, unloading transportation.
- e. To avoid warping of members during unloading by taking sufficient precautionary measures.

- f. To store the members as per the symbol and markings and in order of erection.
- g. To place the steel members at least 150mm above the platform on wooden or steel locks for protection against direct contact with ground and to permit drainage of water.
- h. To equip for rectification of members like straightening at site and to provide sufficient space for the same.
- i. To see that the parts are clean before erection.

2.6.6.4.5 Field Erection

- a) To get approvals of foundation, columns, column pedestals or other related structure on which the structural steel members are to be erected.
- b) To get approvals of the members receiving structural steel members regarding their levels, dimensions, alignments and verticality well in advance.
- c) To carry out any minor discrepancies at no additional cost.
- d) To get approvals of pockets, bolt locations, levels of base plates before erection.
- e) Erection to commence after satisfying the above conditions.
- f) Erection to be done in an organised way so that any individual member is not subjected to instability during the erection time.
- g) Precautionary measures to be taken during erection of trusses, purlins and other steel members by providing proper bracing.
- h) Faulty erections done without caring for safety of members and of personal shall be made good at no additional cost.
- i) Contractor is not relieved of his responsibilities, guarantees even after the Project Manager approves the fabrication, erection, etc., at any stage of work.
- j) Contractor is solely responsible for the correctness accuracy and quality of the fabrication, erection and final approvals to be obtained by the Project Manager.

2.6.6.4.6 Erection and Tolerance

- a. To check and inspect before, during and after erection.
 - 1. Damage during transportation.
 - 2. Alignment of structure.
 - 3. Erection sequence
 - 4. Progress
 - 5. Workmanship
- b. To erect members as per the predetermined plan approved by the Project Manager.
- c. To position and level the structure including aligning and to plumb the stanchion and fixing every member in position with bolts, erection bolts, weld as per design and drawings.
- d. To inform the Project Manager of any variation, deviation in location of foundations, anchor bolts which shall deviate the prefabricated members.
- e. Structural Consultants / Project Manager to give suitable solutions in case of above deviations well in advance for the contractor to proceed with the fabrication of members including any modifications necessary.
- f. Contractor to rectify any minor deviations in foundations, location of steel bolts and orientation of bolthole positions at no extra cost.
- g. To erect structural steel members ensuring that the system is stable against inherent weight, wind and any erection trusses.
- i. To anchor and fasten the erection joints after duly checking the plan, elevation positions of the members with reference to the drawings after the approval of Project Manager.
- j. To fasten bolts to the final position with bolt heads and nuts resting on the member and on tapered washers with members having a sloping surface.

2.6.6.4.7 Final Acceptance and Handing Over the Structure

- a. Contractor to submit As-built shop drawings for the approval of the Structural Consultant / Project Manager, as per the stipulation given in Conditions of Contract.
- b. Documents to be submitted for final acceptance are as follows:
 - 1. Shop acceptance drawings
 - 2. Quality certificate for structural members, plates, flats, bolts.

3. Quality certificate for material used for fabrication including electrodes, welding wire, bolts, nuts, washers, etc.,
4. List of welders who welded the structures and their certificates for having undergone a welding course.
5. Acceptance and intermediate control procedure adopted during the process of fabrication, assembly, transportation, delivery and erection of structure.

2.6.7 Measurements

- a. Payment of structural steel members including bolts, nuts, washers, gusset plates, etc., will be done on weight basis.
- b. The weight of members will be assessed from the final fabricated and approved drawings and the respective Bill of Materials prepared by the Contractor and approved the Structural Consultant / Project Manager.
- c. The weight of members shall be as per IS handbook.
- d. Sections different than mentioned in IS handbook shall be taken as per manufacturers' information.
- e. No rolling tolerance will be allowed.
- f. Built up of members will be paid as per the actual weight of the members.
- g. Gusset plates shall be paid to the nearest rectangle enclosing the shape and no deduction shall be made for any skew cuts.
- h. Welds, bolts, anchors, washers, etc will not be measured and paid for separately.
- i. Payment do not include any other related temporary works connected with this work including welds, shims, wedge plates, etc.
- j. Rates to include any trimming, straightening, edge preparation, preparation and approval of shop drawings, and one coat of red oxide / zinc chromate primer and also including any handling, rehandling, loading and unloading, transportation to the site of work and returning surplus material to the Project Manager at the place requested by him.
- k. Rate to include necessary scaffolding, temporary support, tool and tackles, touching up primer coat grouting etc.

2.6.7.1 Grouting

- a. To level, align and plumb the structural steel work and the base of stanchions by providing steel shim plates.
- b. To align anchor bolts in foundation to the required level, location and orientation by using templates.
- c. To clean the underside of base plates, pockets to receive grout by using compressed air.
- d. To use cement mortar 1:2, 1 of cement and 2 of sand, non-shrink grout under base plates.
- e. To use grade M 30 concrete to fill up the grout pockets left for fixing anchor bolts.
- f. To pour the grout under a sufficient head and tam until the voids are thoroughly filled and the grout overflows.

2.6.7.2 Tolerances

- a. Steel work for line and level $\pm 3\text{mm}$
- b. For structural steel for plumb 3.5mm for 10M and not more than 7mm for 30M
- c. To follow any tolerance criteria provided on the drawings.
- d. To provide tolerances for all structural steel members as per IS code other than what is mentioned in a, b and c.

ANNEXURE - A

Inspection of test	Coverage	Procedure	Evaluation findings & remedy of Defect
Inspection of weld seam	All welds	Naked Eye or	All faulty welds shall be

		Lens	rectified
Checking of Sizes	At least one for each Weld	Ordinary measuring instruments (rule, templates)	Should faulty weld be found all welds shall be checked & all defects shall be rectified.
Mechanical tests for welding procedure Performance & electrodes		As per IS: 823	

ANNEXURE - B
INADMISSIBLE WELD DEFECTS AND TOLERANCE ALLOWED FOR WELDS

Defects	Detailing of sketching of defect	Allowed tolerances & remedy of defects	Cause of defects	Mode of finding defects
Unsatisfactory appearance	Uneven width rugged seam	At discretion cut weld & reweld	Uneven welding progress, voltage fluctuations, varying arc length, negligence inexperienced welded	External (visual inspection)
Unsatisfactory shape	Shallow or jutting welds	No variance from design shape shall be allowed	Negligence	Visual inspection template checking
Incomplete weld		Not allowed fill in weld		Template checking
Molten metal flow		Not allowed fill in weld wrong	Excessive melting, ions handling of electrodes	Visual inspection
Pits	Not allowed cut & reweld		Wrong welding technique	Visual inspection
Surface cracks		Not allowed cut & reweld	Grerat stresses, sudden cooling, wrong type of electrodes	Visual inspection
Incorrect sectional dimensions		B1 = $\pm 2\text{mm}$ B2 = $\pm 2\text{mm}$ B = $\pm 1\text{mm}$ C = $\pm 1\text{mm}$ Chisel & grid	Negligence	Template checking
A) Depth weld				
Insufficient	For weld lengths 11+5mm, for 12+10mm for shorter seams cur & reweld or complete to length		Negligence	Rule checking
Back cuts	If 0.5mm for 10mm & C1mm for 10mm replace relevant members		Burnt material, excessive melting	Visual inspection
Surface porosities	Max 5% of seam area cut & re-weld		Frequent interruptions or welding electrodes inadequately covered	Visual inspection

2.7 Masonry**2.7.1 Block Work****Relevant Indian Standards**

The Standards to be followed are:

IS 264	Specification for Ordinary and Low heat Portland Cement
IS 383	Specification for Course and Fine Aggregate for Cement
IS 455	Specifications for Portland Slag Cement
IS 456	Code of Practice for Plain and Reinforced Cement Concrete
IS 2185	Specification for Cement Concrete Block
IS 2572	Code of practice for Construction of Concrete Walls
IS 9103	Specification for Admixture of Concrete

Concrete blocks (hollow or solid) shall generally conform to IS:2185. Blocks shall be regular in size and shape and shall be of specified strength. Blocks shall be properly cured before they are brought to site.

Half or three quarter size blocks are to be used wherever required to make up length of wall and broken blocks shall not be used. The texture of the blocks shall be such that plaster will adhere to it. They shall be sound, free from cracks, honeycombing, broken edges and other flaws. They shall have plane rectangular faces with parallel sides and sharp straight angled edges. They shall have a fine, compact, uniform texture and thoroughly dried. The sub-contractor shall supply samples for approval. Blocks supplied shall conform to approved samples.

2.7.1.1 Dimensions

The size of hollow blocks shall be as specified in the item of work. The maximum variation in dimensions shall not be more than +1.5mm in ht. and breadth and +/- 3mm in length.

2.7.1.2 Handling And Storage

The sub-contractor is responsible for transporting hollow concrete blocks in such a manner that the units are adequately protected during transportation. The units shall be handled in a manner which will prevent soiling, chipping or damage of any kind. Broken, chipped or otherwise damaged units will be rejected and shall not be used in the work. The blocks shall be stored in neat piles free from contact with ground, which shall be located to avoid being disturbed or damage by construction activities.

2.7.1.3 Sampling

A sample of 20 blocks shall be taken from every consignment of 5000 blocks of the same size, batch and manufacturer for conducting tests.

All 20 blocks shall be checked for dimension and inspected for visual defects. Out of the 20 blocks, 3 blocks shall be subjected to test for block density, 8 blocks for compressive strength, 3 blocks for test of water absorption, 3 blocks for drying shrinkage and rest for moisture movement. Block shall be approved if requirement of conditions mentioned in 11.2 to 11.5 of IS:2185 Part 1 are satisfied.

All Blockwork to be painted or plastered or to remain exposed in the finish shall be equal to the approved samples.

2.7.1.4 Tolerances in Blockwork

Maximum variation in the dimensions shall not vary by 5% in length and 3% in width and height.

2.7.1.5 Preparatory Work

Wetting of blocks

The blocks need not be wetted before or during laying in the walls. In case the climatic conditions so require, the top and the sides of the blocks may only be slightly moistened so as to prevent absorption of water from the mortar and ensure the development of the required bond with the mortar.

2.7.1.6 Laying Concrete Block Masonry

Each block shall be set with bedding joints and vertical joints filled thoroughly. The wall shall be taken up truly plumb. All courses shall be laid truly horizontal and vertical joints truly vertical. Vertical joints

in alternate courses shall come directly over the other. Thickness of the block courses shall be kept uniform.

Necessary tools comprising of wooden straight edge, mason's spirit level, square, foot rule, plumb line and pins etc. shall be frequently and fully used by the masons to ensure that the walls are taken up true to plumb line and levels. All the connecting block masonry work shall be carried out at nearly one level and no portion of work shall be raised more than 1m above the rest of work. Any dislodged block shall be removed and reset in fresh mortar.

The construction of walls may be started either at the corners first, or started from one end and proceeding in the other direction. If the corners of the walls are built first, they shall be built four or five courses higher than the centre of the walls. As each course is pre-laid at the corner, it shall be checked for alignment, level and for being plumb to ensure truly straight and vertical walls. Each course in building shall be stepped back by half block and the horizontal spacing of the block shall be checked by placing a mason's level diagonally across the corners of the block, the mason's line shall be stretched from corner to corner for each course and the top outside edge of each block shall be laid to this line. Handling or gripping the block shall be such as to position the block properly with minimum adjustment. Mortar shall not be spread too far ahead of actual laying of the block that it tends to stiffen and lose its plasticity.

2.7.1.7 Closure Block

When installing the closure block, all edges of the opening and all four vertical edges of the closure block shall be buttered with mortar the closure block shall be carefully lowered into place. If any of the mortar falls out leaving an open joint the closure block shall be removed, fresh mortar applied and the operation.

2.7.1.8 Joints

Horizontal (bedding) joints

Mortar shall be spread over the entire top surface of the block including front and rear shall as well as the webs to a uniform layer of 10mm thickness.

When filling in the wall between the corners Vertical (cross) joints for vertical joints, mortar shall be applied on the vertical edges of the front and rear shall the blocks. The mortar shall be applied on the edges of the succeeding unit when it is standing vertically and then placing it horizontally well pressed against the previously laid unit so as to provide well compacted vertical joints. In the case of two cell blocks, depression on either vertical sides shall also be filled with mortar.

The thickness of both horizontal and vertical joint shall be not more than 10mm. All face shall be raked to a minimum depth of 10mm by raking tool when the mortar is still green. Where pointing or plastering is not required to be done, the joints can be struck flush and finish at the time of laying, such decision lying solely with the Project Manager. The face of concrete block masonry shall be kept cleaned and all mortar droppings removed promptly.

Provision for doors and windows frames. A course of solid concrete block masonry shall be provided under doors and window openings or a 10cm thick precast concrete sill-block under windows. The solid course shall extend for at least 20cm beyond the opening on either side. For jabs of doors and windows, either solid concrete blocks shall be provided or if hollow units are used, the hollows shall be filled with cement concrete 1:2:4

All block work shall be plumb, square and properly bonded. The joints shall be broken. The thickness of the courses shall be uniform with courses horizontal. All connected work shall be carried out at nearly one level and no portion of the work shall be left more than one course lower than the adjacent work.

Blocks shall be full height and no cut pieces shall be allowed.

Where blocks are to be used for load bearing walls, the uppermost layer of the blocks supporting slab or other structural members, shall be solid or treated as directed by the Project Manager.

Precast concrete screen blocks or 'jali' work may be used for decorative purposes. The sub-contractor shall furnish samples for approval.

Fire Stop: Has to be provided for top of partition and duct penetration.

2.7.1.9 Scaffolding

Independent double scaffolding free of the masonry work shall be provided. It shall be tied back in both directions. Planks shall be provided all around. Railing to outside faces shall be provided. Scaffolding must be strong & easy to maintain. Holes in masonry to support scaffolding will not be permitted.

2.7.1.10 Protection

Maintain protection against entry of moisture into blockwork when stored and whenever work is interrupted.

Exposed ledges are to be protected. External corners must be protected which may be damaged by construction activities.

2.7.1.11 Cleaning and Pointing:

Smooth finished blockwork to be cleaned by means of scrapes or stoning. Acids should not be used for cleaning.

Any loose or open joints are to be pointed as required. Replace finishes and materials that cannot be satisfactorily cleaned.

2.7.1.12 Measurements:

Solid Cement Concrete block work shall be measured in square meters for specified width. Rates for items shall include the following:

- Material and labour for the completion of items as specified including any centering, shuttering, curing etc
- Raking out joints
- Preparing tops and sides
- Forming and preparing expansion joints, construction joints, contraction joints
- Making holes, openings etc for outlets, embedding pipes and finishes
- Exposed surfaces as instructed by the Project Manager.

Deductions such as lintels and openings shall be measured for net sizes of all such openings and recesses for 0.1 square meter and over.

2.8 Plastering Work**Relevant Bureau of Indian Standard Codes (BIS)**

The Standards to be followed are:

IS 383	Specification for Course Aggregate and Fine Aggregate
IS 412	Specification for Expanded Metal sheet for General Purpose
IS 1542	Specification for Sand and Plaster
IS 1661	Code of Practice for Application of Cement Plaster Finishes
IS 2645	Specifications for Integral Cement Waterproofing Compound

The sub-contractor shall furnish all materials, labour, scaffolding equipments, tools, plant & incidentals necessary and required for the completion of all plaster and wall finishes, subject to approval by architect/contractor/consultant.

2.8.1 General

Plaster as herein specified shall be applied to all internal and external surfaces where called for. Glazed tile dado, terrazzo dado and other wall finishes shall be provided where indicated on drawings and schedule of finishes. Areas called for on drawings and typical shall be considered to apply to appropriate adjoining areas whether shown on same drawings or not and whether indicated or not.

All plaster work and other wall finished shall be executed by skilled workmen in a workmanlike manner and shall be of the best workmanship and in strict accordance with the dimensions on drawings subject to the approval of the architect/contractor/ consultant.

2.8.2 Plaster Work

The primary requirement of plaster work shall be to provide absolutely water tight enclosure, dense, smooth and hard and devoid of any cracks on the interior and/or exterior. The sub-Contractor shall do all that is necessary to ensure that this objective is achieved. All plastering shall be finished to true plane, without any imperfections and shall be square with adjoining work and form proper foundation for finishing materials such as paint etc.

Masonry and concrete surfaces which call for applications of plaster shall be clean, free from efflorescence, damp and sufficiently rough and keyed to ensure proper bond, subject to the approval of the architect/contractor/consultants.

Wherever directed by the Project Manager, all joints between concrete frames and masonry in filling shall be expressed by a groove cut in the plaster. The said groove shall coincide with the joints beneath as directed. Where grooves are not called for, the joints between concrete members and masonry in filling shall be covered by 24 gauge galvanised chicken mesh strips 400mm wide or as called for on drawings/documents which shall be in position before plastering.

2.8.3 Chasing & Breakage

All chasing, installations of conduits, inserts boxes etc., shall be completed before any plastering or other wall finish is commenced on a surface. No chasing or cutting of plaster or other finish on a surface shall be permitted, broken corners shall be cut back not less than 150mm on both sides and patched with Plaster of Paris as directed. All corners shall be rounded to a radius of 8mm or as directed by the Project Manager.

2.8.4 Samples

Samples of each type of plaster & other wall finish shall be prepared well in advance of undertaking the work for approval by the Project Manager. The Contractor shall also prepare Method Statement for plastering works.

2.8.5 Material:

Cement and Water shall conform to the respective Specification described under the section on Concrete of this volume. Sand shall conform to IS : 1542, specifications for sand plaster aggregate shall conform to IS :383, except that it shall be sieved so that it does not contain particles greater than 1/8" and shall be carefully washed.

Sand from beds of rivers carrying saline water is not be used.

Marble dust obtained from crushing of hard marble shall not contain more than 8% of silt determined by field test. Fineness Modulus shall be greater than 1.0. Integral waterproofing compound shall conform to IS :2645.

2.8.6 Workmanship:

Mixing shall be done mechanically. Each mortar batch shall be within half-hour.

Surfaces to be plastered must be clean and free from dust, loose material, oil grease, mortar droppings, sticking of foreign matter, traces of algae etc. It is very important to ensure that there should not be any chance of plaster getting debonded due to material harmful to bonding.

Raking out joints is expected to be carried out along with masonry but it should be checked thoroughly so as to receive good key.

Walls (concrete, brick or stone) should be sufficiently damp prior to plastering. Water from plastering mortar must not be absorbed by masonry under any condition.

Any unavoidable projection in masonry and concrete surfaces shall be chiselled back. Care shall be taken that surrounding surfaces are not damaged and reinforcements not exposed.

All angles and arises must be finished straight, fine and sharp. Thickness of one coat should not be more than 15mm or less than 8mm for single coat of finished plaster.

Method of application is important and hence it is recommended to throw mix on the surface rather than stuck with a trowel. This enhances the adhesion.

The plaster shall be finished with this layer of cement smooth finish. The plaster surface shall be combed with wire brushes.

Scaffolding should be rigid allowing free and safe movement on the platform and it should be at sufficient distance or height from the working areas.

Scaffolding with railing gives more confidence to workers and increases quality of work.

Actual plastering work shall be undertaken only on the approval of the Project Manager. Following steps should be adopted prior to plaster:

- Surface of application should be thoroughly cleaned.
- Plaster Area must be provided with level dabs or spots allowing working and checking with 2-3 m straight edge. Depth of plaster must not be than 8 mm at any point.
- Required concealing services must be completed and tested.
- No further cutting of masonry will be required.
- Repairs carried out to masonry or concealed services must be cured and dry.
- Surface must be sufficiently damp
- Chicken wire mesh to be put in junctions of masonry and concrete abutments.
- Corner beads and angle stops finished to line and level (measured and paid for separately)

Plastering of entire or unobstructed areas shall be done at one stretch. On occasions when as a result of the extent of the area being too large, or other reason, the work is to be left over for completion on the next morning day. The work to be carried out in such a manner as to have no marks left on the finished work, and joints are to rubbed with carborundum stone to give an even surface without any impression.

Plastered surface shall be cured for 14 days by wet curing. During this period, plaster shall be protected from exposure to extreme temperature and weather.

Plaster shall be lined and leveled with aluminum hollow sections, 2 - 3 m long. There shall not be more than 2 mm difference in level when checked with a 3 m straight edge. Finishing of plaster may be carried out with wooden or metal floats. Thickness shall be as specified in BoQ and Specifications.

All works shall be executed as per Method Statement approved by the Project Manager.

If any marks develop during the Defects Liability Period as defined in the General Conditions of Contract, the Contractor shall rectify the same and make good the surface disturbed at its own cost.

The items relating to plastering in the Bill of Quantities apply to all positions, locations and all the different kinds of surfaces of which the work is to be executed on all floors and heights. The Contractor is to include for small or scattered work, difficult portions and the need for double scaffolding for executing the work up to any height.

2.8.7 Lime for Rendering

This wall be prepared out of best quality fat lime slaked at site with fresh water not less than one week or more than two weeks before use. All impurities, ashes, improperly burnt stuff shall be screened and picked out before slaking. Slaked lime shall be screened through to remove all un-slaked materials, stones etc., so that only a fine creamy paste is available for rendering. Slaking lime is diluted with just sufficient water to give a thick consistent liquid suitable for effective covering of base surface. Before the base coat sets the lime rendering is applied and finished smooth and the entire plastered surface is truly plane.

2.8.8 Measurement of Plastering works:

Plasterwork shall be measured in square meters of the actual work done to the second place of decimal.

No paint, distemper, colour wash or white wash shall be applied to the plastered surfaces for at least two months or until the Contractor has satisfied the Project Manager that the walls and plaster are thoroughly dry.

Thickness of plaster shall be minimum depth of plaster as specified. But if extra thickness occur due to bad workmanship or bad quality of bricks, they shall be to the Contractor's account.

2.8.8.1 Nothing extra will be paid for work in arises, rounded angles, fair edges, narrow returns, splays, drip mouldings, making good around pipes, conducts, cills, brackets, railings etc. “V-joints”,
Deductions:

No deductions shall be made to opening of area less than 0.5 sqm.

2.8.8.2 **Rates to include**

Rates shall include wherever necessary, conveyance, delivery, handling, unloading, storing, fabrication, hoisting, all labour for finishing to required shapes and sizes, setting, fitting and fixing in position, straight cutting and other incidentals.

- Execution of work at all levels and heights as shown in drawings and specified.
- Preparation of Surfaces
- Protection of masonry, if required
- Protection of other finished surfaces.
- Providing, fixing, maintaining and removing the same on completion
- Scaffolding and working platform
- Curing
- Cleaning of adjacent areas, windows, doors etc
- Forming grooves
- Providing and fixing angle stops and corner beads (measured and paid separately)
- Providing and fixing chicken mesh at junctions of RCC, brick, blockwork edges, corners, repaired areas, concealed conduits etc as directed by the Project Manager. It shall be considered as a part of item and no separate charge will be payable.
- Edges of switch boxes, junction boxes and other services and fittings shall be finished next at no extra charge.
- Labour and material
- Raking out joints
- Hacking and hatching the concrete surface and providing the key for holding down the plaster
- Watering

2.9 External Plastering and Pointing**2.9.1 Indian Standards**

All relevant standards as specified elsewhere in this volume are applicable

Indian Standards to be followed are:

1.	IS 383	Specification for coarse and fine aggregates for natural sources for concrete
2.	IS 412	Specifications for expanded metal steel sheets for general purposes
3.	IS 1542	Specifications for sand for plaster
4.	IS 1635	Code of practice for field slaking of building lime and preparation of putty
5.	IS 1661	Code of practice for application of cement and cement-lime plaster finishes
6.	IS 2394	Code of practice for application of lime plaster finish
7.	IS 2402	Code of practice for external rendered finishes
8.	IS 2645	Specifications for integral cement water proofing compound

2.9.2 Materials

Cement, lime, surkhi, water shall conform to the respective specifications of Section II: (Concrete and Mortar) of this volume.

Coloured cement may be either ready-mixed material or may be obtained by mixing pigments and cement at site. The pigments to be mixed with cement shall conform to Appendix "A" of IS 2114 code of practice for laying in-situ Terrazzo Floor Finish.

Sand shall conform to IS 1542 specification for sand and plaster. For white or coloured rendering, only quartz or silica sand shall be used. For textured finishes produced by treatment of freshly applied final or finishing coat with a tool coarser, particles used shall be screened through 3.35 mm IS sieve or 2.36 mm IS sieve. For torn texture a slightly larger portion of material coarser than 4.75 mm IS sieve shall be used.

Aggregate shall conform to IS 383.

Marble dust obtained from crushing of hard marble stone shall not contain more than 8% of silt determined by field test. Fineness modulus shall be greater than 1.0.

Integral water proofing compound shall conform to IS 2645 (specification for integral water proofing compound).

2.9.3 Workmanship**2.9.3.1 Preparation of mortar mix**

2.9.3.1.1 The material used in preparation of plastering mixes shall be measured by volume using gauge-boxes for by weight.

2.9.3.1.2 When cement is measured by weight, 1440 kg of material shall be taken equivalent to one cubic meter.

2.9.3.1.3 Mix proportion of lime, unless otherwise stated, generally refers to the volume of lime putty
2.9.3.2 Mixing

- 2.9.3.2.1 Mixing shall be done mechanically or manually if approved by the EIC. Machine mixing shall be preferable to hand mixing for cement mortar. Each mortar batch shall be used within half an hour. Hand mixing shall be carried out on a clean, watertight platform. The mixing operation shall be continued with addition of necessary quantity of water until a uniform appearance and consistency of mortar is obtained.
- 2.9.3.3 Cement-lime or cement-sand-mortar shall be prepared as follows:
- Lime putty and sand shall be mixed first and kept from drying out. Cement shall be added as and where required and mixed with water if necessary to the minimum extent to give a working consistency for the plaster.
- If fine sand is used, cement and sand shall be dry mixed first. Lime putty, thinned with water, shall be added to the mixer and mixed until a satisfactory mortar obtained
- Cement and sand shall be mixed dry in required proportion to obtain a uniform colour, and water shall then be added to get the required consistency for the plaster.
- 2.9.3.3.1 Surfaces to be plastered must be clean and free from dust, loose material, oil, grease, mortar droppings, sticking of foreign matter, traces of algae, etc. It is very important to ensure that there should not be any chance of the plaster getting debonded due to presence of materials harmful for bonding.
- 2.9.3.3.2 Raking out of joints is expected to be carried out alongwith masonry but it should be checked thoroughly so as to receive good key.
- 2.9.3.3.3 Walls should be sufficiently damp prior to plastering. Water from plastering mortar must not be absorbed by masonry under any condition.
- 2.9.3.3.4 Any unavoidable projections in masonry and concrete surfaces shall be chiseled back. Care shall be taken that surrounding surfaces are not damaged and reinforcement is not exposed.
- 2.9.3.3.5 Thickness of one coat should not be more than 12mm and less than 8mm for single coat finished plaster.
- 2.9.3.3.6 In case of multicoat plaster, sufficient time shall be allowed for the undercoat to harden (cured, dried and shrunk properly) before subsequent coats are applied.
- 2.9.3.3.7 Undercoats shall be scratched or roughened before they are fully hardened to form a mechanical key.
- 2.9.3.3.8 The method of application is also important and hence it is recommended that the mix be thrown on the surface rather than stuck with trowel. This increases the adhesion.
- 2.9.3.3.9 Scaffolding should be rigid, allowing free and safe movement on the platform and it should be at sufficient distance or height from the working areas. Scaffolding with railing gives more confidence to workers and increases the quality of work.
- 2.9.3.3.10 Actual plastering shall be undertaken only on the approval of the Plaster work should only follow the steps mentioned below:
- Surface must be thoroughly cleaned
 - Plaster area must be provided with level dabs or spots allowing working and checking with 2-3 straight edge. Depth of plaster must not be less than 8mm at any point
 - Required concealing services must be completed and tested
 - No further cutting of masonry must be required
 - Repairs carried out to masonry or concealing work must be cured and dry
 - Surface must be sufficiently damp
 - Plaster dabs are checked for plumb and level
- 2.9.3.3.11 Corners, external or internal, shall be finished along with final coat. It is advisable to have rounded corners.
- 2.9.3.3.12 Plaster shall be cured for 14 days by wet curing. During this period plaster shall be protected from exposure to extremes of temperature and weather.
- 2.9.3.3.13 Plaster shall be leveled and lined by aluminium hollow section 2.3 m long. (This will give even and leveled surface). There shall not be more than 2mm difference in level when checked with 3m straight edge. It is important that enough pressing and beating is done to achieve compact filling of joints and that the area is fully compacted.

- 2.9.3.3.14 Finishing of plaster may be carried out with wooden float (randhas) of trowelled smooth with sheet metal trowels as specified. Care shall be taken to avoid excessive trowelling and overworking of the wooden float.
- 2.9.3.3.15 All corners, internal or external, shall be truly vertical or horizontal. These shall be finished with a proper template to achieve best workmanship for rounding and chamfering as specified or directed.
- 2.9.3.3.16 Plaster shall be cut to correct horizontal or vertical line at the end of the day or if work requires to be suspended for any reasons.
- 2.9.3.3.17 It is advisable to limit the area of plaster to 15 sqm to avoid cracks due to thermal movements of dissimilar material in contact. It is advisable to provide joints treated with groove or any other details as suggested by the Architect. These joints if not specified shall be treated with 150mm wide reinforcing chicken mesh (approved by the EIC) fixed over joints by GI nails and the area plastered.

2.9.4 Type of Plaster

- 2.9.4.1 The surface shall be allowed to harden sufficiently for sponging operation. Sponging shall be done by dipping sponge in cement water and removing fine particles and exposing large sand particles. The movement or sponge shall be such that no patches develop nor is excessive material removed from the surface. There shall not be a difference or more than 7mm when checked with 2mm long straight edge.

2.9.5 Pointing

- 2.9.5.1 Pointing shall be done as soon as possible to achieve a good bond in the raked joint. Surface preparation shall be the same as specified in clause 3 above. Mortar shall be prepared as detailed in section 2. Minimum depth of mortar in joint shall be 10mm. Mortar shall be set in or pressed into the raked joint with a pointing trowel. Care shall be taken not to spread the corner edges or surface of masonry. It shall be further finished with a pointing tool. Pointing shall be cured for 7 days by hosing water.

2.9.5.2 Types of Pointing

2.9.5.2.1 Flush Pointing

The mortar shall be pressed into the joints and shall be finished, flush and leveled. The edges shall be neatly trimmed with a trowel and straightened.

2.9.5.2.2 Cut or weather struck pointing

The mortar shall first be pressed into joints. The top or horizontal shall be pressed back 3mm with the pointing tool so that the joint is sloping from top to bottom. The vertical joint shall be ruled pointed. Vertical and horizontal joint lines shall be at true right angles.

2.9.6 Measurement

- 2.9.6.1 Plaster and pointing work shall be measured in square meter to the second place of decimal.
- 2.9.6.2 Thickness of plaster shall be the minimum depth of plaster as specified. But if extra thickness occurs due to bad quality of bricks stones or blocks or due to bad workmanship, the repairs required to be carried out shall be at the cost of contractor.
- 2.9.6.3
- Grooves, pattas in continuation of large areas or plaster areas shall be considered as part of the plaster and not measured separately.
 - Isolated areas and width below 300 mm shall be specified and detailed separately in the BoQ and measured in running meter.
 - Ceiling plaster, including ribbed beam slab shall be measured in square meter.
 - Beams and columns in continuation of masonry shall be measured in square meter.
- 2.9.6.4 Jambs, sills, coves, cornices, etc shall be a part of plaster and no separate payment shall be made towards these items.
- 2.9.6.5 Deduction
- Deduction for an opening in plaster shall not be for area less than 0.5 sqm. Same shall be applicable for pointing

- b) In case the opening area is 0.5 sqm to 3.0 sqm only 50% area shall be deducted from each face. Same shall be applicable for pointings.
- c) In case the width of door or window frames are equal to masonry, full area of opening shall be deducted

2.9.7 Rates to Include

- 2.9.7.1 Description of item in the BoQ, unless otherwise stated, includes, wherever necessary, conveyance and delivery handling, unloading, storing, fabrication, hoisting, all labour for finishing to required shape and size, setting, fitting and fixing in position, straight cutting and waste, return of packings and other incidental charges
- 2.9.7.2 Levels and heights shall be as indicated in the drawings.
- 2.9.7.3 Preparation of surface shall be approved by the Client's Representative.
- 2.9.7.4 Trimming off the projections on masonry shall be included in the price.
- 2.9.7.5 Scaffolding and working platform shall be included in the price.
- 2.9.7.6 Materials as detailed and as required to complete item as specified shall be included in the price.
- 2.9.7.7 Curing of plaster or pointing shall be included in the price.
- 2.9.7.8 Cleaning of adjacent areas, windows, doors frames, etc. including masonry surface in exposed masonry work, shall be included in the price.
- 2.9.7.9 Forming grooves, for joints, between beams / columns and masonry etc. shall be included in the price. Any special treatment if detailed shall be measured separately and billed in BoQ.
- 2.9.7.10 Providing and fixing chicken mesh at junction of RCC brick work, edges, corners, chiseled and repaired brick work prior to plaster over concealed conduit, etc. shall be directed by the Client's Representative; the same shall be considered as part of item and no separate charge will be payable.

2.10 BRICK MASONRY

2.10.1 General

Brick Masonry shall consist of all work required in connection with constructing brick masonry at locations shown on drawings including, but not limited to, furnishing brick, Portland cement and sand for mortar and all other materials, and mixing, placing brick masonry as per bill of quantities

2.10.2 Materials

- i) All Portland cement for mortar shall be furnished by the contractor and shall confirm to the applicable requirements specified in section 2.9
- ii) All sand for mortar shall be furnished by the contractor and shall confirm to the applicable requirements for sand specified in section 2.9
- iii) All water used in manufacture of bricks and in preparation of mortar shall be free from objectionable quantities of silt, organic matter, alkali, salts and other impurities, and will be tested and approved by the PMC/ ENGINEER-IN-CHARGE as per the guidelines of IS:456

2.10.3 Mortar

i) MIX: Mortar for all brick masonry, except where otherwise specified by the PMC/ ENGINEER-IN-CHARGE, shall consist of one part cement to six parts of damp loose mortar sand by volume for brickwork 230mm and above. For brick piers, half brick walls, honey-combed brickwork and hollow (cavity) walls, mortar mix shall consist of one part cement and four parts of sand. Quantity of water shall be just sufficient enough to produce proper consistency for the intended use. Where directed and approved by PMC/ ENGINEER-IN-CHARGE, hydrated lime putty shall be added to the mortar for increased workability. The putty shall, however, not exceed 25% by volume of dry cement.

11) Methods and equipment used for mixing mortar be such as will accurately determine and control the amount of each separate ingredient entering into the mortar and shall be subject to the approval of the PMC/ ENGINEER-IN-CHARGE. Mortar shall be mixed only in sufficient quantities for immediate use and all mortar not used within 30 minutes after addition of the water to the mix shall be wasted. Re-tempering of mortar will not be allowed. The mixers shall be thoroughly cleaned and washed at the end of each day's work.

2.10.4 BRICK.

i) All bricks shall be of first class quality made from good brick earth, free from saline deposits and shall be sand moulded. They shall be thoroughly burnt without being vitrified, shall be regular, uniform in shape and size with sharp and square edges parallel faces and of deep red or copper colour. First class bricks shall be homogeneous in texture and emit a clear ringing sound when struck, and shall be free from flaws, cracks, chips, stones and nodules of lime. First class brick in an oven dried condition shall not absorb more than 1/5 of its weight of water when immersed for one hour in water at 21 to 29 degrees centigrade and shall show no signs of efflorescence on subsequent drying. The average compressive strength of five representative first class bricks shall be 15 N/mm.sq. and shall not result shall fall below 10 N/mm sq. The bricks in general shall conform to the requirements of IS:1099.

ii) All bricks shall be manufactured by the Trench Kiln method or other standard methods approved by the PMC/ ENGINEER-IN-CHARGE. The earth used in manufacturing bricks shall be carefully selected and shall be free from objectionable quantities of lime, gravel coarse sand roots, or other organic matter salts shall not exceed 0.3% and calcium carbonate shall not exceed 2.0%.

iii) The moulds used in the manufacture of bricks shall be thoroughly sanded before each use and shall be sufficiently larger than the size of the bricks being manufactured to allow for shrinkage in drying and burning. The size ready for use shall be 9" by 4 3/8" by 2 3/4" (229X 112X 90mm) and shall weigh between 3.2 to 4.2 Kilograms. All bricks shall have a "Frog" 1/4" deep on one face.

2.10.5 PLACING.

i) The methods and equipment used for transporting the bricks and mortar shall be such as will not damage the brick nor delay the use of mixed mortar. Brick shall not be placed during rains sufficiently heavy or prolonged to wash the mortar from the brick. Mortar which becomes diluted by rain shall be removed and replaced before continuing with the work. All bricks to be used in brick masonry shall be moistened with water for three to four hours before they are used. The chosen method of wetting shall

ensure that all bricks are thoroughly and uniformly wetted. All bricks shall be free from water adhering to their surface when they are placed in the brick masonry.

ii) Bricks shall be laid "Frog" upward with mortar joints and in English bond as shown on the drawings or as directed by the PMC/ ENGINEER-IN-CHARGE. Both bed and vertical joints shall be 6mm in thickness completely filled with cement mortar as specified herein, and each brick shall be bedded by firmly tapping with the handle of the trowel. All horizontal joints shall be parallel and all vertical joints in alternate courses shall be directly over one another. Excess mortar at the outer edges shall be removed and joints drawn straight with the edge of a trowel and a straight edge. All anchors and similar work required to be embedded in the brick masonry shall be installed as the work progresses. At the completion of the work all holes or defective mortar joints shall be cut out and repointed.

iii) The exterior faces of the walls shall be finished by striking the joints as the work proceeds. The joints shall be struck by raking the green mortar after the brick work has been laid and finishing the joint with a pointing tool. Horizontal joints shall be struck to form a weathered joints and vertical joints shall be struck with a V notch. Care shall be taken that the striking tools do not develop a cutting edge as the object of striking the joint is to compress the mortar into the joints.

iv) **REINFORCED BRICKWORK:**

All half brickwork shall be reinforced with 2 no. 6mm dia M.S. round bars or equivalent reinforcement at every fourth course. The reinforcement cleaned of rust and loose flakes with a wire brush, shall be embedded thoroughly in cement mortar at every fourth course. It shall be cast in or securely fixed to adjoining columns or walls, in a manner approved by the PMC/ ENGINEER-IN-CHARGE.

2.10.6 CURING AND REPAIR.

i) All brick masonry shall be water cured and shall be kept wet for least seven days by an approved method which will keep all surfaces continuously wet. Water used for curing shall meet the requirements of these specifications for water used in the manufacture of bricks.

ii) If, after the completion of any brick masonry work, the brick is not in alignment or level, or does not conform to the lines and grades shown on the drawings, or shows a defective surface, it shall be removed and replaced by the Contractor at his expense unless the PMC/ ENGINEER-IN-CHARGE grants permission, in writing to patch or replace the defective area

2.10.7 SCAFFOLDING.

Contractor shall provide safe scaffolding of adequate strength for use of workmen at all levels and heights at his own expenses. Scaffolding which is unsafe in the opinion of the PMC/ ENGINEERINCHARGE shall not be used until it has been strengthened and made safe for use of workmen. Cost of scaffolding etc., shall be included by the Contractor in the unit rate for masonry items. Damaged, masonry from scaffolding or from any other bjection shall be repaired by the Contractor at his own cost.

2.10.8 TOLERANCES.

The brick work shall be erected plumb and true to line at level with the maximum variation in any storey height of any length of wall being one meter. The maximum tolerance in the length, height or width of any single masonry unit shall be +/- 3mm.

2.10.9 MEASUREMENT AND PAYMENT.

Except otherwise specified herein or elsewhere in the contract documents, the measurement and payment will be made for the under mentioned specified works related to the relevant items of the bill of quantities.

2.10.9.1 Cutting & chiseling of masonry wherever required.

2.10.9.2 Cement sand mortar used in laying bricks including wastage.

2.10.9.3 Curing & repairing the masonry work.

2.10.9.4 All joint reinforcing bars, reinforcing anchor bars and dove tail anchors.

Measurement.

Measurement of acceptable completed works of brick masonry will be made on the basis of *cubic metres* for 230mm thick brickwork and *Square metres* for 100mm thick brickwork provided and installed in position as shown on the drawing or as directed by the PMC/ ENGINEER-INCHARGE.

Payment.

Payment will be made for acceptable measured quantity of brick masonry on the basis of unit rate per cu.m./ per sq.m. quoted in the bill of quantities and shall constitute full compensation for all the works related to the items.

- 2.11 **Miscellaneous Works**
- 2.11.1 **Anti Termite Treatment**

2.11.1.1 Specifications for Anti Termite Treatment

All the buildings shall be adequately protected against attack by sub terrain termites by suitable chemical treatment measures. The work shall be carried out by a specialist pest control agency approved by Consultants / Project Manager. The work to be carried out by the specialist firm shall carry a guarantee for the satisfactory performance of the treatment for a min. Period of ten (10) years.

The treatment shall be carried out generally in accordance with the stipulation laid down by IS 6313 - Part II latest edition (Code of practice for anti termite measures in buildings and part II re constructional chemical treatment measures) subject to the min. Requirement given in this specification.

2.11.1.2 Minimum Specifications

The earth filling immediately under the stone soling (under floors) bottom and side fills of all foundations (excepting foundations) and soil along external perimeter of all buildings shall be chemically treated against termites. The chemical to be used for the treatment shall be Dildrin, Aldrin, Heptachlor or Chlordane or as specified conforming of the requirement and concentration laid down in IS 6313 (Part II) - latest edition.

2.11.1.3 Application

The chemical solution shall be prepared by mixing the chemical with the appropriate quantity of water to obtain a chemical emulsion of the correct concentration as stipulated above. The prepared emulsion shall be applied as described below.

2.11.1.3.1 Column Pits, Wall Trenches, etc

The bottom surface and sides of the excavations (up to a height of 30cm from the bottom) made for column foundations, wall foundations etc., (excepting RCC foundations) shall be treated with the chemical emulsion at the rate of 5 ltr/m² of surface area.

2.11.1.3.2 Treatment to Backfill

After the column foundations, wall foundations etc., are constructed, the back fill in immediate contact with the foundation structure shall be treated at the rate of 15 ltr/m² of the surface of the substructure for each side if water is used for ramming operation completely by rodding earth at 15cm centers close to the wall face and spraying the chemical with the above dose. The earth shall be filled in layers and the treatment shall also be carried out in similar stages. The chemical emulsion shall be directed towards the masonry wall surfaces so that the earth in contact with these surfaces is well treated with the chemicals.

In the case of RCC walls and columns, the treatment shall start at the depth of 50 cm. below natural ground level.

From this depth the back fill around the RCC columns, walls, etc., shall be treated at the rate of 15 ltr/m² of the surface.

2.11.1.3.3 Top Surface of Plinth Filling

The top surface of the plinth fill (just below the stone soling) shall be treated with chemical emulsion at the rate of 5 ltr/m² of the surface before the stone lay. If the filled earth has been well consolidated and does not permit the emulsion to seep through, holes up to 50 to 75mm deep at 150mm centers both ways may be made with crowbars to facilitate saturation of the soil with the chemical emulsion.

2.11.1.3.4 Junction of Wall and Floor

A channel size of 3x3 cm shall be made at all the junction of walls and columns with the floor (before laying soling) and rod wholes made in the channels up to the ground level at 15cm centers. The solution is poured into the channels at the rate of 15 ltr/m² of the vertical surface and allowed to soak through the holes fully so that the soil is in contact with the chemical. The soil shall be tamped back into the channel and consolidation to the original conditions.

2.11.1.3.5 External Perimeter of Building

After the building is complete, holes shall be made along the external perimeter of the building at intervals 15cms and depth of 30cms and the emulsions shall be allowed to soak through these holes fully at the rate of 5 ltr/m² of the perimeter wall.

2.11.1.3.6 **Soil Surrounding Pipes**

Wherever any service pipes enter the soil inside the area of the foundations of any building, the solid surrounding the point of entry of each pipe at the foundation, floor etc., shall be fully soaked with the chemical solution for a distance of at least 1mtr. from the point of such entry.

2.11.1.3.7 **Expansion Joints**

Soil beneath the expansion joints at ground floor level shall be specially treated as directed. The joints itself shall also be treated as directed by the Consultants / Project Manager.

2.11.1.3.8 **Treatment Under Apron**

The soil below the concrete for stone aprons to be provided around the perimeter walls of all buildings shall also be treated with the chemical solutions at the rate of 5 ltr/m².

2.11.1.3.9 **Treatment Over DPC**

Top of concrete damp proof course in external and internal walls shall be given a liberal coat of chemical solution when the concrete is still green.

2.11.1.4 **Spraying Equipment**

To facilitate proper penetration of the chemical into the soil, a pressure pump of adequate capacity and sprayers shall be employed to apply the solution.

2.11.1.5 **Measurements**

The measurements shall be made in square meter on the basis of plinth area of the building at ground floor only for all operations described in schedule of quantities. Nothing extra shall be measured.

The rate shall include cost of all material and labour involved in all operations described above.

2.11.1.6 **Code of Practice:**

Notwithstanding the above the specialist contractor will ensure that all requirements in accordance with the relevant Indian Codes are met with regards to materials, application, handling and storage.

2.11.1.7 **Guarantee:**

On completion of the treatment in all respects, a guarantee that the building is safe from subterranean species of termite infestation for a period of 10 years is required on stamp paper in a format which shall be approved by the Developer who shall have the final decision.

In the event of re-infestation of the said structure at any time during guarantee period, an undertaking is required to carry out such treatment as may be necessary to render the structure free from termite infestation without any extra cost including any remedial work, resulting sleeves, cutout etc.

2.11.2 **Admixtures and Additives**

- Chemical admixtures are not to be used until permitted by the Consultants. In case their use is permitted, the type, amount and method of use of any admixture proposed by the contractor shall be submitted to Consultants for approval.
- The contractor shall further provide the following information concerning each admixture to Consultants.
- Normal dosage and detrimental effects, if any, of under dosage and over dosage.
- The chemical names of main ingredients in the admixture
- The Chloride iron content, if any, expressed as a percentage by weight of admixture.
- Whether or not the admixture leads to the entrainment of air when used in the manufacturer's recommended dosage.
- Where two or more admixtures are proposed to be used in any one mix, the manufacturer's written confirmation of their compatibility.
- In reinforced concrete, the chloride iron of any admixtures used shall not exceed 2 percent by weight of the admixtures in accordance with IS 6925 and the total chloride iron in all admixtures used in concrete mix shall not exceed 0.03 % by weight of cement
- The admixtures when used shall conform to IS 9103 "The suitability of all admixtures shall be verified by trial mixtures".

- The addition of calcium chloride to concrete containing embedded metal will not be permitted under any circumstances.
- Retarding admixtures when used shall be based on lingosulphonates with due considerations to IS 7861
- Water proofing admixtures shall comply with IS 2645.

2.11.3 Grouts

2.11.3.1 Grouting

- Grouting shall be done in 1:2 cement mortar (one part cement and two parts coarse sand) of thickness 3" (75mm) or less, or as directed. Where the thickness is more than 3" (75 mm) thick grouting shall be done in plain or reinforced cement with coarse aggregate 3/8" and down gauge. The mix of concrete will be as shown in the relevant drawings as directed.
- The base plate shall be temporarily supported on steel wedges and properly aligned before grouting. Forms shall be built around the base and wet mortar shall be placed under pressure around and under the base. To ensure that no air pockets are left after grouting additions holes may have to be cut if directed in the base plate so that pressure grouting can be carried out thorough these holes also and proper inspection of the grout can be ascertained. The wedges shall be removed after the grouting has set and recess shall be properly pointed.
- Grouting of machine foundations shall be done only after taking the written instructions from the Consultants / Project Manager.
- The grouting work is included in the respective item of concrete and the rate for these items and inclusive of proper pressure grouting after preparations of surfaces to be grouted, necessary form work providing and removing necessary wedges, cutting holes in the base plate to ensure that the air pockets are left etc. No extra rate will be paid for grouting or any work that will be necessary to carry out and ensure proper grouting entirely to the satisfaction of the Consultants / Project Manager. If however a concrete mix richer than the foundation is specified for grouting, only the difference of the quantity of cement used in richer mix of grout and the mix of the footing shall be paid.

2.11.3.2 Special Grouts

Where so specified non-shrinking grouts such as 'Conbextra', 'shrinkkomp' or 'Ferro grout' shall be used as per the instructions and specifications of the manufacturers.

2.11.4 Precast Concrete

2.11.4.1 Precast Nominal Mix Concrete

General

All precast concrete shall be cast over vibrating tables or by using form vibrators. The concrete mix shall conform in all respect to " Various Concretes" described in the appropriate paragraph under this section.

Exposed precast surfaces shall be finished as called for on the drawing or as directed by the Consultants / Project Manager. All surfaces coming in contact with in situ concrete shall be wire brushed and hosed down until the aggregate is free from cement slurry. Castellations shall be provided wherever called for. Leaving grouting holes, grooves, inserts, projections reinforcements, lifting hooks etc., to conform to the erection procedure. All edges and delicate projection likely to be damaged during erection shall be protected by means of wooden cover fillets, until placed in position.

2.11.4.2 Precast Jali Blocks Louvers, Shelves, etc

All precast jali shall be exactly of the size and pattern shown on the drawings and shall be made face up in the following manner. All units shall be integrally cast, steel formwork shall be used for making jalis.

Provided in the formwork as shown in the drawings. Stiff plastic concrete 1:1.5:3 shall be used with coarse aggregate 12mm and down size.

The precast units shall not be removed from the forms for three days. Precast work shall be cured under cover and shall be kept under water for fifteen days before placing in position.

Samples of each part shall be approved by the Project Manager before proceeding with the work.

Unit may require wetting before bedding. The concrete base shall be wetted and coated with slurry and minimum of mixing water shall be used in the bedding mortar, which shall be Portland cement and sand 1:3.

The section shall apply also to prestressed precast controlled concrete work.

For all precast controlled concrete work a specially equipped site factory, with casting yard, pretensioning beds of individual moulds for vibrating plants, cement store, concrete laboratory erection equipment, etc., are to be provided. The contractor is deemed to have included in his rates all the above provisions needed for a workman like construction in precast controlled concrete.

All precast design mix concrete shall be weigh batched.

2.11.4.3 **Placing and Compacting of Concrete**

All precautions in handling and placing of high strength concrete mixes apply. The concrete placed shall be compacted thoroughly by using pin, vibrators, shutter vibrators or other suitable means. No construction joints shall be allowed in precast design mix concrete work. Un-shuttered top surfaces are to be finished smooth with trowel.

During the period of initial setting special precautions are to be taken to keep precast members sufficiently moist to protect them against vibrations and any adverse loading.

2.11.5 **Waterproofing**

Alternatives

1. Cement Based Waterproofing
2. Membrane Type

2.11.5.1 **Cement Based Waterproofing**

Related Works

- a. Includes de-watering, soling, PCC 1:3:6, drains.
- b. Concreting for retaining walls, slab casting at toilets, terraces.
- c. Overhead tanks, sump tanks.

Material

a. Cement	- @ 5 bags/100 Sft
b. Sand	- Shall be clean river sand
c. Water Proofing Admixture	- By approved Manufacturer
d. Aggregates	- 20mm size
e. Brick bats	

Execution

Box Method

A. Basement

- a. First layer shall be laid after cleaning, brushing the PCC layer/ blinding concrete.
- b. First coat of waterproof plaster is done with CM 1:3 & approved waterproofing admixture as per manufacturer's specification to be used with cement and 20mm size aggregates are embedded over the surface evenly. Weight of aggregates shall be 20kgs/Sqm.
- c. Second layer of waterproof admixture mixed mortar shall be applied a day after the first coat to the thickness of the aggregate.
- d. Grouting shall be done at selected points with cement slurry mixed with waterproof admixture
- e. Third layer or finishing coat is done with waterproof admixture mixed cement mortar and surface is finished smooth. Curing shall be carried out for a minimum period of 7 days.
- f. Total thickness of water proofing layers shall be not less than 50mm.

B. Retaining Wall

- a. Shall be done in two layers of waterproof plastering leaving 2 hours gap between each coat.
- b. Total thickness shall not exceed 35mm or 1.5" thick.

- c. Water proof admixture to be used as per manufacturer's specification with CM 1:3.
- d. Grouting wherever necessary and at construction joints shall be carried out.
- e. Curing shall be done till 7 days.
- f. Back filling shall be done carefully with specified material. Care to take not to puncture the layer.

Roof

Surface Method

Part - 1

- a. RCC surface to be cleaned brushed and watered.
- b. First coat of bituminous water proof coating (two part highly purified Coal tar and polyurethane polymer) shall be applied after necessary grouting at construction joints and honey comb areas with cement grout
- c. Nylon fine mesh/ Geo-fabric shall be fixed with minimum overlap of 100mm
- d. First coat of bituminous water proof coating (two part highly purified Coal tar and polyurethane polymer) shall be applied over fabric layer
- e. Treatment shall continue along the parapet for a height of 300mm above the finished level.

Material: TAR OTHANE of Choksey make / NITOPROOF100/ 120 of Fosroc make or equivalent)

Part - 2

- a. RCC surface to be cleaned brushed and watered.
- b. Cement slurry with waterproof compound shall be provided over the cleaned surface.
- c. Brick coba shall be laid for necessary gradient for easy flow of rain- water (joints shall be filled with CM 1:1 with water proof compound)
or
Metal coba shall be laid for specified thickness and necessary gradient for easy flow of rain-water with CM 1:1 with waterproof compound
- d. Coba to be covered with joint less water proof plaster with CM 1:2 with water proof compound as per manufacturer's specification finish shall be smooth.
- e. Impression markings of 300mm x 300mm square to be done with 3mm rod.
- f. Parapet to be treated for a height of 600mm in shape of round water.
- g. Curing shall be carried for 7 days.

Sump, OH Tank and Toilets

- 1. RCC surface to be cleaned, brushed and watered
- 2. Toilets: Water proofing for floor shall be of 35mm thick, for walls shall be 25mm thick with CM 1:4
- 3. For OH Tank and UG Sump thickness of plaster shall be 35mm in two layers
- 4. Waterproofing admixture shall be as per the manufacturer's specification.
- 5. Grouting shall be done with cement slurry wherever required and honeycombing in concrete is found.
- 6. Curing shall be done for a minimum period of 7 days.

2.11.6 Expansion Joints, Water Stops, Premoulded Joint Fillers, Flashings

2.11.6.1 Expansion Joints

Expansion joints shall be provided with 20 gauge copper strips/m.s. hot dip galvanised strips of 250 mm width at locations shown on drawings or as approved by Consultants / Project Manager. The strips shall be bent to the shape indicated on the drawing and embedded properly in masonry. The joint width shall be uniform throughout and special care shall be taken to ensure proper bonding at expansion joints. Expansion joints shall be continuous and where two or more strips meet, they shall be lapped to the extent of 75 mm and joints properly soldered. The expansion joints shall be filled with pre moulded joint fillers and sealed with mastic compound. For purposes of measurement, the laps provided will be neglected. Wherever an expansion joint between the existing part and new part is proposed the rate quoted shall be inclusive of making necessary connections with existing part.

2.11.6.2 Water Stops

Water stops shall be of 20 Gauge GI Sheet (230mm wide) of approved make. These shall be provided at locations indicated on drawings. Water stops shall be lapped 100 mm and heat sealed to obtain

continuity. Water stops shall be cleaned thoroughly of all concrete and mortar coating as directed before resuming concrete work. Water stops shall be in long lengths to avoid joints as far as possible.

2.11.6.3 **Joint Filler**

Premoulded joint fillers shall be of a non-deteriorating and resilient type. A sample of material shall be approved by the Consultants / Project Manager before being brought to site. Installation shall be carried out properly and as directed.

2.11.6.4 **Flashings**

Metal or tar felt flashing shall be fixed as directed by the Consultants / Project Manager. Metal flashing where provided shall be welded/ soldered to obtain continuity. Tar felt flashing shall be lapped for a minimum length of 150 mm.

Flashing shall be measured and paid for in linear metres for the specified width disregarding laps or joints.

2.11.7 **Specification For Laminated Neoprene Pad**

The scope of this specification shall apply to laminated free elastomeric bearings.

2.11.7.1 **Material**

2.11.7.1.1 Chloroprene shall only be used in the manufacture of bearing.

2.11.7.1.2 Grades of raw elastomer of proven use in elastomeric bearings, with low crystallisation rates and adequate shelf life (e.g. Neoprene, WRT, Bayprene 110 or equivalent) shall be used. No reclaimed rubber or vulcanised wastes shall be used.

2.11.7.1.3 The raw elastomer content of the compound shall not be lower than 60%. The ash content shall not exceed 5% (as per test conducted in accordance with ASTM D-297)

2.11.7.2 **Properties of Elastomer**

2.11.7.2.1 The elastomer shall conform to all properties specified in the following table.

SI No	Property	Unit	Test method I.S specification reference	Value of the characteristic specified.
1.0	Physical properties			
1.1	Hardness	IRHD	IS : 3400 (Part II)	60 ± 5
1.2	Minimum tensile strength	Mpa	IS : 3400 (Part I)	17
1.3	Minimum elongation at break	%	IS : 3400 (Part I)	400
2.0	Maximum compression set	%	IS : 3400 (Part X)	
SI No	Property	Unit	Test method I.S specification reference	Value of the characteristic specified.

			Duration (h)	Temperature (C)	
	C.R.		(+0 to 24-2)	100 ± 1	35
3.0	Maximum compression set	%	IS : 3400 (Part IV)		
	C.R.		(70)	100 ± 1	
3.1	Maximum change in hardness	IRHD			+ 15
3.2	Maximum change in tensile strength	%			- 15
3.3	Maximum change in elongation	%			- 40

2.11.7.2.2 Shear modules of the elastomer bearing shall not be less than 0.8Mpa nor greater than 1.20Mpa.

2.11.7.2.3 The adhesive strength of elastomer to steel plates (determined as per IS 3400: Part XIV method A) shall not be less than 7 kN/m

2.11.7.3 **Design parameters of elastomer bearings.**

2.11.7.3.1 The thickness of all internal layers of elastomer "h_i" shall be as specified in the Bill of Quantities.

2.11.7.3.2 Thickness of outer layers shall be h_e = h_i/2 subject to a maximum of 6mm and side cover shall be 6mm for all bearings.

2.11.7.3.3 Elastomer bearing shall satisfy the criteria enumerated in Clause No. 916.3.3, 916.3.5 & 916.3.6 of IRC 83 (Part II) - 1987

2.11.7.4 **Fabrication**

Bearing with steel laminates shall be cast as a single unit in a mould and vulcanised under heat and pressure. Casting of elements in separate units and subsequent bonding is not permitted nor shall cutting from large size cast be permitted.

Bearings of similar size shall be produced by identical process and in one lot as far as practicable.

The moulds used shall have standard surface finish adequate to produce bearings free from any surface blemishes.

Steel plates for laminates shall be sand blasted, clean of all mill scales and shall be free from all contaminants prior to bonding by vulcanisation. Rusty plates with pitting shall not be used. All edges of plates shall be rounded.

Spacers used in mould to ensure cover and location of laminates shall be of minimum size and number practicable. Any hole at surface or in edge cover shall be filled in subsequently.

Care shall be taken to ensure uniform vulcanising conditions and homogeneity of elastomer through the surface and body of the bearing.

The bearings shall be fabricated with the tolerance specified in the following table.

SI No	Items	Tolerances
1.	Overall plan dimensions	-0, +6mm
2.	Total bearing thickness	-0, +5%

3.	Parallelism	
a.	Of top surface of bearing with respect to the bottom surface as datum.	1 in 200
b.	Of one side surface with respect to the other as datum	1 in 100
4. a.	Thickness of individual internal layer of elastomer	$\pm 20\%$ (max of 2 mm)
b.	Thickness of individual outer layer	- 0, + 1mm
5. a.	Plan dimensions of laminates	-3mm, +0
b.	Thickness of laminate	$\pm 10\%$
c.	Parallelism of laminate with respect to bearing base as datum	1 to 100

The vulcanising equipment press should be such that between the platens of the press the pressure and temperature are uniform and capable of being maintained at constant values as required for effecting an uniform vulcanisation of the bearing.

The moulding dies utilised for manufacturing the bearings should be so set inside the platen of the press so that the pressure development during vulcanisation of the product is evenly distributed and the thickness maintained at all places is within acceptable tolerance limits taking into consideration, the shrinkage allowance of vulcanization.

The raw compound which has been introduced inside the metal dies for vulcanisation should be accurately weighed each time and it must be ensured that sufficient quantity has been put inside the die for proper flow of material at every place so that a homogeneous and compact bearing is produced without any sign of sponginess or deficiency of material at any place.

Before any vulcanizate of any batch of production is used for producing vulcanised bearings, test pieces in the form of standard slab and buttons should be prepared in accordance with prescribed standards and salient properties tested and recorded regularly against each batch of production to monitor the quality of the products.

2.11.7.5 Quality Control Certificate

2.11.7.5.1 The manufacturer shall certify for each lot of bearing under acceptance:

- a. That an adequate system of continuous quality control was operated in his plant.
- b. That the entire process remained in control during the production of the lot of bearings under acceptance as verified from the quality control records / charts which shall be open to inspection of the Consultants / Project Manager on demand.

2.11.7.5.2 A certified copy of the results of process control testing done on samples of elastomer used in the production of the lot shall be appended and shall include at least the following information.

2.11.7.5.3 Composition of the compound- raw elastomer and ash content, the grade of raw elastomer used (include name, source, age on shelf), test results of hardness, tensile strength, elongation at break, compression set, accelerated ageing etc.

Part-IV : Field Quality Plan

STANDARD FIELD QUALITY PLAN

FOR

CIVIL WORKS

(ERECTION)

For

CAPACITY



BHARAT HEAVY ELECTRICALS LIMITED

DOC.NO.: AA/ CQ/ SFQP/ SCA/CL/ 01
REV NO.: R00



STANDARD FIELD QUALITY PLAN
FOR
CIVIL WORKS
(ERECTION)

FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

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	xi) Form Work(Shuttering)	
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STATUS OF REVISIONS

REVISION NO.	DATE OF REVISION	DETAILS OF REVISION
00 (1 st Issue)	23/01/2019	Made first time as SFQP by the task force. Reference taken from FQPs of different supercritical projects of all regions.

	STANDARD FIELDQUALITY PLAN FOR CIVILWORKS (ERECTION)		FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
			REV. NO. : R00
			SHEET 1 / 1 SHEET
AUTHORISATION FOR DIFFERENT CATEGORIES OF CHECKS			
Classification of Check ----- Symbol Description		Checking Authority	Accepting Authority
A	Critical	BHEL & Customer	Customer
B	Major	BHEL	HOS
C	Minor	BHEL	BHEL
Legend : Customer :Customer or any other agency authorised by customer. HOS : Head of Section BHEL : Concerned Task Performer of BHEL . NOTE : - Quantum of check shall be 100% for all characteristics unless otherwise mentioned in reference documents. - Customer shall witness A category checks. He is also authorised to carry out Surveillance in any of the B & C category of checks at his discretion. - In case of non-conformity, accepting authority shall ensure dispositioning before accepting and the dispositioning shall be reflected in log sheets / protocols. Dispositioning of non-conformities to be authorised by Erection Engineer with intimation to Head/Quality. - Instruments with valid calibration to be used for measurements.			

	STANDARD FIELD QUALITY PLAN FOR CIVIL WORKS (ERECTION)	FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
		REV. NO. : R00
		SHEET 1 / 31 SHEETS
STATEMENT OF CHECKS		
Capacity / Type :		
System :	Civil	
Sub-system :	-----	
Area :	Construction	
NOTES : - As an evidence of having carried out the work satisfactorily, a general purpose logsheet, L-00 shall be maintained for checks where no protocols are available. - Drawing / Contract requirements shall apply over and above the checks given. - Abbreviations used in the column 'Type of check' are: - R : Record verification - M: Measurement - V : Visual - P : Physical - T : Test		

		STANDARD FIELD QUALITY PLAN FOR CIVIL WORKS (STATEMENT OF CHECKS)					FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01	
							REV. NO. : R00	
SYSTEM : CIVIL WORKS			SUB-SYSTEM : TEST EQUIPMENT		AREA : CONSTRUCTION		SHEET 2 / 31 SHEETS	
S.NO.	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
1.0	TEST LABORATORY ESTABLISHMENT: a) Ensure that test laboratory is established at site sufficiently before commencement of civil work. (List of equipment as per Annexure-I)	V		B	Annexure-I	100%	-	



STANDARD FIELD QUALITY PLAN

FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

FOR
CIVIL WORKS
(STATEMENT OF CHECKS)

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : LEVELLING AND GRADING		AREA : CONSTRUCTION			SHEET 3 / 31 SHEETS	
S.NO.	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
2.0	LEVELLING & GRADING:							
2.1	Preparation of Grid pillar and bench mark and transfer of permanent bench mark	P		B		100%	Protocol	
2.2	Pework levels and identification of disposal points. Excavation is carried out for levelling & grading including dressing to the specified levels & grades	P		B		100%		
3.0	FILLING AND COMPACTION (for Open Area):							
3.1	Approval of Fill material as per TS/IS. a) Proctor density & Optimum Moisture content b) Relative Density Index	P T	Proctor density equipment with mould and moisture meter	A B	IS 2720/Tech specn	100%	Protocol Protocol	
3.2	Ensure that the compacted soil/ sand is tested for "DRY DENSITY" for each filling. Acceptance criteria as per Drawing	T	Core Cutter/ Sand displacement method	B	IS 2720/Tech specn/ Drawing	Once in every 10000M ² on each compacted layer	Register	
3.3	Ensure additional two samples are tested where the sample does not satisfy the specified condition after further compaction of the layer Note: Two samples for each layer should satisfy the specified condition	T		B		On each compacted layer on above	Register	



STANDARD FIELD QUALITY PLAN
FOR

FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

CIVIL WORKS
(STATEMENT OF CHECKS)

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : EARTH WORKS		AREA : CONSTRUCTION			SHEET 4 / 31 SHEETS	
S.NO.	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
4.0	EARTH WORK For Foundation area (Excavation, Filling, Compaction) :							
4.1	a) Approval of quarry for borrowed earth material			A				
	b) Approval of Filling material as per TS/IS.			A				
4.2	Degree of Compaction of fill.							
	a) Maximum Dry Density by Proctor Needle Penetration (Random)	M	As per IS 2720	A	IS 2720 Annexure II	Annexure-III	Protocol	
	b) Dry Density by Core Cutter Method / Sand Displacement Method	M	As per IS 2720	B	IS 2720 Annexure II	Annexure-III	Protocol	

		STANDARD FIELD QUALITY PLAN FOR CIVIL WORKS (STATEMENT OF CHECKS)					FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01	
							REV. NO. : R00	
SYSTEM : CIVIL WORKS			SUB-SYSTEM : PILING		AREA : CONSTRUCTION		SHEET 5 / 31 SHEETS	
S.NO.	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
5.0	PILING WORKS :							
5.1	Checks during Boring Operation							
5.1.1	Approval of Drill Mud (Bentonite) as per TS/IS	V		A	Review of MTC	One from each Tank/day		
5.1.2	Centring of pile on positioning of pile location	P	Total Station	A	As per IS 2911 (Part 1/Sec 2) - 1979	100%	Pour Card	
5.1.3	Verticality of pile bore	V	Inclonometer of Hydraulic Piling Rig	A	-do-	100%	Pour card	
5.1.4	Specific Gravity of bentonite slurry during boring/ drilling operation.	P	Sp. Gravity meter	A	-do-	100%	Protocol/ Pour card	
5.1.5	Marsh Cone Viscosity	P	Marsh Cone	A	-do-	100%	Protocol	
5.1.6	Specific Gravity of bore water just before concreting operation.	P	Sp. Gravity meter	A	-do-	100%	Protocol	
5.1.7	Termination level of pile before concreting.	P	Chain Link	A	As per drawing	100%	Protocol	
5.1.8	Pile reinforcement checking	P/V	BBS	A	-do-	100%	Pour Card	
5.1.9	Concrete placement by Tremie method	P	Tremie pipe	B		100%	Pour card	
5.1.10	Concrete workability by slump cone method	P	Slump cone	A	IS 456/ Design Mix recommendation	100%	Pour Card	
5.1.11	Concrete cube sampling	P	Cube moulds	A	As per IS 516	As per IS 456	Pour Card	



STANDARD FIELD QUALITY PLAN
FOR
CIVIL WORKS
(STATEMENT OF CHECKS)

FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : PILING

AREA : CONSTRUCTION

SHEET 6 / 31 SHEETS

S.NO.	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
5.2	Checks involved after pouring of concrete							
5.2.1	Compressive strength of cube samples.							
	At- 7 days	P	Compressive testing Machine	A	As Per IS 456	As per IS 456	Site Lab test report / Cube Strength registers	
	At- 28 days	P	-do-	A	-do-	-do-	-do-	
5.3	DRIVEN CAST IN-SITU PILE							
	Checks during casing driving							
5.3.1	Test pile driving for set criteria establishment	V	Rig/Pile shoe/MS Casing pipe/ Measuring tape	A	IS 2911/Part 1/ Section 1	Tech Spec	Protocol	
	Working Pile							
5.3.2	Centring of pile on positioning of pile location	P	Total Station	A	Drawing/ Tech Spec	100%	Pour Card	
5.3.3	Sequence of Pile installation	P	Total Station	B	Drawing	100%	Pour Card	
5.3.4	Dimension of pile and mark of pile	P	Total Station	B	Drawing/ Tech Spec	100%	Pour Card	
5.3.5	Placing of Pile shoe as per design	P	Chain Link	B	Drawing/ Tech Spec	100%	Pour Card	
5.3.6	MS pipe casing placement in Rig as per deigned thickness, diameter & Verticality	P	Measuring tape	B	IS 2911/Part1/Sec 1	100%	Pour Card	
5.3.7	Termination level of pile/depth of pile	P	Measuring tape	B	Drawing/ Tech Spec	100%	Pour Card	
5.3.8	Set Criteria	P		B	Drawing	100%	Pour Card	
5.3.9	Reinforcement cage	P		C	IS 2911/part1 /Sec 1	100%	Pour Card	
5.3.10	Placement & checking of Reinforcement cage	P		C	Drawing	100%	Pour Card	

		FIELD QUALITY PLAN FOR CIVIL WORKS (STATEMENT OF CHECKS)						FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
								REV. NO. : R00
SYSTEM : CIVIL WORKS		SUB-SYSTEM : PILING			AREA : CONSTRUCTION			SHEET 7 / 31 SHEETS
S.NO.	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
5.3.11	Concrete placement by Tremie method	P	Tremie pipe	B		100%	Pour card	
5.3.12	Concrete slump	P	Slump cone	C	Drawing	100%	Pour Card	
5.3.13	Concrete compaction	P		C	Mix Design/IS 456	100%	Pour card	
5.3.14	Time taken for driving and concreting	P		B		100%	Pour card	
5.3.15	Withdrawal of MS Casing pipe vertically	P		C		100%	Pour card	
5.3.16	Concrete cube sampling							
A	Check for pile termination level, continuity of concrete throughout the length of pile through foundation pile diagnostic system by Pile Integrity Test	P	NDT Kit	A	ASTM D4945, ASTM D5882, Tech Spec, Drawing	100%	Test Certificate by 3 rd party	
a	Pile load test	P & V	Hydraulic Jack system	A	IS 2911 (Part 4)	As per contract/drg	Protocol/ Test report	
b	Test Pile	P & V	-do-	A	-do-	-do-	-do-	
c	Vertical Load test	P & V	-do-	A	-do-	-do-	-do-	
B	Lateral Load test							
a	Pull out test	P & V	-do-	A	-do-	-do-	-do-	
b	Job Pile / Working Pile	P & V	-do-	A	-do-	-do-	-do-	
c	Vertical load test (Routine test)	P & V	-do-	A	-do-	-do-	-do-	



STANDARD FIELD QUALITY PLAN
FOR
CIVIL WORKS
(STATEMENT OF CHECKS)

FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : PILING		AREA : CONSTRUCTION			SHEET 8 / 31 SHEETS	
S.NO.	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
5.4	COMPACTION PILE/ STONE COLUMN							
	Test Pile:-							
5.4.1	Layout of test patch	P/V	Total station/ Measuring tape	A	Design of Pile shoe/ Tech Spec	Once before start of job pile	Protocol	
5.4.2	Placing of pile shoe	P/V	Chain link	A	-do-	-do-	-do-	
5.4.3	Placing of Rig with casing pipe	P/V	Measuring tape	A	-do-	-do-	-do-	
5.4.4	Pouring of mix and compaction	P/V	Mixer m/c & Hammer	A	-do-	-do-	-do-	
5.4.5	Plate load test	P/V	Hydraulic jack/MS plate/Concrete blocks Rig/ Hammer/Total stn/Mixer M/c	A	-do-	-do-	-do-	
	Working pile: -							
5.4.6	Centring of pile on positioning of pile location & check diameter of pile	P	Total Station	A	Drawing/ Tech Spec/ BBQ	100%	Pour card	
5.4.7	Placing of Pile shoe as per design	P	Chain Link	B	-do-	100%	-do-	
5.4.8	MS pipe casing placement in Rig as per designed thickness & Verticality.	P	Measuring tape	B	-do-	100%	-do-	
5.4.9	Termination level of pile.	P	Measuring tape	B	-do-	100%	-do-	
5.4.10	Pour of aggregate mix.	P	Mixer m/c & Hammer	A	Aggregate test report	100%	-do-	
5.4.11	Compaction of mix.	P		A	Tech Spec	100%	-do-	
5.4.12	Withdrawal of MS Casing pipe	P		A	-do-	100%	-do-	



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FOR
CIVIL WORKS
(STATEMENT OF CHECKS)

FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : BRICKS

AREA : CONSTRUCTION

SHEET 9 / 31 SHEETS

S.NO.	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT/ ACCEPTANCE STANDARD	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
6.0	BRICKS (Clay/ Ash) :							
6.1	Approval of bricks as per TS/IS.	V		A	IS1077/ IS-12894 Technical Specification	One for every 10000 nos. or part thereof or change of source	Protocol	
6.2	Ensure that the following tests are conducted : - Compressive strength & water absorption	M	Compressive Strength Testing machine, weigh balance	A	-do-	-do-	L06,L07	
6.3	Check for soundness	P/ V	Weigh balance, Oven	C	-do-	-do-		
6.4	Check for Efflorescence	V		C	-do-	Random		



STANDARD FIELD QUALITY PLAN
FOR
CIVIL WORKS
(STATEMENT OF CHECKS)

FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : CEMENT

AREA : CONSTRUCTION

SHEET 10 / 31 SHEETS

S.NO.	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
7.0	CEMENT :							
7.1	Review of material test certificate	V		B			Test Certificate	
7.2	Ensure the following tests are conducted for conformity with requirement for strength and quality							
	a) Consistency of cement	M	Vicat Needle	A	Annexure-IV	Annexure-IV	L-01	
	b) Initial and final setting time	M	Vicat Needle	A	IS269, IS455, IS4031, IS1489-1		L-02	
	c) Compressive strength - 3days & 7 days	M	Compressive Testing Machine, Cube Mould, Vibrator, Curing chambers, Standard Sand	A			Protocol	



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FOR
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FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : FINE AGGREGATE		AREA : CONSTRUCTION			SHEET 11 / 31 SHEETS	
S.NO.	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
8.0	FINE AGGREGATE (River /manufactured sand) :							
8.1	Approval of material source as per TS/IS.	T		A	IS 383	Annex IV	Logsheet	Refer cl. 8.0 of Annexure-II



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(STATEMENT OF CHECKS)

FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : COARSE AGGREGATE		AREA : CONSTRUCTION			SHEET 12 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
9.0	COARSE AGGREGATE : (Stone metal / Gravel)							
9.1	Approval of Coarse Aggregate material (source as per TS)	T		A	IS 383	Annex IV	Logsheet	Refer cl.9.0 of Annexure-II



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FOR
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FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : STEEL

AREA : CONSTRUCTION

SHEET 13 / 31 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
10.0	REINFORCEMENT STEEL							
10.1	Ensure that the raw materials is as per the specification Verification of test certificates, identification marks, length, width, thickness and melt/heat number (Remarks: One sample per lot, in case of material supplied by sub contractor. In case material is bought from dealer, mechanical and chemical test to be carried out by BHEL site)	R		B	Test / Test certificates, Drawing, IS2062, 8500, 808, 3502 and other relevant codes	100%	Test Certificate	In absence of related TCs, correlation, tests to be done.
10.2	Verify the following : a) Surface characteristics like free from cracks, Surface flaws, Imperfect edge, Lamination & Rough jogged. b) Proper identification for different type and size of steel	V V		B B	IS 1786, IS 432, IS 1566 Drawings	Once per each lot/TC dia- wise		
10.3	Check for placement of reinforcement bar a) Dimension b) The bar bending schedule with necessary hooks, laps, covers, spacers, binding & chairs shall be 100%. Check for all before start of concreting.	M M	Vernier calliper Measurement Tape	B B	Bar bending schedule/ Drawing Drawing	100% 100%	Logsheet/ Protocol Logsheet/ Protocol/ BBS	



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FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : WATER

AREA : CONSTRUCTION

SHEET 14 / 31 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
11.0	WATER							
11.1	Ensure that water from all source is potable as per the standard before use	Testing		B	Annexure-IV, Test certificate,	Once a month per source/once in 6 months if from borewell/ once a month in rainy season		
	a) Conduct test for neutralisation of water	M	Lab test	B	Annexure-IV, IS 3025 & IS456	Once a month per source/-do-	Site logbook	
	b) Check and ascertain limits of solids	M	Lab Test	B	Annexure-IV, IS 3025 & IS456	Once a month per source/-do-	Site logbook	
	c) Conduct test for PH value	M	PH Meter	B	Annexure-IV, IS456	Once a month per source/-do-	Site logbook	



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FOR
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FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : FORM WORK		AREA : CONSTRUCTION			SHEET 15 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
12.0	FORM WORK (SHUTTERING) :							
12.1	Approval for Type of Shuttering			A	Tech Spec/ Drawing			
12.2	Check for the following :							
	a) Cleanliness, Damage and warpage	V		C		100%	Pour Card	
	b) Ensure internal dimension of box forms and distances between internal surfaces of shuttering of walls.	M	Measuring Tape	B	Drawing	100%	-do-	
	c) Staging	R /V /P		B	Drawing/ Design	100%	-do-	
	d) Ensure the following :							
	(i) Soundness of material	M/ V	Hammer	C	Drawing	100%	-do-	
	(ii) Proper joining bracing	V		C	Tech Spec	100%	-do-	
	(iii) Proper support	V		C	Tech Spec	100%	-do-	
	(iv) Verticality of side shuttering before and after Reinforcement	M	Plumb bob	C	Drawing	100%	-do-	
	(v) Closing of gaps in form work/ shuttering	V		C		100%		



STANDARD FIELD QUALITY PLAN

FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

FOR
CIVIL WORKS
(STATEMENT OF CHECKS)

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : PLANT & MACHINERY		AREA : CONSTRUCTION			SHEET 16 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
13.0	PLANT & MACHINERY :							
13.1	All the plant/ machinery should be calibrated/ load tested and records to be checked as per applicable codes As per requirement: a) Concrete Mixer b) Vibrators of adequate capacity c) Weigh batches & batching plant d) Lighting e) Air compressor f) Pumps g) Jack hammer h) Transit mixer i) Generator j) Winches k) Cranes l) Excavator, Power roller, plate compactor m) Electric balance	V / P		C	Tech Spec	100%	Protocol / Site record	



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FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : EMBEDDED PARTS		AREA : CONSTRUCTION			SHEET 17 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
14.0	EMBEDDED PARTS :							
14.1	Ensure the following :							
	a) Position and level of embedded parts	M	Dumpy level, Measuring Tape	B	Drawings	100%	Pour Card	
	b) All necessary steps like welding of lug to reinforcement are done to keep the embedded parts undisturbed during the process of concreting	V		B	Drawings	100%	Protocol	



STANDARD FIELD QUALITY PLAN
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FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : CONCRETING		AREA : CONSTRUCTION			SHEET 18 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
15.0	CONCRETING :							
15.1	Ensure Preliminary tests are conducted for determining design mix for required strength.	Test		A	Annexure IV Test certificate IS456, IS1199	Annexure-IV	L-05	
15.2	Ensure compliance of Sl. No. 10.0, 12.0, 13.0, 14.0 before concreting	P		B			Pour Card	
15.3	Ensure the following : Workability of the concrete checked at frequent intervals by Slump Cone test or Compaction Factor Test.	M	Slump Cone	B	IS456, IS2386 Part III IS1199 Annexure-IV	Annexure IV	L-05	



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FOR
CIVIL WORKS
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FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : CONCRETING		AREA : CONSTRUCTION			SHEET 19 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
15.4	a) The temperature of concrete does not exceed 25° C for major equipment foundation, use ice proportionally to maintain temperature	M	Thermometer	B	IS 456/ Drawing/ Tech Spec	100%	Protocol	
	b) Stripping time of formwork is strictly regulated as follows in normal circumstances (where temperature is above 20° C) and where ordinary cement is used. i) Wall columns & vertical sides of beams : 24 to 48 hours ii) Slab (props left under) : 3 days iii) Beams soffits (props left under) : 7 days iv) Removal of props to slabs span less than 4.5m : 7 days v) Removal of props to slabs spanning over 4.5m : 14 days vi) Removal of props to beams and arches : 14 days Spanning upto 6 m vii) Removal of props to beams and arches spanning over 6m : 21 days viii) After deshuttering, expose to surface shall be thoroughly inspected to rectify minor honey combs and removal of exposed tie rods and other shuttering supports. Note : Where rapid hardening cement is used the stripping time in respect of items ii and vi of above be regulated at 3/7 of the corresponding periods stated for ordinary cement with the approval of customer	V		B	IS 456	100%	Logbook	



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FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : CONCRETING		AREA : CONSTRUCTION			SHEET 20 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
15.5	Ensure the following: Curing of concrete is carried out for a minimum of 7 days from the date of placing of concrete. Curing is started not later than 10 to 12 hours after termination of concreting in normal weather and in hot and windy weather within 2 to 3 hours.	P		B	IS 456	100%	Protocol	Date of casting of structure to be written on the surface



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FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : TESTING		AREA : CONSTRUCTION			SHEET 21 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
16.0	TESTING :							
16.1	Ensure that adequate number of test specimen (Cubes) are taken from mixed concrete and kept properly identified for purpose of testing as per specifications/standards (min. 3 nos. for 7 days and 3 nos. for 28 days)	Lab Test	Compressive Test Machine	A	IS456, IS2911	Annexure-IV	Pour card/ Logbook	
16.2	Ensure that concrete cubes are tested and recorded at specified period of curing as per standards and the test results of concrete cubes are examined to verify the specified grade of concrete as required	Lab Test		A	Annexure-IV/ V IS516, IS2911		L-05	
16.3	Ensure that test results of concrete cubes are examined to verify the specified grade of concrete as required	Load Test		A	IS456		Protocol	
16.4	Rebound Hammer Test (if applicable) or any other non-destructive tests as per Tech Spec	Test		A	IS13311-I		Protocol/ test report	
16.5	UPV test on TG and other identified machine foundations (if applicable) as per tech spec/ BOQ	Test		A	IS13311-I		Protocol/ test report	



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FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

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SYSTEM : CIVIL WORKS		SUB-SYSTEM : MISCELLANEOUS		AREA : CONSTRUCTION			SHEET 22 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
17.0	WATER RETAINING STRUCTURE :							
17.1	Ensure inspection of finished structure and identify if pressure grouting is required.	V		B	Drawing	100%	Log book	
17.2	Ensure construction joints are as per drawings and specification	V		C	Drawing	100%	Protocol	
17.3	Checks on Copper &PVC Water stops, joint filler	V		C	Drawing	100%	Protocol/ Pour card	
17.4	Ensure water fill test is conducted for specified water retaining structure.	V		B	Drawing/ Tech Spec	100%	Protocol	
18.0	WATER SUPPLY :							
18.1	Check properly alignment level and grades of each laid length of water supply lines	M	Measuring Tape, Levelling instrument/ water level	C	Drawing	100%	Protocol	
18.2	Ensure that the water supply lines are tested.	V		B		100%	Protocol	
19.0	DRAINAGE AND SANITATION :							
19.1	Check for alignment and slope	M	Levelling instrument/ water level	B	Drawing	100%	Protocol	
19.2	Water leakage test	V		B	Specification	100%	Protocol	



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FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : MISCELLANEOUS		AREA : CONSTRUCTION			SHEET 23 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
20.0	FLOORING AND FINISHING WORKS:							
20.1	Cleanliness & readiness of concrete surface.	V		B		100%	Logbook	
20.2	Check for levels and slope	M	Levelling Instrument/ water level	B	Drawing	100%	Protocol	
21.0	WEATHERING COURSE:							
21.1	Check for slope	M	Levelling Instrument/ water level	B	Drawing	100%	Protocol	
22.0	MASONRY WORK & PLASTERING:							
22.1	Ensure bricks are soaked in water before use in brick masonry and ensure mortar joints have uniform thickness as per specification.	V		C	IS2212/ Specification	100%		
22.2	Ensure curing of brick work	V		C		100%		
22.3	Ensure that the thickness of plastering of brick walls shall be as per TS/Drawing	V / M	Steel Tape	B	Drawing/ Tech Spec	Random Test	Protocol	
22.4	Ensure that the curing of plastering surfaces are carried out for 7 days (min.)	V		C		100%		
23.0	SUSPENDED/ FALSE CEILING:			B	TC	100%		
23.1	Review of TC/ IR of resin bonded mineral wool	R		B	Drawing/ Tech spec	100%	Protocol	
23.2	Thickness/ review of insulation applied	M	tape	B	Drawing	100%	Protocol	
23.3	Level of finished suspended ceiling	M	Levelling instrument/ Water level	A	Annexure-VII	100%	Protocol	
24.0	BOUGHT OUT ITEMS (BOI):							
24.1	Check the BOIs are as per Technical specification / IS codes before use. Approval of all bought out items.	V/R						



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FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : MISCELLANEOUS

AREA : CONSTRUCTION

SHEET 24 / 31 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
25.0	ROOF DECKING: a) Review of T/C Dimension Check including thickness, depth of valley centre to centre distance of valley b) Fixing of Decking Seats Appearance, Water Tightness, check side end laps, Check conformity of Fixing as per approved design, Review of T/C for fasteners and Z spacers	M V	Measuring Tape/ Screw gauge	B C	Drawing IS 3618	Sample Test Sample Test	Protocol	



STANDARD FIELD QUALITY PLAN FOR **CIVIL WORKS** (STATEMENT OF CHECKS)

FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS

SUB-SYSTEM : MISCELLANEOUS

AREA : CONSTRUCTION

SHEET 25 / 31 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
27.0	WALL CLADDING WORK:							
	a) Inner sheets							
	i) Review of TC for physical & chemical properties (material & coating)	R		B	Drawing / Spec	100%		
	ii) Dimensional conformities including thickness, Rib depth, cover width.	M	Measuring Tape/Screw Gauge/ Vernier calliper/ Elcometer	B	Drawing / Spec	100%	Protocol	
	b) Outer skin sheets							
	i) Review of TC for physical & chemical properties (material & coating)	R		B	Drawing / Spec	100%		
	ii) Dimensional conformities including thickness, Rib depth, cover width.	M	Measuring Tape/Screw gauge/ Vernier calliper/ Elcometer	B	Drawing / Specification	100%	Protocol	



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FOR
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FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : MISCELLANEOUS		AREA : CONSTRUCTION			SHEET 26 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
	c) Thermal Insulation Check thickness, Thermal conductivity at 50°C, Density of thermal insulation and review of TC for all test	M / V/ R		B	IS 8183	100%	Protocol	
i)	Check positioning and location of laps.	M	Measuring Tape	C	Drawing	100%	Protocol	
ii)	Check alignment of sheets and fixing (Plumb & level)	M	Water level / Plumb	C	Drawing	100%	Protocol	
iii)	Check End lap and Side lap fixing of other item	V		C	Drawing	100%	Protocol	
iv)	Check location and spacing of fixing.	V/ M	Measuring Tape	C	Drawing	100%	Protocol	



**STANDARD FIELD QUALITY PLAN
FOR
CIVIL WORKS
(STATEMENT OF CHECKS)**

FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS SUB-SYSTEM : MISCELLANEOUS AREA : CONSTRUCTION SHEET 27 / 31 SHEETS

S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
28.0	ROADS:							
(i)	Alignment as per layout	V/M		B	Drawing	100%	Protocol	
(ii)	Subgrade	P	Proctor Density/ Relative Density	A	IS 1200/ IS 2720 Part 24 and 28 /Tech Spec/ Drawing	Every 1000 sqm and each layer	Protocol	
(iii)	Granular Sub Base							
	(a) Approval of Fill material	R	Lab test	A		Once or change of source		
	(b) Sieve Analysis	P	Lab test	B	Tech Spec/ Drawing/ Annex II		Report/ Protocol	
	(c) Thickness of Fill in each layer after dry rolling as per CBR Value	P	Level M/c	B		Every 1000 sqm and each layer		
	(d) Level & Camber Check before and after rolling	P	Level M/c	B				
(iv)	WBM (Water bound macadam)							
	(a) Approval of Fill material	R	Lab test	A	Tech Spec/ Drawing/ Annex II	Once or change of source	Report/ Protocol	
	(b) Sieve Analysis	P	Lab test	B				
	(c) Thickness of Fill in each layer after dry rolling	P	Level M/c	B		Every 1000 sqm and each layer		
	(d) Level & Camber Check before and after rolling	P	Level M/c	B				
(v)	Tack Coat (Qty. Of Bitumen/Sqm to be ascertained)	P		A	Tech Spec	Every 1000 sqm and each layer	Protocol	
(vi)	Bituminous Macadam							
	(a) Mix Design as per Specification	R	Lab Test report	A	Tech Spec	Once or change of source	Protocol	
	(b) Approval of Material (review the TC of material)	R	Lab Test report	A				
	(c) Temperature of Mix before Laying	P	Temp. Gauge	B		Every 1000 sqm and each layer		
	(d) Thickness of Fill	P	Tape	B				
	(e) Level & Camber Check before and after rolling	P	Level M/c	B				
	(f) Random Bitumen quality Check	P	Chemical Test	B				

		STANDARD FIELD QUALITY PLAN FOR CIVIL WORKS (STATEMENT OF CHECKS)						FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
								REV. NO. : R00
SYSTEM : CIVIL WORKS		SUB-SYSTEM : MISCELLANEOUS		AREA : CONSTRUCTION			SHEET 28 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLAS S	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
(vii)	Premix Carpet							
	(a) Mix Design as per Specification (b) Thickness of Fill (c) Level & Camber Check before and after rolling (d) Random Bitumen Quality check	R P P P	Lab Test Tape Level M/c Chemical test	A B B B	Tech Spec	Once or change of source Every 1000 sqm and each layer	Protocol	
(viii)	RCC Pavements: a. Checking/testing of material b. Mix Design as per spec c. Level, slope and thickness (top level) d. Consolidation, finishing and casting of test cubes e. Compaction, curing of concrete	V/T V/M V/M V/M V/M	Lab reports Lab reports Levelling instrument	A A B A C	Tech spec	100%	Test Report Test report L05 L05	
29.0	WATER PROOFING :							
(i)	Approval of Material including bitumen sheet and chicken mesh	R	Test Certificate	A	Tech Spec	Once	Test certificate/ Protocol	
(ii)	Laying as per Manufacturer Recommendation	P		B	Manufacturer Recommendation	Every 1000 sqm or per roof	Protocol	
(iii)	Other masonry works and concrete work as mentioned in this FQP	P		B		100%	Protocol	
(iv)	Leak test of water proof area	V		A				



STANDARD FIELD QUALITY PLAN
FOR
CIVIL WORKS
(STATEMENT OF CHECKS)

FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

REV. NO. : R00

SYSTEM : CIVIL WORKS		SUB-SYSTEM : MISCELLANEOUS		AREA : CONSTRUCTION			SHEET 29 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
30.0	Topographical survey							
a	Establishment of benchmark and plant coordinates at site	P	Total station and auto level	A	Tech spec/ Drawings	Once before commencement of work	Protocol	
b	Spot levels of project area	P	-do-		-do-	-do-	Protocol	
c	Recording of existing facilities in project area	P	-do-	A	-do-	-do-	Protocol	
d	Submission of Final topographical survey report along with topo map/ contour drawings (As required / agreed)	P		A B	-do-	After completion of topographical survey work and review of draft reports	Report	
31	GEOTECHNICAL INVESTIGATION WORK							
a	Deployment of approved - Equipment, qualified Manpower for Geotechnical Investigation survey	P		A	Tech spec and relevant IS Codes	Once before commencement of work	Site Record	
b	Execution of Geotechnical Investigation - locations, type etc as per scheme	P		B	-do-	Each Location	-do-	
c	Collection of disturbed and undisturbed samples , their packing and storage	P		B	-do-	each sampling	-do-	
d	Submission of Field Bore logs in approved format	R		B	-do-	Within 24 hours after completion of each BH	-do-	
e	Submission of laboratory test schedule and selection of samples for laboratory testing	R		A	-do-	As per consultation with engineer during dispatch of samples to approved laboratory	-do-	
f	Submission of Final Geotechnical investigation report along with recommendations	P		B	-do-	After completion of investigation work and review of draft reports	Report	

 STANDARD FIELD QUALITY PLAN FOR CIVIL WORKS (STATEMENT OF CHECKS) FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01 REV. NO. : R00								
SYSTEM : CIVIL WORKS		SUB-SYSTEM : MISCELLANEOUS		AREA : CONSTRUCTION			SHEET 30 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
33	ANTIWEED TREATMENT Anti-weed treatment materials	V/P		A	Tech Specs and Drawings	Each batch of delivery	SR/ MTC	EIC Approved source and review of MTC/ test reports
34	Execution of treatment	V/P		B	-do-	Random check for each treatment	SR	
	SPECIAL ITEMS Earthing Mat (Grounding System)							
	Earthing mat	V		A	As per relevant IS and Tech. Specs / Manufacturer's, IS 3043	Each lot of delivery as per Specifications	SR/MTC	EIC Approved source and review of MTC/ test reports
	Weld sizes & lap length	V/ M	Visual/Tape	B	Tech Specs and Const. Drawings	100%		BHEL approved electrodes shall be used
	D P test	P	DP test Kit	B	Tech Specs and Const. Drawings	10% at random of the offered lot		TR
	Earth test	P	Earthing test kit	A	Tech Specs and Const. Drawings	100%		SR
	b. Bitumen layer for tank foundation							
	Material- Grade of bitumen	V		A	As per relevant IS and Tech. Specs /MTC/ drawing	Each lot of delivery as per Specifications	SR/MTC	
	Acceptance and workmanship	P		B	Tech Specs and Drawings	Random	SR	

		STANDARD FIELD QUALITY PLAN FOR CIVIL WORKS (STATEMENT OF CHECKS)					FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01	
							REV. NO. : R00	
SYSTEM : CIVIL WORKS		SUB-SYSTEM : MISCELLANEOUS		AREA : CONSTRUCTION			SHEET 31 / 31 SHEETS	
S.NO	CHARACTERSTICS	TYPE OF CHECK	INSTRUMENT	CLASS	REFERENCE DOCUMENT	QUANTUM / FREQUENCY OF CHECK	FORMAT OF RECORD	REMARKS
	Composite Aluminium Panels and structural glazing							
	Material- Type of aluminium panels / structural glazing / fasteners and fixtures / silicon sealant	V/ R	Weigh balance	A	Technical specifications / drawings	Each lot of delivery as per Specifications	Protocol	Review of MTC
	Acceptance and workmanship	P		B	Technical specifications / drawings	Random		
	Pressure Release Valves							
	Material	V		A	Technical specifications / drawings	Each lot of delivery as per Specifications	Protocol	Review of MTC
	Acceptance and workmanship	P		B	Technical specifications / drawings	Random		



ANNEXURE - I

FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

RECOMMENDED LABORATORY EQUIPMENTS/MEASURING DEVICES/INSTRUMENTS FOR CIVIL WORKS AT TURNKEY PROJECTS

REV. NO. : R00

SHEET No.: 01 OF 02

SL NO.	BROAD CLASS	NOMENCLATURE DESCRIPTION	UTILITY	TEST PROCEDURE	CODE REF.	TO BE AVAILABLE AT SITE
1	Routine Test Lab. Equipment	1.1 Vicat Apparatus	Cement Consistence	Penetration of Std. Needle	IS 5513	Yes
		1.2 Lechatelier's test Apparatus	Cement shrinkage	Size variation after curing of sample	IS 5514	Yes
		1.3 Mould (cement) (70.7x70.7x70.7mm)	Cement cubes	Cubes made of 1:3 cement: Sand	IS 10086	Yes
		1.4 Cement Mortar Mould Vibrator	Cube Compaction	Vibration for fixed duration	IS 10078	Yes
		1.5 Concrete cube mould (150x150x150)mm	Concrete cubes	--	IS 10086	Yes
		1.6 Compressive strength Testing machine	Concrete cube test	Crushing strength of cube	IS 2505	Yes
		1.7 Concrete slump cone	Workability check	Drop in cone height of concrete	IS 7320	Yes
		1.8 Coarse aggregate sieves	Sieve analysis	Sieving	IS 383	Yes
		1.9 Fine aggregate sieves	Sieve analysis	Sieving	IS 383	Yes
		1.10 Sieve shaker	Mechanical sieving	--		Yes
		1.11 Aggregate impact test machine	Impact value of aggregate	--	IS 9377	Yes
		1.12 Compaction factor Apparatus	Workability of concrete	Lab test	--	--



ANNEXURE – 1

FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01

RECOMMENDED LABORATORY EQUIPMENTS/MEASURING DEVICES/INSTRUMENTS FOR CIVIL WORKS AT TURNKEY PROJECTS

REV. NO. : R00

SHEET No.: 02 OF 02

SL NO.	BROAD CLASS	NOMENCLATURE DESCRIPTION	UTILITY	TEST PROCEDURE	CODE REF.	TO BE AVAILABLE AT SITE
2.0	Dimensional & Allied Measuring Equipment	1.13 Abrasion and Attrition Testing Machines.		--	--	Yes
		1.14 Proctor Density Testing Equipment with Mould and moisture meter		--	--	Yes
		1.15 Thermometer/Poker		--	--	Yes
		1.16 Measuring Cylinders		--	--	Yes
		2.1 Theodolite, levelling Instruments & Levelling Staff, Total Station	Levelling and centre line marking & verticality measurement	Measurements & recording	--	Yes
3.0	Process Control Accessories	2.2 Measuring tape	Dimension	--	--	Yes
		2.3 Slide Callipers	Dimension	--	--	Yes
		2.4 Screw Gauges	Dimension	--	--	Yes
		2.5 Elcometer & Elcometer 500	Paint coating thickness for steel and concrete	--	Specification	Yes
		3.1 Oven	Material drying for moisture control	Material to be kept for specific duration		Yes
		3.2 Physical balance with weight	Weighing	--	--	Yes
		3.3 Platform weighing machine (1000 KGs capacity)	-do-	--	--	Yes

CHECKLIST FOR CIVIL WORKS**1.0 TEST LABORATORY ESTABLISHMENT**

- Preliminary Survey & Layout

#

2.0 BRICKS

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- Ensure that the bricks are free from cracks, warpage and of uniform colour.
- Ensure clear ringing sound is heard on being struck.
- Check for the dimension, Check for bond / closers thickness of joints in masonry, Line, level and plumb,
- Racking out joints, keys in brick work, if any.
- Check for efflorescence & curing.

3.0 LEVELLING & GRADING

- Ensure that the vegetation in the plant area is completely removed.
- Ensure that excavation is carried out for levelling & grading including dressing to the specified levels & grades.
- Ensure that surplus earth unsuitable for filling are dumped and leveled as specified.

4.0 FILLING AND COMPACTION

- Check that all the "blocks" are filled with approved filled material as per priority.
- Ensure that the area to be filled is free from water slush, vegetables, roots etc.
- Ensure that compaction is carried out for the original ground with required passes of rolling.
- Carry out the leveling of the filled area
- Ensure that the filled material is spread in horizontal layers not exceeding 300mm.
- Ensure that each block is finished with formation level, as specified.
- Check that watering is done before starting compaction
- Ensure that the compaction is carried out by rolling to the required extent

5.0 EARTH WORK

Ensure that the material is as per standard :

- a) Proctor Density & Optimum moisture content (Standard Proctor Test)
- b) Relative Density Index

6.0 PILING WORKS

The following tests are to be performed:

- Specific Gravity
- Differential Free Swell
- Liquid Limit
- pH value
- Sand Content
- Marsh Cone Viscosity

7.0 CEMENT

Ensure that material is stored properly to avoid deterioration due to moisture and contamination by various impurities

- Covered storage is provided
- Material is stored on raised platform
- Not more than 10 bags are stacked on one heap with proper access for inspection
- Cement shall be stacked consignment wise, type & grade wise for clear identification

8.0 FINE AGGREGATE (river/ manufactured sand)

Ensure that the following tests are conducted for each source of supply and check the material is as per standards (for mix design)

- Silt & Clay content
- Sieve analysis (Particle size and shape)
- Bulking of sand
- Specific gravity, density, voids & absorption
- Moisture content
- Deleterious materials
- Petrographic examination
- Soundness
- Reaction with Alkali : Mortar making properties.
 - Conduct tests and ensure that the material is as per standards before use at site
- Silt & Clay content
- Sieve analysis
- Bulking of sand

9.0 COARSE AGGREGATE (Stone Metal/Gravel)

Conduct the following tests and ensure that the material is as per standards (for Mix design)

- Sieve Analysis (Particle Size and Shape)
- Moisture content
- Specific gravity
- Crushing Strength
- Bulk density
- Absorption value, Abrasion value & Impact Value
- Voids
- Soundness
- Reaction with Alkali
- Petrographic examination
- Deleterious materials
- Temperature Cycle test
- Flakiness

10.0 REINFORCING STEEL

- Conduct following chemical and mechanical tests wherever required and ensure that the material is as per standards :
 - Chemical analysis including chromium and other corrosion resistant element
 - Tensile strength, Proof stress, Elongation
 - Bend Test
- Ensure fabrication is done as per details given in drawings and bar bending schedules
- Ensure that the joints and crossing bars are tied properly with right gauge wire.
- Ensure lapping of bars, wherever necessary

11.0 FORM WORK

- Ensure the form work is as per contract specifications and drawings. Also before form work of main castings like TG raft, Fans, Mills etc. ensure availability of Mechanical GA Drgs.
- Ensure horizontality before and after placement of reinforcement.
- Form work material are as per the specification and approved.
- Check that there is no loss of liquid through joints.

12.0 EMBEDDED PARTS

- Check for Position, depth and size of bolt holes
- Ensure suitable pipe sleeves have been provided for bolt holes before concreting
- Ensure length, diameter and verticality of embedded bolts
- Ensure that sufficient length of bolts protruding above finished floor level to accommodate equipment (Base frame)
- Ensure that the threads of foundation bolts are adequately projected.

13.0 CONCRETING

Ensure the following :

- Preliminary tests are conducted for determining design mix for required strength
- Cement water and aggregate content as per mix design (W-C ratio and cement content)
- Ensure the continuous concreting and the quantity of constituents measured by weigh batching
- Ensure that all measuring equipment are maintained in a clean serviceable condition and their accuracy checked periodically.
- The reinforcement rods are clean and free from rust, paint, oil and other coatings.
- The reinforcement are placed correctly in position with adequate separators before pouring concrete.
- Area to be concreted is clean and free from debris and any extraneous matter of water logging
- Water stopper or seals are introduced wherever required
- Old concrete surfaces are chopped, cleaned with wire brush, wetted and coat of cement slurry applied before laying new concrete

- Adequate cover is provided between reinforcement and shuttering
- Ensure chipping of pile head as per pile cap requirement
- Concrete is transported/ placed and compacted before expiry of initial setting time of cement and not disturbed subsequently
- Concrete is placed in even layers in quick succession, each of which is compacted before placing next layer and no cold joints are formed.

14.0 WATER RETAINING STRUCTURE

Ensure proper jointing of RCC pipes and curing of joints for minimum of 10 days

15.0 DRAINAGE AND SANITATION

- Ensure proper jointing of each length
- Ensure that water fill test is conducted to identify water leakage in joints for RCC non-pressure pipes.
- Ensure that all pipe i.e. fittings and fixtures are as per relevant code and as per drawing.

16.0 FLOORING & FINISHING WORKS

- Ensure that the floors are chipped prior to commencement of actual finishing work.
- Ensure that the cement concrete floors are cured minimum for 7 days
- Ensure that the tiled finished floors are polished as per the requirement of customer

17.0 WEATHERING COURSE

Check for joint finishing

18.0 BITUMEN TOP

Check for proper laying of Bitumen top

19.0 PLASTERING

Ensure that the plastering of concrete ceiling is as specified.

20.0 SUSPENDED/ FALSE CEILING

Ensure that the false ceiling is done as per drawing / specification

Ensure that as per requirement resin mineral wool is packed in black polythene and laid on top of Ceiling panels.

21.0 WALL CLADDING WORK

- Inner sheets
 - Check for galvanizing weight of zinc coating
 - Type of permanently colour coating and appearance
- Outer Skin Sheets
 - Check for Fluor Polymer Paint Coating Thickness through elcometer

FREQUENCY OF SAMPLING AND TESTING

SL No.	Nature of Test / Characteristics		Method of Test	No. of samples & Frequency of Test	Remarks
I	EARTH WORK				
	Suitability of Fill Materials				
	(a)	Grain size Analysis	1S:2720 (Part IV)	One in every 5000 Cu.m. for each type and each source of fill material subject to a minimum of two samples	Test for soil and sand
	(b)	Liquid limit and Plastic Limit	IS:2720 (Part V)		Test for soil
	(c)	Shrinkage Limit	IS:2720(Part VI)	One in every 5000 cu.m. for each type and each source of fill materials	The frequency of Test shall be increased depending on type of soil.
	(d)	Free swell Index	IS:2720 (Part XL)		
	(e)	Chemical Analysis	IS:2720 (Part 5)		
	(i)	Organic matter	Part XXII	One in every 5000 cu.m. for each type and each source of fill materials	Test for soil and sand
	(ii)	Calcium Carbonate	Part XXIII		
	(iii)	PH	Part XXVI		
	(iv)	Total soluble sulphate	Part XXVII		
II.	Standard Proctor Test		IS:2720 (Part VII)	One in every 2000 cu.m. for each type, each layer and each source of fill materials	Test for soil for determining optimum moisture content, Dry Density etc.
III	Moisture content of Fill before compaction		IS: 2720 (Part-II)		Test for soil

FREQUENCY OF SAMPLING AND TESTING

SL No.	Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks
IV	Degree of compaction of fill			
	a) Dry density by core cutter method OR Dry density implace by sand displacement methods	IS:2720 (Part XXIX) IS:2720 (Part XXVIII)	i. For foundation filling one for every ten foundations for each compacted layer for location of important and heavily loaded foundations. ii. For each filling, one for every 1000 sq.m. area for each compacted layer.	Test for soil
	b) Relative density Index	IS:2720 (Part XIV)	-do- (I) & (ii)	Test for sand
	c) Dry Density by proctor needle-penetration.	Standard Practice	Random checks to be carried out for each compacted layer in addition to tests mentioned under IV (a) above.	Test for soil.
	d) Permeability Test .	Standard Practice	Random checks	.Test for soil

Note; Number of samples & Frequency of test shall be verified with Customer/Engineering technical specification of respective project

FREQUENCY OF SAMPLING AND TESTING

SL No.	Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks
I	Coarse Aggregates			
	a) Particle size and shape	IS:2386 (Part I)	One per 100 cu.m. or part thereof or change of source whichever is earlier	Result to be as per the requirement of design mix, subject to variations within the limits specified in relevant Indian Standards.
	b) Moisture content	IS:2386 (Part 3)	Once for each stack of 100 cu.m. or part thereof except during monsoon when this has to be done every day before starting of the work.	Accordingly, water content of the concrete shall be adjusted.
	c) Specific gravity, density, voids, absorption.	IS:2386 (Part 3)	Once in 12 weeks or change of source, whichever is earlier.	These tests shall be carried out while establishing design mix and results to be intimated.
	d) Mechanical properties, crushing value, abrasion value and impact value.	IS:2386 (Part 4)	-do-	Acceptance norms shall be as per IS:383.
	e) Soundness	IS:2386 (Part 5)	-do-	Acceptance norms shall be as per per IS:383.
	f) Reaction with alkali	IS:2386(Part 7)	-do-	These tests shall be carried out while establishing design mix and result to be intimated. Acceptance shall be as per IS:2386 (Part 7)
	g) Flakiness and petrographic examinations	IS:2386	This is to-be done once in 12 weeks and should be repeated in case the source is changed.	These tests shall be carried out while establishing design mix and result to be intimated.
	h) Deleterious materials	IS:2386(Part 2)	Same as 'c' above	Results should be within the limits as specified in relevant Indian Standard.

SL No.	Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks
II	FINE AGGREGATES / SAND			
	a) Particle size and shape.	IS:2386 (Part I)	One per 100 cu.m. or part thereof or change of source, whichever is earlier.	Should be as per the requirement of design mix, subject to variation within the limit as specified in relevant IS Codes.
	b) Specific gravity density voids, absorption and bulking.	IS:2386 (Part 3)	Once in 12 weeks or change of source whichever is earlier.	These tests will be carried out while establishing design mix and results To be intimated.
	c) Bulkage, moisture content (Routine test)	IS:2386 (Part 3)	To be done everyday before start of work.	Volume of sand and weight of water shall be adjusted as per bulkage and moisture content.
	d) Silt, clay deleterious materials, organic impurities.	IS:2386 (Part 2)	Once per source and to be repeated, if source is changed.	Acceptance norms shall be as per IS:383.
	e) Soundness and Petrographic examination.	IS:2386(Part 5&8)	Same as 'b' above	Acceptance norms shall be as per IS:383.
	f) Mortar making properties.	IS:2386 (Part 6)	Same as 'b' above	Acceptance norms shall be as per IS:383.
	g) Reaction with alkali.	IS:2386(Part 7)	Same as 'b' above	Acceptance norms shall be as per IS:383 and IS:2386 (Part 7)

Annexure – IV

SHEET NO. 3 of 5
FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
REV. NO. : R00

SL No.	Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks
III	CEMENT			
	a. Setting time	IS:4031	One sample from each batch received from stores.	Acceptance norms shall be as per relevant Indian Standard.
	b. Compressive Strength c. Fineness	IS:4031	One sample from each batch received from stores.	Acceptance norms shall be as per relevant Indian Standard.
IV.	WATER			
	Harmful substances, pH value, initial setting time, compressive strength.	IS-3025,IS:4031 & IS:516	Once a month for each source	Acceptance norms shall be as per Cl.4.3 of IS:456 1978.
V.	CONCRETE			
	a) Workability (Slump and compaction factor).	IS: 1199	One sample every 6 cum from mixing plant	Acceptance norms shall be as per Cl.6.1 of IS:456 1978.
	b) Crushing Strength	IS:516	i) As per Cl. 14.2.2 of IS:456-1978 for initial period.	Acceptance criteria shall be as per Cl.15 of IS:456-1978.
			ii) One sample of six cubes per 150 cu.m. or part thereof for mass concrete for subsequent period.	A minimum of 3 (Part-7) specimens shall be tested for 28 days strength.
	c) Water cement ratio.	IS:1199	At random at the time of batching.	According to mix design.
	d) Cement Content	IS:1199	At random at the time of batching.	According to mix design.
	e) Water-tightness test (for water retaining Structures).	IS:370	Each tank or reservoir.	Acceptance criteria as per specification & relevant IS codes.
	f) Finished dimensions	Physical measurement	All structures	Acceptance as per Specifications.

Annexure – IV

SHEET NO. 4 of 5
FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
REV. NO. : R00

SL No.	Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks
VI.	FORM WORK			
	a) Staging (Durability, strength & soundness of staging, joints. adequacy of its foundation and specific level).	Visual / Measurement	Each member	Staging design for TG Deck shall be approved by the Engineer for its durability and strength.
				After erection of staging, nominated representatives of Engineer shall check the soundness of the staging as a whole, its joints, adequacy of its foundation and the specific levels.
	b) Shuttering			
	i) Materials	Visual	Random	Form work materials shall be strictly as per specifications and approval of the Engineer. Materials for form work shall be unwarped, thoroughly clean and without broken or damaged edges either due to repetitive use or otherwise oiling of form work before concreting shall be resorted to.
	ii) Joints	Visual	Random	Joints shall be leak proof to avoid loss of liquid.
	iii) Dimensions and plumb	Physical. measurement	Each member and before every lift.	Tolerances as per Specifications.

Annexure – IV

SHEET NO. 5 of 5
FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
REV. NO. : R00

SL. No.	Nature of Test / Characteristics	Method of Test	No. of samples & Frequency of Test	Remarks
VII.	REINFORCEMENT			
	a) Placement	Visual/ Measurement	each	The bar bending schedule with the necessary hooks, laps, covers, spacers and chairs shall be 100% checked for all concreting works before start of the work.
	b) Cutting tolerance	Physical measurement	Random	Tolerance shall be as per specification.
	c) Freedom from defects.	Visual	Random	Any of the bars selected for use shall be free from cracks, surface flaws, laminations and rough, jagged and imperfect edges.
	d) Tensile strength	Lab test		
VIII	EMBEDDED PARTS			
	a) Type of embedment	Visual/ Measurement	Each part	Type/Details as per drawings. Tolerance as per specification.
	b) Location	Physical/ Measurement	-do-	Detail as per drawings. Tolerance as per specification.

METHOD FOR DETERMINATION OF SLUMP OF CONCRETE

Slump test As per IS 1199

Objective : To determine the consistency of fresh concrete and to check the uniformity of concrete from batch to batch.

Test Procedure

1. Internal surface and mould should be cleaned thoroughly to make it free from moisture and any set concrete.
2. Place the mould on levelled metal plate.
3. The internal surface of the mould (cone) shall be thoroughly cleaned and free from superfluous moisture and any set concrete.
4. The mould shall be placed on a smooth, horizontal rigid and non-absorbent surface (such as carefully levelled metal plate)
5. Cone shall be filled in four layers, each approximately one Quarter of the height of the mould.
6. Each layer shall be tamped with 25 strokes of the rounded end of the tapping rod in such a manner that the strokes are uniformly distributed over the cross section of the mould and for the second and subsequent layers the rod to be penetrated into the underlying layers.
7. After the top layer has been rodded the concrete shall be struck off level with a trowel or tapping rod.
8. Leaked out mortar between the mould and the base plate is cleaned away.
9. The mould should be removed from the concrete immediately by raising it slowly and carefully in a vertical direction.
10. The slump shall be measured immediately. (The slump can be measured by keeping the tapping rod on the inverted mould and thus measuring the difference between the height of the mould and that of the highest point of the specimen being tested).

NOTE:-

- i) The test is to be carried out at a place free from vibration or shock and within two minutes of sampling.
- ii) Slump specimen which collapsed or sheared off laterally should be rejected and another test should be carried out.
- iii) Actual slump to be recorded in logsheet L-05

METHOD FOR DETERMINING THE COMPRESSIVE STRENGTH OF CONCRETE CUBES

(IS 516)

a) Age Test :

The age shall be calculated from the time of the addition of the water to the dry ingredients.

The testing shall be carried out at the age of 7 days and 28 days.

b) Number of Specimens :

Three specimen from different batches.

c) Procedure :

Specimens stored in water shall be tested immediately on removal from the water, in testing machine. The load shall be applied without shock and increased continuously at the rate of approx. 140 kg/ cm²/min, Until the resistance of the specimen to the increasing load breaks down and no greater load can be sustained. The maximum load applied to the specimen shall then be recorded.

d) Calculation :

Compressive Strength (kg / cm²) = Max. Load Applied / Cross-sectional area

BOUGHT OUT ITEMS

Check the following bought out items for their specifications / IS codes before use

- i. Teak wood
- ii. Grout Materials
- iii. Steel doors & Press steel door frames (IS 4351)
- iv. Steel glazed windows
- v. Glass for glazing of doors & windows & partition work
- vi. Aluminium partition, doors, windows (IS:1548)
- vii. Rolling shutters
- viii. Water proofing cement paint
- ix. Alkali / Acid resistant resin based epoxy paint
- x. Fire resistant paint
- xi. Anti-corrosive bituminastic paint
- xii. Acid resistance bricks
- xiii. Asbestos Mill board
- xiv. Asbestos rope
- xv. Mineral wool
- xvi. Vineertax
- xvii. Marine Terrazo flooring / Cement Concrete flooring (granolithic & ironite)
- xviii. Glazed / Ceramic / tiles flooring, wall cladding
- xix. Flexivynyle lining / PVC tiles
- xx. Heavy duty water proofing treatment on roof
- xxi. Under desk insulation & aluminium false ceiling materials
- xxii. Galvanised pipeline for water supply including fittings, C I pipes, RCC non-pressure pipes
- xxiii. Coarse aggregate
- xxiv. Fine aggregate
- xxv. Reinforcement
- xxvi. Cement

Note :-

- 1) Customer may witness the tests at manufacturers' premises or at laboratory as and when felt necessary.

	STANDARD FIELD QUALITY PLAN FOR CIVIL WORKS (STATEMENT OF CHECKS)	FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
		REV. NO. : R00
		SHEET 1 / 1 SHEETS
DOCUMENTS REFERRED IN FIELD QUALITY PLAN		
Sl. No.	Reference Document	Issuing Authority
1	Drawings	PEM
2.	IS 269, 370, 383, 432, 455, 456, 515, 516, 1077, 1199, 1489-1, 1566, 1786, 2386 part 1 to 7, 2502, 2720, 2911, 3025, 3616, 4031, 4351, 5513, 5514, 7320, 8183, 9377, 10078, 10086, 13311 - II	Bureau of Indian Standards (BIS)



RECORD OF QUALITY CHECKS

SHEET NO. OF SFQP	CHECK NO.	RESULTS ACHIEVED OK / NOT OK	DRAWING / DOCUMENT REFERENCE	FORMAT OF RECORD	INSPECTED BY SIGN. & DATE	CLEARED BY SIGN. & DATE	REMARKS

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

		SYSTEM	SUB-SYSTEM	AREA	FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
PROJECT					REV. NO. : R00
UNIT NO.					LOG SHEETNO. L-00
RATING					PAGE 1 OF 1



INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

CONSISTENCY OF CEMENT PASTE

This method is for determining the quantity of water required for preparing a cement paste of standard consistency. This can be performed by vicat apparatus.

Agency

Date of Testing

Grade

Reading recorded by analyst

Weight of sample _____ gms
mould

500 gms for 80 mm diameter vicat

Quantity of water _____ ml

Time of gauging _____ min.

3 to 5 min.

Penetration of plunger _____ mm
of 10 mm diameter

5 to 7 from bottom of the mould

Formula : $\frac{\text{Water added} \times 100}{\text{Weight of cement}}$

Consistency : %

			NAME	SIG. / DATE	FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
PROJECT		INSPECTED BY			REV. NO. : R00
UNIT NO.		CLEARED BY			LOGSHEETNO. L-01
RATING		CUSTOMER			SHEET 1 / 1 SHEETS



INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

INITIAL & FINAL SETTING TIMES OF CEMENT
(VICAT APPARATUS)

Date of testing

Weight of sample _____ gms

500 gms for 80 mm diameter vicat

Type of cement _____

Week number _____

Quantity of water _____ ml

85% of standard consistency

i) Initial Setting Time :

Penetration of vicat needle of 1 mm²
mould

5 + 0.5 mm from the bottom of the

Initial Setting min/sec

Total time from water addition to
proper penetration of the needle.

ii) Final Setting Time :

Final setting Time min. / sec.

Total time from water addition to
failure of making outer impression of the
surface of the cement specimen.

iii) Specification :

Initial (mins.) Min 30 min.

Final (mins.) Max 600 min.

			NAME	SIG. / DATE	FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
PROJECT		INSPECTED BY			REV. NO. : R00
UNIT NO.		CLEARED BY			LOGSHEETNO. L-02
RATING		CUSTOMER			SHEET 1 / 1 SHEETS



INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

**GRADING OF THE SAND
(FINE AGGREGATE)**

Date of testing

Source of sample: _____ Location of sample: _____

Weight of sample _____ gms Type of Aggregate : _____

Sl. No.	Retained on IS Sieve No.	Weight Retained	Percentage Weight Retained	Cumulative % Weight Retained	Percentage Passing
1.	10 mm				
2.	4.74 mm				
3.	2.36 mm				
4.	1.18 mm				
5.	600 microns				
6.	300 microns				
7.	150 microns				
8.	75 microns				

Fineness modulus _____

GRADING ZONES OF FINE AGGREGATE (IS 383)

IS Sieve Designation	Percentage Passing for			
	Grading Zone I	Grading Zone II	Grading Zone III	Grading Zone IV
10 mm	100	100	100	100
4.75 mm	90 - 100	90 - 100	90 - 100	95 - 100
2.36 mm	60 - 95	75 - 100	85 - 100	95 - 100
1.18 mm	30 - 70	55 - 90	75 - 100	90 - 100
600 microns	15 - 34	35 - 59	60 - 79	80 - 100
300 microns	5 - 20	8 - 30	12 - 40	15 - 50
150 microns	0 - 10	0 - 10	0 - 10	0 - 15

			NAME	SIG. / DATE	FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
PROJECT		INSPECTED BY			REV. NO. : R00
UNIT NO.		CLEARED BY			LOGSHEETNO. L-03
RATING		CUSTOMER			SHEET 1 / 1 SHEETS



INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

SIEVE ANALYSIS**GRADING OF COARSE AGGREGATE**

Date of testing

Source of sample: _____ Location of sample: _____

Weight of sample _____ gms Type of Aggregate : _____

Sl. No.	Retained on IS Sieve No.	Weight Retained	Percentage Weight Retained	Cumulative % Weight Retained	Percentage Passing
1.	40 mm				
2.	20 mm				
3.	16 mm				
4.	12.5 mm				
5.	10 mm				
6.	4.75 mm				
7.	2.36 mm				

GRADING ZONES OF COARSE AGGREGATE (IS 383)

IS Sieve Designation	Percentage Passing for Graded Aggregate of Nominal size			
	40 mm	20 mm	16 mm	12.5 mm
40 mm	95 - 100	100	-	-
20 mm	30 - 70	95 - 100	100	100
16 mm	-	-	90 - 100	-
12.5 mm	-	-	-	90 - 100
10 mm	10 - 35	25 - 55	30 - 70	40 - 85
4.75 mm	0 - 5	0 - 10	0 - 10	0 - 10
2.36 mm	-	-	-	-

Remarks:

			NAME	SIG. / DATE	FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
PROJECT		INSPECTED BY			REV. NO. : R00
UNIT NO.		CLEARED BY			LOGSHEETNO. L-04
RATING		CUSTOMER			SHEET 1 / 1 SHEETS



INSTRUMENT REG. NO.

DATE OF INSPECTION

DRAWING / DOCUMENT
REF.**COMPRESSIVE STRENGTH OF CEMENT CONCRETE**

Name of Agency :

Brand & Type of cement:

Location / Structure :

Grade of Concrete Mix Proportion :

Week no.:

Water /Cement Ratio:

Cement weight(kg)

Sl. No.	Date of Casting	Cube Identification Mark	Slump (mm)	Concrete Quantity from which sampling done	Date of Testing	Age of Cube	Weight of Cube	Load KN	Compression Strength N/ mm ²		Remarks
									Individual	Average	
						NAME		SIGNATURE / DATE		FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01	
PROJECT					INSPECTED BY					REV. NO. : R00	
UNIT NO.					CLEARED BY					LOG SHEET NO. L-05	
RATING					CUSTOMER					SHEET 1 / 1 SHEETS	



INSTRUMENT REG. NO.

DATE OF INSPECTION

D R A W I N G / D O C U M E N T R E F.

COMPRESSION STRENGTH OF BRICKS

AREA/LOCATION	:	BRAND	CLASS

Sl No	Sample No.	Brick Mark	Dimensions L Cm x B Cm x D Cm	Area of Cross Section Loaded	Load In Kg	Compression Strength N/ mm ²	Remarks
				NAME	SIG. / DATE		FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
PROJECT			INSPECTED BY				REV. NO. : R00
UNIT NO.			CLEARED BY				LOGSHEETNO. L-06
RATING			CUSTOMER				SHEET 1 / 1 SHEETS



			NAME	SIG. / DATE	FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
PROJECT		INSPECTED BY			REV. NO. : R00
UNIT NO.		CLEARED BY			LOGSHEETNO. L-07
RATING		CUSTOMER			SHEET 1 / 1 SHEETS



INSTRUMENT REG. NO./TAG NO.

DATE OF INSPECTION

DRAWING / DOCUMENT REF.

PROTOCOL

			NAME	SIGNATURE & DATE	FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
PROJECT		INSPECTED BY			REV.NO.: R00
UNIT NO.		CLEARED BY			PROTOCOL
RATING		CUSTOMER			PAGE:



FEEDBACK ON STANDARD FIELD QUALITY PLAN

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

Sheet No. Of SFQP	Check No. / Log Sheet No.	Proposed Change / Reasons / Remarks		
PROJECT		From :	To Head (Quality)	FQP. NO.: AA/CQ/SFQP/SCA/CL/ 01
UNIT NO.				REV.NO.: R00
RATING				SHEET 1 / 1 SHEET



BHARAT HEAVY ELECTRICALS LIMITED
Centre of Excellence (CoE), Karkhiyaon, Varanasi

Name Of Work:

**Construction of Propulsion Manufacturing Block
Foundation and Miscellaneous Enabling Works at
BHEL CoE, Karkhiyaon, Varanasi**

Tender Enquiry No. : COE/VNS/CVL/2023/001

Part-V

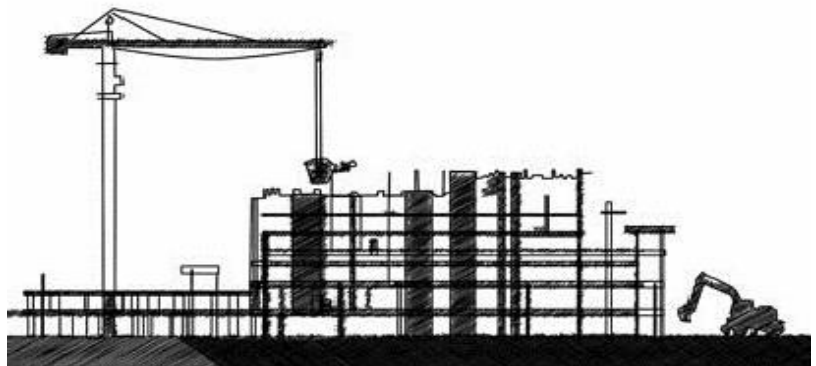
Following Documents are attached as Part-V Chapter XV of Volume -1B TCC:

Health, Safety & Environment (HSE) Plan



HSEP

Health, Safety & Environment Plan for Site Operations by Contractor



Bharat Heavy Electricals Limited, CoE Karkhiyaon

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3	ESTABLISHMENT OF COMMON FACILITIES
4	CRITICAL REQUIREMENTS W.R.T. EQUIPMENT & PPES
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SN	Description
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SECTION A

**CRITICAL RESOURCES FOR HSE
IMPLEMENTATION**

1. SHARING OF OPERATING COSTS OF FACILITIES

TABLE A.1

SN	FACILITY
1	Ambulance (24 hr.) with driver and First Aider (Specs in Annexure A)
2	Training Centre Consumables
3	Water sprinkling vehicle for dust suppression

Note:

- i. Responsibility of operation of above facilities shall rest with BHEL
- ii. Operating cost of the above shall be managed by subcontractors on sharing basis as per their contract value.
- iii. "Contract value" defined above & subsequently in the document shall be considered as "Awarded contract value".
- iv. No overhead cost/ enabling cost of BHEL shall be levied on the contractors for common facilities.

2. RESOURCES TO BE PROVIDED SOLELY BY THE SUBCONTRACTOR

TABLE A.2

SN	ITEM	SPECIFICATIONS
1.	HSE DISPLAYS, Posters and signage	Annexure B
2.	HSE Tools/ Equipment/ Devices	Annexure C
3.	Labor Colony	Annexure E
4.	Toilets (Latrines & Urinals) - in Site and Labor Colony	Annexure F
5.	Fire Extinguishers	Annexure G

Note:

In case subcontractor fails to provide the required resources, same will be procured and deployed by BHEL with applicable overhead on total procurement cost

3. ESTABLISHMENT OF COMMON FACILITIES

BHEL shall arrange and provide the following facilities which shall be used by all subcontractors for their employees and workers. These shall be

- i. Safety Park with facilities of audio-visual training & vertigo test center.
- ii. No cost shall be deducted from the subcontractors for the structure part only.
- iii. The running cost with basic inputs already mentioned at Point 1 above shall be shared by all contractors.
- iv. The sub-contractors shall be required to ensure participation in trainings, medical checkup and vertigo test as per the guidelines laid in this document and required as per statutory HSE requirements.

- v. However, in projects where in these facilities are not provided by BHEL, subcontractors shall ensure the training, medical/ vertigo test of all workers at site in consultation and guidance of BHEL HSE team at site in line with provisions of this document.
- vi. The overall onus of compliance to HSE practices pertaining to training, medical checkup including vertigo test shall lie on the subcontractor only.

4. CRITICAL REQUIREMENTS W.R.T. EQUIPMENT & PPES

- I. Conventional Hydra crane with carriage in front shall not be permitted. Pick & carry tyre mounted Front Cabin mobile crane (FX or TRX/ NextGen series of 'ESCORT" or equivalent make) shall only be permitted.
- II. Any Heavy equipment (cranes, winch machines, etc.) shall be deployed only after pre-safety Inspection by safety dept. Valid AMCs/ Fitness/ other statutory clearances as per local rules shall be required to be submitted before mobilizing the equipment at site.
- III. All other Hand tools and power tools should not be older than 5 years.
- IV. Deployment for all the lifting T&Ps and construction machinery/ equipment shall be made after obtaining written acceptance (Pre-entry Safety Clearance) from BHEL Site Safety Department after physical verification and checking all requisite documents/ compliance to Safety norms
- V. All motor vehicles should have valid registration certificate, insurance, Pollution under control (PUC) and fitness certificate as per Motor Vehicle Act 2020. The certificates should be pasted in the glass from inside.
- VI. PPEs shall be from reputed manufactures viz. 3M, Udyogi, Karam, Frontier, Freedom, Honeywell, Liberty, Bata, Nomex, Acme, Unicare, Life Gear or equivalent.

VII. Scaffold Tagging

- a. Scaffolds being erected, modified or dismantled must be tagged as suitable for use. Tagging shall be done with standard tag holder. Scaffolding tag should be certified by scaffolding inspector having valid certificate.
 - **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 erection.
 - **YELLOW** scaffold tag – to be fixed if scaffold is in under construction/ maintenance.



FIG. A.4.1 SAMPLE SCAFFOLD TAGS AND TAG HOLDER

VIII. T&P Color Coding:

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:

TABLE. A.4.2: T&P COLOR CODES

GREEN	BLUE	YELLOW	PURPLE
January February March	April May June	July August September	October November December

- The cycle of colors shall be Quarterly as a minimum or as decided by BHEL. 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 subcontractor.
- 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 discard immediately if they fail to meet the minimum requirements of the project.
- The Subcontractor's HSE Officer 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 Ten (10) day interval period shall be given into each monthly color code change. During this Ten (10) day period either color shall be acceptable.

xi. **T&P Tagging:**

All deployed Wire Rope Slings, Chain Pulley Blocks, Hooks, slings etc. shall be Tagged using aluminium or any other metal tag with punching.

5. HSE PERSONNEL TO BE PROVIDED SOLELY BY THE SUBCONTRACTOR

5.1. NUMBERS OF HSE PERSONNEL (APPLICABLE FOR EACH WORK SHIFT)

Number of HSE Officers and Supervisors shall be in proportion to number of workers as per Table A.5 below

TABLE A.5

No. of Workers	No. of HSE Supervisors	No. of HSE Officers
Up to 100	1	1
101 to 250	2	1
251 to 500	4	1
501 to 1000	6	2
1000 to 2000	6+ One additional supervisor up to every additional 250 workers	3
2000-3000	10+ One additional supervisor up to every additional 250 workers	4
3000-4000	14+ One additional supervisor up to every additional 250 workers	5

5.1.1. DEPLOYMENT PLAN

- i. Above requirement is for every shift for each unit.
- ii. The dynamic deployment plan of Safety manpower at various locations containing names, areas, time periods, shifts etc. shall be submitted to BHEL for approval by subcontractor
- iii. BHEL may modify the deployment plan based on nature and volume of jobs, Risks and hazards associated etc.
- iv. For less than 20 workers HSE Officer is not mandatory. In case the number of workers exceed 20 for 3 consecutive months, HSE Officer is to be engaged. The HSE Officer shall be deployed for a minimum period of 6 months even if the number of workers fall below 20 in any month subsequent to deployment. If within that 6-month period, the number of workers is more than 20 for at least 3 months, the deployment duration of HSE Officer will extend further 6 months after completion of previous 6-month period.
- v. For Site Material Management/ Handling (Loading/ Unloading) contracts, 1 no. HSE Officer shall be required irrespective of the total manpower deployed.
- vi. HSE Officers/Supervisors of all the vendors may be required to report directly to BHEL HSE Officer at site & shall comprise as a total team for handling all HSE issues.

However, each safety officer/ agency shall be individually responsible for the safe execution of work in their respective areas.

5.2. QUALIFICATION & EXPERIENCE REQUIREMENTS OF HSE PERSONNEL

5.2.1. HSE OFFICER

HSE Officer to be mandatorily as per Option I or II as under and shall be designated as Senior HSE Officer.

A. Option I

- i. possesses a recognized degree in any branch of engineering or technology or architecture and had a practical experience of working in a building or other construction work in a supervisory capacity for a period of not less than two years or possesses a recognized diploma in any branch of engineering or technology and has had practical experience of building or other construction work in a supervisory capacity for a period of not less than five years;
- ii. possesses a recognized degree or diploma in industrial safety with at least one paper in construction safety (as an elective subject/ part thereof);
- iii. has adequate knowledge of the language spoken by majority of building workers from the construction site in which he is to be appointed.

B. Option II:

Graduation Degree in Science with Physics & Chemistry and degree or diploma in Industrial Safety (All Degrees/ Diploma from any Indian institutes recognized by AICTE or State Council of Technical Education of any Indian State) with practical experience of working in a building, plant or other construction works (as HSE Officer, in line with Indian Factories Act, 1958 or BOCW Act, 1996) for a period of not less than five years **Note:**

- i. In case of resignation of the Senior HSE Officer, the same has to be replaced within 15 days else penalty provision will be applicable.
- ii. The penalty shall be deducted considering non-availability of any HSE Officer at site.

5.2.2. HSE SUPERVISOR: EITHER OF X OR Y BELOW

- X. Recognized Degree in any branch of Engineering OR Diploma in any branch of engineering with at least one-year construction experience + Diploma in industrial safety **OR**
- Y. A recognized graduation Degree or a recognized diploma in Engg. or Tech. with at least two-year construction experience + Diploma in industrial safety

5.3. HSE IN-CHARGE

In case there is more than one HSE Officer with any subcontractor, one of them, who is senior most by experience & meets qualification as per Option-1 as mentioned in clause 5.2 above (in HSE discipline), may be designated as HSE In-charge who will be the nodal point of contact on HSE matters.

5.4. SUPPORTING STAFF TO HSE TEAM

- i. Supporting Staff shall include scaffolders, scaffolding inspectors, riggers, skilled and unskilled manpower
- ii. Subcontractor shall provide adequate number of workers as and when required, in order to attend and comply to Safety observations raised by BHEL/ Customer.

5.5. AVAILABILITY AND PENALTY FOR NON-DEPLOYMENT

- i. The subcontractor shall submit the certificates of qualification & experience of HSE manpower before deployment for BHEL to assess suitability as per requirement detailed in this document
- ii. In case of rejection, subcontractor shall arrange additional candidates and submit resume to BHEL. Penalties will be applicable during the period of non-deployment in such cases as well. iii. Subcontractor shall ensure physical availability of safety personnel at the place of specific work locations.
- iii. The Subcontractor shall deploy the HSE Officers as per the site's requirement. Non- deployment shall lead to stoppage of the work and final decision shall rest with Site HSE & Construction manager.
- iv. The Subcontractor shall prepare an organization chart identifying the areas of operations, responsibilities and reporting structure of all safety personnel for each shift and submit the same to BHEL.
- v. The subcontractor shall deploy sufficient HSE Officers, supervisors, as per numbers & qualifications mandated in this Section since mobilization of first batch of manpower and add more in proportion to the added strength in work force. Any delay in deployment will attract a penalty at following rates:
Non-deployment of HSE Officer – Rs. 20,000 per man-month
- vi. Penalty shall be collected for the period of non-availability of safety personnel after allowing a grace period of 15 days for finding a replacement. The same shall be deducted on pro-rata basis till the required manpower is deployed.
- vii. In case of abnormal delay & frequent rejections of candidates proposed by the subcontractor, BHEL shall exercise the right to deploy the safety manpower & deduct the amount from subcontractor's running bill with

applicable overheads. In such cases also, the provision of logistics, transportation, food and other logistical support to the HSE personnel shall be in the scope of subcontractor in addition to the salary. After deployment of manpower by BHEL, the penalty for non-deployment specified above shall not be applicable.

6. COMPETENCY OF OPERATORS/ DRIVERS OF CRANE, WINCH, LIFTING/ CONSTRUCTION EQUIPMENT ETC.

- i. The Operators/ Drivers of crane, winch, construction/ lifting equipment etc. shall be experienced and have valid driving license for the class of vehicle / machinery as applicable (like Crane/ Forklift/ Rig, Construction equipment driving license etc.).
- ii. Minimum HMV driving license is required for all heavy equipment/ heavy vehicle (trailer/ Hydra /dumper /TM) operators at site.
- iii. The subcontractor shall certify competence of these persons in writing as and when they are posted at site.
- iv. Crane, Winch, Construction & lifting equipment operator should have certificate on subject course or experience certificate in employer letterhead.
- v. Where state is providing license for operating crane, tractor and other construction vehicles, same to be ensured.

Note: In case the statutory requirements i.e. State or Central Acts and / or Rules as applicable like the BOCW Act 1996, BOCW Rule-1996 or State Rules (wherever notified), the Factories Act, 1948 or Rules (wherever notified), etc. are more stringent than above, the same shall be followed.

7. HSE MANAGEMENT SYSTEM

- i. BHEL reserves the right to revise/ update these systems and procedure as per requirement to address any changing HSE needs
- ii. BHEL will provide hard / soft copies of applicable HSE Procedures, Work Permits, Operational Control Procedures, Inspection/ Other Formats etc. that are necessary for ensuring safe work to the successful bidder at Site. It is the responsibility of the subcontractor to ensure availability of these documents before commencing work at site. iii. The subcontractor can get soft copies of these documents from respective Region SCT/ HSE for reference. The signed hard copies of the same shall not be required to be submitted along with tender document
- iii. Subcontractor shall use the Digital (Web & App-Based) HSE management Software Systems provided by BHEL whenever provided. In case not provided, hard copy systems will continue to be used. All information technology

resources (Computers, mobile phones, mobile data, internet access etc.) for the use of such systems shall be ensured by the subcontractor.

8. HSE PERFORMANCE EVALUATION

- i. Subcontractor shall be assessed on monthly basis for HSE Compliance by BHEL Safety In-charge at site.
- ii. The HSE evaluation shall be based on HSE Performance Evaluation System of BHEL covering the contractual, statutory and regulatory requirements of HSE.
- iii. BHEL shall reserve the right to use these performance scores for evaluating bidder's capacity for future tenders
- iv. 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, provided the execution performance is satisfactory.

9. HSE PENALTIES

- i. Nonconformity of safety rules and safety appliances will be viewed seriously and BHEL has right to impose fines on the subcontractor for every instance of violation noticed.
- ii. As per contractual provision HSE penalties shall be imposed on subcontractors for non- compliance on HSE requirement as per following format.
- iii. Following are the applicable penalties for various Safety violations:

Sub: MEMO for Penalty for non-compliances in Safety

Following lapse (tick marked) was observed and penalty (in Rs.) is imposed as stated at the bottom of this memo. It is requested that such occurrences be please avoided in future.

S. No	Nature of Non - Compliance	Penalty (in INR)	Remarks
A. System Violations			
1	Working without valid Work Permit/ HIRA/ Method Statement / JSA	2000	Per case
2	Controls as per Work Permit/ HIRA/MS/JSA not ensured	2000	Per case
3	Reported Safety Violations Not Closed within Stipulated Time	1000-10000	Per case
4	Absence of required Subcontractor Officials (Site Head, HS Head) in Safety Reviews/Meetings	5000	Per case

5	Not providing required PPEs (Safety Harness, Lifeline, Safety Net, Fall arrestor, Safety Helmet, Gloves, Shoes etc.) for the work by subcontractor	2000	Per case
B. Competency/ Training/ Induction Violations			
1	Incompetent personnel deployed for specialized jobs like height work, hot work, rigging, vehicle operation etc. (without valid license/ certificate etc.)	3000	Per case
2	Work without induction training & medical check	2000	Per case
3	Height Work without Vertigo Test and height work training	2000	Per case
C. PPE Violations – Height Work			
1	Not wearing/ hooking Double Lanyard Safety Harness while working at height (> 1.2 meters) or not anchoring to lifeline	1000	Per case
2	Not Providing Lifeline for height work	3000	
3	Unsafe platforms – without Top, Mid Rails and Toe-Guards for Height Work	3000	
4	Not providing secondary means of fall protection for height work (Safety Nets, Retractable Fall Arrestors etc.)	3000	Per case
D. PPE Violations – General			
1	Not wearing safety helmet	1000	Per case
2	Wearing of helmets without chin straps	1000	Per case
3	Not Wearing safety shoes	500	Per case
4	Not wearing gloves	500	Per case
6	Not using grinding goggles/ face shield during grinding/ cutting	2000	Per case
E. Electrical Safety Violations			
1	Broken/ exposed wires/ cables	2000	Per case per day
2	Electrical plug not used for connection/ hand machines	1000	Per case per day
3	Not using proper ELCBs for electrical equipment	2000	Per case per day
4	Improper earthing of welding & Other electrical machines (Lack of double earthing, improper/ untested earth pit etc.)	2000	Per case per day
5	Not using 24 V supply for lighting in confined spaces	2000	Per case
6	Cables haphazard/ blocking way/ not organized properly	1000	Per case per day
F. Lifting & Rigging Violations			
1	Using Sling/ Chain Pulley Block and other Small T&Ps without proper, traceable Tag and Test Certificate	2000	Per T&P per day
2	Using damaged slings or not slinging properly	2000	Per T&P per day
3	Use of lifting equipment without having valid Test certificate	5000	Per equipment per seven days

4	Lifting hooks used without latches	2000	Per hook per day
5	Not effectively barricading area below lifting activity	5000	Per case
6	Using untrained/ unqualified rigger	5000	Per case
G. Housekeeping			
1	Non-removal of scrap from platforms	5000	Per Event Per location per 7 days
2	Not conducting scheduled housekeeping drives	5000	Per drive
H. Hot Work Safety Violations			
1	Gas cutting without flash back arrestor at both ends	5000	Per machine per incidence
2	Gas cutting at height without fire blanket	2000	Per event
3	Not keeping gas cylinders vertically	2000	Per event
4	Lifting cylinders without cage or rolling of cylinders	2000	Per incidence
5	Leakage in gas cylinder	2000	Per incidence
I. Vehicle Safety/ Operation			
1	Not having valid driving license for the type of vehicle/ T&P	2000	Per driver per incidence
2	Two-wheeler entry in construction area	2000	Per vehicle
3	Using Hydra for material movement at site in unsafe manner	2000	Per case
4	Using Two Hydra in Tandem for material movement without proper precautions as per OCP	2000	Per case
5	Vehicles, Hydras, Cranes, Dumpers and Earth Movers not having automatic back horns linked to gear	2000	Per Equipment per day
6	Not providing proper hard barricades around excavations/ unpermitted areas	5000	Per location per day
7	Not using guide rope while transporting material using Hydra or Cranes	2000	Per event
8	Over speeding	5000	Per case
9	Using Conventional Hydra crane	50000	Per day /crane
J. Accidents/ Incidents/ Near Misses			
1	Non-reporting of Near Miss/ Incident	20000	Per case
2	Major Accident – Worker unable to resume work within 48 hrs	100000	Per incident
3	Fatal Accident	500000	Per incident
K. Miscellaneous			
1.	Not providing the facility (drinking water, rest shed, labor colony etc. as per the specifications/ requirement)	5000	Per month per violation

2.	Not nominating the required number of workers for training as per plan	5000	Per incidence
3.	Lack of proper arrangement for disposal of sewage/ waste water/ effluents etc.	10000	Per incidence

Details (if any) related to non- compliance (Name of persons, Nature of deficiency, etc.):

Penalty Amount:

1. Rate as per above chart
2. No. of Persons/ machine/ event/ labor
3. No. of times the same error is repeated: Repetition factor
4. Total Penalty= 1. X 2. X 3. =

Witnessed by:

(Sub- Subcontractor representative)

(BHEL representative)

Signature

Name

Distribution: 1 Copy: to Sub- subcontractor Site In-charge,
1 Copy to Site Construction Manager (BHEL)
1 Copy to Site Finance

Note:

- i. For repeated violation for the same equipment/ location, the penalty would be double of the previous penalty. Date of "Repeated violation" will be counted from subsequent days.
- iv. For repeated fatal incident in the same Unit incremental penalty shall be imposed: The subcontractor will pay 2 times the previously paid penalty in case there is repeated major/ fatal incident under the same subcontractor for the same package in the same unit.
- v. Any other non-conformity noticed not listed above will also be fined as deemed fit by BHEL. The decision of BHEL engineer is final on the above.
- vi. If statutory and regulatory bodies impose some penalty on HSE due to the non-compliance of the subcontractor the same shall be passed on to them.
- vii. The penalty amount shall be recovered by BHEL Finance department from subcontractors from the RA/Final bill.

10. LEGAL IMPLICATIONS

Any legal Costs incurred by BHEL, on account of accidents taking place in the activities of the subcontractor, shall be debited to the subcontractor on actual cost basis.

For any accident occurring at site to any worker/ employee of the subcontractor leading to legal implications to BHEL Employee/ Management shall be safeguarded by BHEL legal department. All legal expenses incurred by BHEL on this account shall be recovered from the subcontractor. The accident also includes fire, loss of property or life at site.

11. HSE REVIEW MEETING

- i. Subcontractor Site In-charge and HSE In-charge shall attend the HSE Review Meeting as and when called by BHEL.

The indicative agenda points are given below:

- a) Implementation of earlier MOM points
 - b) Compliance Status of HSE Observations
 - c) Incidents & Near Misses, their Root Causes and Actions Taken
 - d) HSE performance review
 - e) HSE inspection findings
 - f) HSE audit
 - g) HSE training
 - h) Health check-up of worker
 - i) HSE planning for the erection and commissioning and installation activities in the coming month
 - j) HSE reward and promotional activities
- ii. MOM on the discussion along with HSE observations will be circulated to the subcontractor for action.
 - iii. The subcontractor shall close the observations to the satisfaction of BHEL within stipulated time frame.

12. OTHER REQUIREMENTS

- i. 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 and the cost shall be debited to the subcontractor with applicable overheads.

- ii. 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, favourably consider to reward the subcontractor suitably for the performance.
- iii. 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.
- iv. 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.
- v. 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.
- vi. The subcontractor shall notify BHEL of his intention to bring to site any equipment or material which may create hazard.
- vii. 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.
- viii. 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.

13. MEMORANDUM OF UNDERSTANDING:

After award of work, subcontractors are required to enter into a memorandum of understanding as given below:

Memorandum of Understanding

BHEL is committed to Health, Safety and Environment Policy (HSE Policy).

M/s..... do hereby also commit to comply with the same HSE Policy while executing the Contract Number _____

M/s..... have gone through and understood all the HSE requirements of the contract including HSE manpower, tools & equipment, systems & procedures, and agree to fulfill the same as a minimum. Any additional resources and support required for ensuring fulfillment of HSE Objectives shall be provided by subcontractor at no extra cost.

M/s..... agree that in case they fail to comply to the HSE requirements as stipulated in the contract, BHEL shall have the right to implement the same and the cost shall be recovered from the subcontractor with applicable overheads.

M/s..... shall ensure that safe work practices as per the HSE plan. Spirit and content therein shall be imbibed in all workers and supervisors for compliance.

In addition to this, M/s..... shall comply to all applicable statutory and regulatory requirements which are in force in the place of project and any special requirement specified in the contract document of the principal customer.

M/s..... shall co-operate in HSE audits/inspections conducted by BHEL /customer/ third party and ensure to close any non-conformity observed/reported within prescribed time limit.

M/s..... agree that the subcontractor shall seek HSE clearance as per BHEL format before each RA bill as mentioned in clause no. 9. The penalty amounts for not providing Safety manpower and various Safety violations have also been reviewed and agreed.

M/s..... agree to share the HSE Costs (running costs) of common facilities created by BHEL on proportional to contract value basis as calculated at Site by BHEL. Signed by authorized representative of M/s -----

Name :

Place & Date:

SECTION B

OPERATIONAL REQUIREMENTS

1. 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.
- 1.2. This document shall be followed by BHEL's subcontractors at CoE Karkhiyaon.
- 1.3. Although every effort has been made to make the procedures and guidelines in line with statutory requirements, in case of any discrepancy wherein the relevant statutory guidelines supersedes this document, the same shall be followed.
- 1.4. In case there's any specific HSE requirement, not explicitly indicated in this document the same shall be required to be fulfilled as per the decision of BHEL Project Director of CoE Karkhiyaon.

2. SCOPE:

The document is applicable to BHEL's Subcontractors at all Construction activities of BHEL CoE Karkhiyaon as per the relevant contractual obligations

3. OBJECTIVES AND TARGETS:

- i. To achieve "Zero Incident at Site"
- ii. 100% compliance to all legal/statutory requirements related to EHS.
- iii. 100% Health, Safety and Environmental Induction training attendance for all workers.
- iv. Prevent pollution to environment
- v. Ensure the Health and Safety of all persons at work site is not adversely affected by the work.
- vi. Ensure protection of environment of the work site.
- xii. Comply at all times with the relevant statutory and contractual HSE requirements.
- vii. xiii. Provide trained, experienced and competent personnel. Ensure medically fit personnel only are engaged at work.
- xiv. Provide and maintain plant, places and systems of work that are safe and without risk to health and the environment.
- viii. Provide all personnel with adequate information, instruction, training and supervision on the safety aspect of their work.
- ix. Effectively control, co-ordinate and monitor the activities of all personnel on the Project sites including subcontractors in respects of HSE.
- x. Establish effective communication on HSE matters with all relevant parties involved in the Project works.
- xi. Ensure that all work planning considers all persons that may be affected by the work.

- xii. Ensure fitness testing of all T&Ps/Lifting appliances like cranes, chain pulley blocks etc. are to be certified by competent person.
- xiii. Ensure timely provision of resources to facilitate effective implementation of HSE requirements.
- xiv. Ensure continual improvements in HSE performance.
- xv. Ensure conservation of resources and reduction of wastage.
- xvi. Capture the data of all incidents including near misses, process deviation etc. Investigate and analyse the same to find out the root cause.
- xvii. Ensure timely implementation of correction, corrective action and preventive action. The subcontractor shall also comply with HSE Targets stipulated by BHEL from time to time.

4. BHEL HEALTH, SAFETY & ENVIRONMENT POLICY:

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

- ✚ Developing safety and sustainability culture through active leadership and by ensuring availability of required resources.
- ✚ Ensuring compliance with applicable legislation, regulations and BHEL systems.
- ✚ Taking up activities for conservation of resources and adopting sound waste management by following Reduce/Recycle/Reuse approach.
- ✚ Continually identifying, assessing and managing environmental impacts and Occupational Health & Safety risks of all activities, products and services adopting approach based on elimination/ substitution/reduction/control.
- ✚ Incorporating appropriate Occupational Health, Safety and Environment criteria into business decisions, design of products & systems and for selection of plants, technologies and services.
- ✚ Imparting appropriate structured training to all persons at workplace and promoting awareness amongst customers, subcontractors and suppliers on HSE issues.
- ✚ Reviewing periodically this policy and HSE Management Systems to ensure its relevance, appropriateness and effectiveness.
- ✚ Communicating this policy within BHEL and making it available to interested parties.

- Chairman & Managing Director/ BHEL

5. ILLUSTRATIVE RESPONSIBILITIES OF SUBCONTRACTOR EMPLOYEES

5.1. HSE - A LINE RESPONSIBILITY

i. HSE is a "Line Responsibility".

ii. The term "Line" includes management, Executives, Supervisors, Foremen, and Workers who are part of the workforce. Line is to be fully involved in HSE Planning & Implementation with the aid and advice of HSE organization. iii. "Line", having control of resources and manpower is responsible for overall implementation of HSE Systems and closure of HSE observations.

5.2. SITE IN -CHARGE:

- i. Shall sign Memorandum of Understanding (MoU)
- ii. Shall ensure availability of all necessary resources required for implementation of HSE at Site
- iii. Shall engage qualified HSE Officer(s) and supervisors (s)
- iv. Shall adhere to the rules and regulations mentioned in this code, practice very strictly in area of work in consultation with concerned engineer and the safety coordinator.
- v. Shall screen all workmen for health and competence requirement before engaging for the job and periodically thereafter as required.
- vi. Shall not engage any employee below 18 years.
- vii. Shall arrange for all necessary PPEs like safety helmets, belts, full body harness, shoes, face shield, hand gloves etc. before starting the job.
- viii. Shall ensure that all T&Ps engaged are tested for fitness and have valid certificates from competent person.
- ix. Shall ensure closure of all HSE non-conformities reported by BHEL or observed during internal inspection by providing appropriate resources in a timely manner.
- x. Shall ensure the implementation of provisions of applicable acts and rules pertaining to HSE.
- xi. Shall ensure availability of updated (Hazard Identification and Risk Assessment) Register for the area of activity
- xii. Shall ensure availability of Method Statements & Job Safety Analysis for all hazardous activities
- xiii. Shall ensure necessary controls to minimize risk in all applicable hazardous activities including Height Work, Hot Work, Lifting & Rigging, Confined Space, Maintenance, excavation, Radiography, Loading/ Unloading, Drilling/ Blasting etc.

- xiv. Shall ensure implementation of HSE requirements mentioned in this document and as specified in the BHEL HSE management System including training, inspection, awareness, reporting etc.
- xv. Shall ensure that person working above 2.0 meter should use Safety Harness tied to a life line/stable structure.
- xvi. Shall ensure a secondary means of fall protection (Safety Net, Retractable Fall Arrestor etc.) for preventing fall from height
- xvii. Shall ensure that materials are not thrown from height. Cautions to be exercised to prevent fall of material from height.
- xviii. Shall report all incidents (Fatal/Major/Minor/Near Miss) to the Site engineer /HSE officer of BHEL.
- xix. Shall ensure that Horseplay is strictly forbidden.
- xx. Shall ensure that adequate illumination is arranged during night work.
- xxi. Shall ensure that all personnel working under subcontractor are working safely and do not create any Hazard to self and to others.
- xxii. Shall ensure display of adequate signage/posters on HSE.
- xxiii. Shall ensure that mobile phone is not used by workers while working.
- xxiv. Shall ensure conductance of HSE audit, mock drill, medical camps, induction training and training on HSE at site.
- xxv. Shall ensure full co-operation during HSE audits.
- xxvi. Shall ensure submission of look-ahead plan for procurement of HSE equipment's and PPEs as per work schedule.
- xxvii. Shall ensure good housekeeping.
- xxviii. Shall ensure adequate valid fire extinguishers are provided at the work site.
- xxix. Shall ensure availability of sufficient number of toilets (preferably bio-toilets) /restrooms and adequate drinking water at work site and labor colony.
- xxx. Shall ensure adequate emergency preparedness.
- xxxi. Shall be member of site HSE committee and attend all meetings of the committee
- xxxii. Power source for hand lamps shall be maximum of 24 v.
- xxxiii. Temporary fencing should be done for open edges if Hand – railings and Toe-guards are not available
- xxxiv. To record all incidents including near miss and report to BHEL and to ensure analysis & corrective actions for the same.
- xxxv. Shall conduct weekly Safety Walks in the work area and record the findings.

- xxxvi. Construction of Canteen at Site, Office Infrastructure: Printer, PC, Fire Extinguishers etc.
- xxxvii. Shall analysis HSE Performance regularly in work area and take steps to improve the same
- xxxviii. Shall ensure stoppage of work in case of unacceptable Safety hazards

5.1 HSE OFFICER:

- i. Carry out safety inspection of Work Area, Work Method, Men, Machine & Material, P&M and other tools and tackles.
- ii. Facilitate inclusion of safety elements into Work Method Statement and creation of Job Safety Analysis (JSA)
- iii. (HSE Head) To prepare deployment plan of HSE personnel for all shifts, so as to ensure constant supervision of all areas. The plan to be submitted to BHEL
- iv. Highlight the requirements of safety through Tool-box / other meetings.
- v. Help concerned HOS to prepare Job Specific instructions/ JSA for critical jobs.
- vi. Conduct investigation of all incident/dangerous occurrences & recommend appropriate safety measures.
- vii. Advice & co-ordinate for implementation of HSE Systems & Procedures.
- viii. To stop work in case of any critical safety violation until the violation is cleared
- ix. Convene HSE meeting & minute the proceeding for circulation & follow-up action.
- x. Plan procurement of PPE & Safety devices and inspect their healthiness.
- xi. Report to BHEL on all matters pertaining to status of safety and promotional program at site level.
- xii. Facilitate administration of First Aid
- xiii. Facilitate screening of workmen and safety induction.
- xiv. Conduct fire Drill and facilitate emergency preparedness
- xv. Design campaigns, competitions & other special emphasis programs to promote safety in the workplace.
- xvi. Apprise BHEL on safety related problems.
- xvii. Notify site personnel non-conformance to safety norms observed during site visits / site inspections.
- xviii. 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.
- xix. To decline acceptance of such PPE / safety equipment that do not conform to specified requirements.

- xx. Encourage raising Near Miss Report on safety along with, improvement initiatives on safety.
- xxi. Shall work as interface between various agencies such customer, package-in-charges, subcontractors on HSE matters.

5.2 HSE SUPERVISOR:

- i. All requirements as per 5.1
- ii. To monitor allotted area for Safety violations, take required action and inform the concerned Safety Supervisor / Officer
- iii. To assist HSE Officer

5.3 PACKAGE IN-CHARGES, ENGINEERS & ALL EMPLOYEES:

- i. To be aware of, get involved in and ensure implementation of all HSE related Systems and Procedures including but not limited to:
 - a. BHEL HSE Management System including HSE Procedures and OCPs, HIRA, JSA etc.
 - b. Work Permit System
 - c. Emergency Preparedness Response Plans
 - d. Contractual HSE requirements
 - e. Legal Requirements
 - f. Penalty System
 - g. Training requirements
- ii. To ensure that the persons engaged in respective area follow the safety rules like using appropriate PPEs.
- iii. To develop Method Statements and ensure availability of Job Safety Analysis for all activities in scope
- iv. To ensure that the reported HSE non-conformities in the work area are resolved immediately before resuming work
- v. To record all incidents including near miss and report to BHEL.
- vi. To adopt safe working practices at all times and act as role model for Safety
- vii. To take immediate corrective action actions in case any non-conformity is observed on product / process / system with respect to Occupational Health, Safety and Environment.
- viii. In case any particular activity / work has extremely high consequential risk or high environmental impact, same shall be brought to the notice of BHEL Package In-charge before starting the work.
- ix. To interfere/ stop work as & when identified unsafe.
- x. To maintain & promote improved level of house-keeping all the time at site.

- xi. To support/co-operate with audit team members as & when safety audits are carried out.
- xii. To involve in investigation, if any incident occurs in his work area.
- xiii. To participate in safety promotional programs
- xiv. To attend the safety committee meeting, if member/invitee
- xv. To ensure that only fit T&Ps and qualified persons are engaged for all activities.
- xvi. Shall ensure that person working above 2.0 meter should use Safety Harness tied to a life line/stable structure.
- xvii. Shall ensure that materials are not thrown from height. Cautions to be exercised to prevent fall of material from height.
- xviii. Shall ensure that all T&Ps engaged are tested for fitness and have valid certificates from competent authorities.

6. HSE PLANNING BY SUBCONTRACTOR:

6.1 HAZARD ANALYSIS & RISK ASSESSMENT (HIRA), METHOD STATEMENT (MS) & JOB SAFETY ANALYSIS (JSA):

- i. Subcontractor shall identify all OHS Hazards and Risks applicable to all activities in scope and plan & implement the required control measures. HIRA Register shall be maintained.
- ii. Subcontractor shall develop Method Statements & Job Safety Analysis documents for all hazardous activities in scope and ensure the required control measures. Job Safety Analysis is to be attached along with any Work Permit request

6.2 REGISTER OF REGULATIONS:

Subcontractor shall prepare a register of applicable rules and regulations in the scope and plan to ensure compliance.

HIRA Register, Method Statements, Job Safety Analysis and Register of Regulations are dynamic documents and shall be revised (as applicable):

- i. At fixed frequency of 3 months
- ii. Addition/ deletion/ modification of a process/ activity
- iii. After an accident/ incident
- iv. After any change in applicable rules/ regulations/ laws.

6.3 MONTHLY HSE PLAN COVERING THE FOLLOWING AS A MINIMUM SHALL BE PREPARED AND SUBMITTED TO BHEL FOR APPROVAL:

- i. HSE Trainings covering all activities/ hazards/ workers
- ii. HSE Inspection Plan covering all areas/ activities/ equipment/ hazards
- iii. HSE Activities: Safety walks, Awards, housekeeping, reviews etc.

Note: Online/ App-based system shall be used for HSE Planning and Implementation/ Update whenever provided by BHEL otherwise Hard-copy based system shall continue

6.4 MONTHLY HSE PLANNING & REVIEW OF HSE ACTIVITIES ALONG WITH BHEL:

Monthly planning and review of HSE activities shall be carried out by subcontractor as per provided **format** jointly along with BHEL

7. MOBILIZATION OF MANPOWER BY SUBCONTRACTOR:

- i. 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 subsubcontractor to ensure competency and fitness through following measures:
 - a) **Medical Checkup:** Examination of medical fitness shall be conducted through qualified medical professional for all workers to be deployed as per provided **format**. For height workers, vertigo (height phobia) test to be carried out as qualification criteria and recorded in provided **format**.
 - b) **Induction Training:** Induction training of all workers to be ensured as per **provided procedure and format**. Training evaluation to be carried out and training to be repeated if not passed
 - c) Only on successfully meeting above criteria, permanent gate passes to be issued
- ii. The subcontractor shall arrange induction and regular health check of their employees as per schedule VII of BOCW rules by a registered medical practitioner.
- iii. The subcontractor shall take special care of the employees affected with occupational diseases under rule 230 and schedule II of BOCW Rules. The employees not meeting the fitness requirement should not be engaged for such job.

- iv. 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.
- v. Appropriate accommodation to be arranged for all workmen in hygienic condition.
- vi. Cost of contractual, statutory and regulatory requirements like Training, medical checks, PPEs etc. shall not be transferred to the workers and such activities shall be considered as part of the job.

8. PROVISION OF PERSONAL PROTECTIVE EQUIPMENT (PPEs):

- i. Personnel Protective Equipment (PPEs), shall be provided by the subcontractor to all workers as per requirement of the job.
- ii. The choice of PPEs to ensure multiple (at least more than 1) means of protection against any hazard. All applicable safety precautions for a job shall be ensured notwithstanding the duration or perceived importance of the task.
- iii. The applicability of PPEs shall be as per the concept of Hierarchy of controls, i.e.:
- iv. Elimination->Substitution->EngineeringControls->AdministrativeControls->PPEs
- v. Relying solely on PPEs without ensuring necessary controls to be strictly avoided.
- vi. The following matrix recommends usage of minimum PPEs against the respective job:

Activity	Type of Protection						Remarks, if any
	Hand	Eye	Ear	Body	Respiratory	Others	
Gas Welding & Cutting	LG	WG	-	LA	*SCBA/ OLBA	-	* for confined space
Electric Arc Welding	LG	HMWS	-	LA	*SCBA/ OLBA	-	* for confined space
Rigging	CG	SG	-				--
Working at Height	-	SG	-	DLFBH	-	*FAS	* for vertical columns
Grinding & Chipping	CG	FS / SG	-	LA	-	-	--
Working in High Noise	-	-	EP/ EM	-	-	-	--
Handling of Cement Concrete	RG	SG	-	-	DM	-	

Blasting	CG	SG	EP*	-	-	-	* at noise area
Excavation	CG	SG	-	-	DM	-	*Gum boot in place of Safety shoe for foot
Chemical Handling	PVCG	CSG	-	PVCA	-	-	*Full body rubber suit with hood
Electrical and C&I	ERG*	SG	-	-	-	-	*For high voltages
Sand/shot blasting	CG	-	EP/EM	CA	SAMH	-	

ABBREVIATIONS: FS: Face Shield, CSG: Chemical splash goggles, HMWS: Helmet mounted welder's shield, GB: gum boot, DLFBH: Double lanyard full body harness, SG: Safety goggles, DM: Dust mask, SAMH L Supplied air mask/hood, EP/EM: Ear plug/Ear Muff, CG: Cotton hand gloves, LG: Leather hand gloves, LA: Leather apron, RG: Rubber gloves, PVCG: PVC Gloves, PVCA: PVC Apron, SCBA: Self-contained breathing apparatus, WG: Welding goggles, ERG: Electrical Rubber Gloves. OLBA: Online breathing apparatus

The list is not exhaustive. Additional PPEs to ensure Safe Work may need to be deployed as per the requirement of the task at no additional cost.

- vii. All the personnel and visitors shall mandatorily use safety helmet (with company logo), safety shoe and reflective vests, in addition to any other PPEs as deemed appropriate for the area of work/ visit.
- viii. Following Color scheme for Helmets shall be followed:
 - a. Workmen: Yellow
 - b. Safety staff: Green or white with green band
 - c. Electrician: Red
 - d. Others including visitors: White
- ix. The subcontractor shall maintain register for issue and receipt of PPEs.
- x. All the PPEs shall be checked for quality before issue and the same shall be periodically re-checked. The users shall be advised to check the PPEs themselves for any defect before putting on. The defective ones shall be replaced.
- xi. The Helmets shall have logo or name (abbreviation of agency name permitted) affixed or printed on the front.
- xii. The body harnesses shall be serial numbered.

9 ARRANGEMENT OF INFRASTRUCTURE:

9.1 DRINKING WATER:

- i. Drinking water shall be provided and maintained at suitable places at different elevations.

- ii. Drinking water tank shall be so installed so as to be available within 200 meters of each working area
- iii. Container should be labeled as “Drinking Water” in languages understood by the workers
- iv. Cleaning of the container shall be ensured at least once in a week. 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 (also applicable to labor colony).
- v. Suitability of water source for drinking to be tested as per IS10500 at least once in six months.

9.2 WASHING FACILITIES:

- i. In every workplace, adequate and suitable facilities for washing shall be provided and maintained.
- ii. 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.
- iii. Water suitable for washing and not for drinking shall be clearly indicated as “Not for Drinking” in language understood by workers.
- iv. 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.

9.3 LATRINES AND URINALS:

- i. Latrines and urinals shall be provided in every work place as indicated in Section A
- ii. Urinals shall also be provided at different elevations.
- iii. They shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times, by appointing designated person.
- iv. Separate facilities shall be provided for the use of male and female worker if any.

9.4 MEDICAL FACILITIES:

9.4.1 GENERAL

- i. Provision of First Aid, Ambulance etc.
- ii. Medical waste shall be disposed as per prevailing legislation (Bio-Medical Waste – Management and Handling Rules, 1998)
- iii. Every injury shall be treated, recorded and reported.
- iv. All First Aid injuries shall be recorded as per provided Format

- v. List of qualified first aiders and their contact numbers to be displayed at conspicuous places.

9.4.2 FIRST AIDER/ FIRST AID BOX

- i. The first aider along with facilities should be available at a point nearest to the work location wherein majority of the workers are working.
- ii. The subcontractor shall provide necessary first aid facilities as per schedule III of BOCW. At every work place first aid facilities shall be provided and maintained.
- iii. 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.
- iv. 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.
- v. The first aid box shall be distinctly marked with a Green Cross on white background.
- vi. Details of contents of first aid box is given in **Annexure J**
- vii. A slip of contents shall be pasted on the First Aid Box with following details
- viii. Monthly inspection of First Aid Box shall be carried out by the owner as per provided format
- ix. The subcontractor should conduct periodical first –aid classes to keep his supervisor and Engineers properly trained for attending to any emergency.

9.4.3 HEALTH CHECK UP

The persons engaged at the site shall undergo health check-up as per provided format before induction. In addition, the persons engaged in the following works shall undergo health checkup at least once in a year:

- i. Height workers
- ii. Drivers/crane operators/riggers
- iii. Confined space workers
- iv. Shot/sand blaster
- v. Welding and NDE personnel

9.4.4 HEIGHT PHOBIA/ VERTIGO TEST:

The persons engaged in working at heights (above 2 meters) to be assessed for Vertigo and associated conditions and recorded as per provided format. Such workers are to be allowed only on successful completion of test, otherwise shall be allocated ground-based jobs.

9.5 PROVISION OF ACCOMMODATION/LABOR COLONY FOR WORKFORCE:

- i. Proper accommodation for workforce to be provided in line with minimum requirements indicated in Section A
- ii. Labor colony shall be inspected each week by HSE Officer and report submitted to BHEL as per provided format

9.6 PEST CONTROL:

Regular pest control should be carried out at all offices, mainly laboratories, canteen, labor colony and stores.

9.7 ILLUMINATION:

- i. The subcontractor shall arrange at his cost adequate lighting facilities e.g. flood lighting, hand lamps, area lighting etc. at various levels for safe and proper working operations at dark places and during night hours at the work spot as well as at the pre-assembly area.
- ii. Lamp (hand held) shall not be powered by mains supply but either by 24V or dry cells.
- iii. Lamps shall be protected by suitable guards where necessary to prevent danger, in case of breakage of lamp.
- iv. Emergency lighting provision for night work shall be made to minimize danger in case of main supply failure.
- v. Adequate and suitable light shall be provided at all work places & their approaches including passage ways as per IS: 3646 (Part-II).

SUITABLE ILLUMINATION LEVELS FOR VARIOUS AREAS SHALL BE DECIDED BASED ON BROAD GUIDELINES INDICATED BELOW:

S. No.	Location	Lux Level (lumens/sqm)
A.	Construction Site	
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	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

- vi. Illuminations shall be inspected on weekly basis as per provided **format** using a calibrated lux meter.

10 HSE TRAINING & AWARENESS:

10.1 HSE INDUCTION TRAINING

- i. All persons entering into project site shall be given HSE induction training by the HSE officer of BHEL /subcontractor before being assigned to work.
- ii. The induction training shall be imparted through audio-visual medium (Classroom specialized training), and shall be minimum of 4 hours.
- iii. Evaluation to be carried out after training and training shall be repeated in case of failure.
- iv. Safety Induction Card shall be printed by Subcontractor and provided to all trained workers.
- v. Induction training subjects shall include but not limited to:
 - a. Briefing of the Project details.
 - b. Safety objectives and targets.
 - c. Site HSE rules.
 - d. Critical Safety Violations and consequences
 - e. Site HSE hazards and aspects.
 - f. First aid facility.
 - g. Emergency Contact No.
 - h. Incident & Near Miss reporting.
 - i. Fire prevention and emergency response.
 - j. Rules to be followed in the labor colony (if applicable)
 - k. Accident case studies

SAFETY INDUCTED	
Name :	
Date :	
Sign By Trainer :	

ABOVE STICKER SHALL BE PASTED ON HELMET OF WORKERS AFTER SAFETY INDUCTION TRAINING

10.2 JOB-SPECIFIC SKILL BASED HSE TRAINING

The contracting agency shall also impart job specific skill-based safety training to all its employees (Minimum one day) on various related safety topics using internal/external safety professionals/consultants as per the matrix given below. Record of such trainings and attendance particulars shall be maintained in a register for ready reference to statutory authorities/engineer-in charge as per provided format.

TRAINING MATRIX

Name of topic	Executives	Supervisors	Skilled Workmen	Other Workers
Safety Induction	Y	Y	Y	Y
Accident_ Causes, factors, cost	Y	Y	Y	-
Industrial hazards & Accident Prevention	Y	Y	Y	-
Investigating, reporting, records	Y	Y	-	-
Personal Protective Equipment	-	Y	Y	Y
Construction Safety & Role of Supervisory personnel	-	Y	-	-
Permit to Work (PTW)	-	Y	Y	y
Statutory Provisions (BOCW Act/Rules, Factories Act 1948 etc.)	Y	Y	Y	Y
Material handling	-	y	Y	Y
Emergency Management	Y	Y	Y	-
Electrical Safety	-	Y	Y	-
Fire safety	Y	Y	Y	Y
First Aid & CPR (cardio pulmonary resuscitation)	-	Y	Y	Y (Selected)
Safety in Welding & Cutting	-	-	Y	-
Safety Audit	Y	Y	-	-

Safety in Lifting Tools & Tackles	-	Y	Y	y
Safety in Working at height	-	Y	Y	Y
Safety in Confined space work	-	Y	Y	Y
Defensive Driving	-	Y*	Y*	Y*

*for construction vehicle operators, helpers & crane operators

Y=YES

Note:

- i. It is to be ensured that every worker undergoes Job-Specific training once every 3 months.
- ii. Records of training programmes along with attendance shall be maintained by the subcontractor

10.3 HSE TOOL-BOX TALK:

- i. HSE tool Box talk shall be conducted by frontline foreman/supervisor of subcontractor to specific work groups prior to the start of work and shall be randomly attended by subcontractor engineers/ officials/Site In charge.

The agenda shall consist of the following:

- a. Details of the job being intended for immediate execution.
- b. The relevant hazards and risks involved in executing the job and their control and mitigating measures.
- c. Specific site condition to be considered while executing the job like high temperature, humidity, unfavourable weather etc.
- d. Recent non-compliances observed.
- e. Appreciation of good work done by any person.
- f. Any doubt clearing session at the end.
- ii. Tool box talk to be conducted before start of work in every shift.
- iii. During toolbox talk, visual check-up of workers regarding health, any signs of fatigue, intoxication etc. shall be conducted and any suspected workers to be acted upon.
- iv. Record of Tool box talk shall be maintained.

10.4 RE-INDUCTION TRAINING

The induction training shall be repeated for every worker after at least 01 year and shall be a pre-requisite for renewal of Gate Pass/ ID card.

10.5 PENALTY TRAINING

The personnel involved in Safety Violations/ Incidents shall mandatorily undertake penalty training pertaining to the violation/ incident. Penalty training shall be at least half-day duration.

10.6 HSE PROMOTION-SIGNAGE, POSTERS, COMPETITION, AWARDS ETC.:

- i. HSE Displays shall be installed as indicated in **Section A**
- ii. Contracting agencies shall arrange for display of safety hoardings depicting suitable safety cartoons/messages/ cautionary notices at appropriate places of project site to remind the workers to perform their duties safely.
- iii. Apart from safety hoardings, each agency should maintain a safety bulletin board at all their work locations. Such safety bulletin boards should depict the activities being planned for the day, good practices, permit details etc.
- iv. Safety suggestion boxes shall be kept at each subcontractor's office at site for obtaining safety suggestions from the workers. Best suggestions should be implemented and may be rewarded suitably to encourage the workers for safety.
- v. Safety awareness campaigns, competitions, plays, movie shows, songs etc. to be organized for workers at Site and Labor colony from time to time to enhance Safety Awareness

10.7 HSE REWARDS & INCENTIVE SCHEME

Subcontractor shall implement a reward & incentive scheme for workers & supervisors displaying adherence to safety principles. Such workers shall be felicitated in a monthly function, attended by Subcontractor top management and BHEL representatives. Suitable gift shall be given to such workers for encouragement.

11. HSE COMMUNICATION AND PARTICIPATION:

11.1 MONTHLY HSE REPORTING:

- i. All routine and non-routine HSE activities shall be reported to BHEL on monthly basis by the subcontractor as per provided format. The reporting medium can be hard/soft as per BHEL requirement.
- ii. The period of reporting shall be 25th of the preceding month to 24th of the present month and shall be submitted by the end of the calendar month.
- iii. Report shall include good quality images of HSE Activities

11.2 HSE SUGGESTIONS:

All workers and employees shall be encouraged to provide suggestions for improvement in Health, Safety & Environment performance at site. The suggestions shall be recorded in a "Suggestions Register" as per provided format. Suggestions found suitable for implementation shall be implemented and recognition / reward to be given to the submitter.

Suggestion Register to be placed at Site and Labor Colony and shall be reviewed on periodic basis

12. SAFETY DURING WORK EXECUTION:

Safety during work execution shall be ensured by following appropriate Safety Rules, providing adequate resources, deploying competent and trained manpower, regular training & inspection and non-conformity resolution.

12.1 WORK PERMIT SYSTEM:

- i. The following activities shall be carried out by the subcontractor strictly after obtaining Permit to Work from BHEL
 - a) Height working
 - b) Hot working
 - c) Confined space Work
 - d) Excavation more than 2-meter depth
 - e) Radiography
 - f) Heavy / Complex / Critical Lifting Activity
 - g) Night / Holiday Work
 - h) Material Loading / Unloading
 - i) Grating, Safety Net, Safety Facility Removal
 - j) Live Electrical Maintenance etc. - Lockout / Tagout
 - k) Any other permit
- ii. The Work Permit Formats shall be provided by BHEL at Site. It is the responsibility of the subcontractor to ensure their availability
- iii. The above list is not exhaustive. BHEL reserves right to introduce additional Permits or modify requirements for usage of existing Permits.
- iv. All the Permits along with JSA/HIRA must be initiated by Agency Execution Team
- v. Permit applicant shall apply for work permit of particular work activity at particular location before starting of the work with Job Hazard Analysis.
- vi. All Permit signatories (including subcontractor's package in-charge and HSE Officer) shall physically visit the work area and check that all the safety

control measures necessary for the activity are in place. Only then the permit shall be issued.

- vii. Signatory shall physically visit the area of work and ensure all required safeguards before signing the Permit
- viii. Signatory shall periodically visit the area to confirm the availability of required safeguards throughout the currency of the permit
- ix. In case any Permit requirement is not available, work will be stopped till it is made available
- x. Permit holder shall implement and maintain all control measures during the period of permit. The permit will be closed after completion of the work.

12.2 ACTIVITY-SPECIFIC PRECAUTIONS/ CONTROLS

Detailed HSE precautions for various activities undertaken at Site by the subcontractors are specified in **Annexure I**. Same are to be ensured by the Sub-subcontractor while carrying out respective activities at Site

Index of **Annexure I** is given as under:

SN	Description
1.	General
2.	Work at height
2.1	Personnel fall protection system must include
2.2	Working Platform
2.3	Scaffolding
2.4	Ladder Safety
3.	Excavation & Civil Works
3.1	Excavation
3.2	Piling
3.3	Batching Plant Operation
3.4	Mobile Plant
3.5	Concrete Vibrators
3.6	Concrete Mixers
4.	Welding & Gas Cutting Safety (Hot Work)
5.	Lifting & Rigging Safety
5.1	Cranes & Hoisting Equipment
6.	Demolition Work
7.	T&Ps General
8.	Chemical Handling
9.	Electrical Safety
10.	Use of Hand Tools and Power-Operated Tools
11.	Start Up, Commissioning and Testing:

12.	Fire Safety
13.	Painting
14.	Hazardous Energy” Control Procedure/ Lockout/Tagout (LOTO)
15.	Risk Assessment
16.	HSE Preparedness for Adverse Climates and Weather
16.1	Summer
16.2	Monsoon
16.3	Emergency Weather Conditions
16.4	Prevention of Covid-19 At Project Site & Labor Colony
16.5	Noise Mitigation

13. ENVIRONMENTAL CONTROL & SOCIAL RESPONSIBILITY

- i. Environment protection has always been given prime importance by BHEL. Environmental damage is a major concern of the principal subcontractor and every effort shall be made, to have effective control measures in place to avoid pollution of Air, Water and Land and associated life. Banned substances like asbestos and 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.
- ii. Any chemical including solvents and paints, required for construction shall be stored in designated bonded areas around the site as per Material Safety Data Sheet (MSDS).
- iii. 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. The subcontractor shall use appropriate MSDS for clean-up technique
- iv. All subcontractors shall be responsible for the cleanliness of their own areas
- v. Regular dust suppression using sprinklers shall be carried out in respective area
- vi. The subcontractors shall ensure that noise levels generated by plant or machinery are as low as reasonably practicable. Where the subcontractor anticipates the generation of excessive noise levels from his operations the subcontractor shall inform to Construction Manager of BHEL accordingly so that reasonable & practicable precautions can be taken to protect other persons who may be affected.
- vii. It is imperative on the part of the subcontractor to join and effectively contribute in joint measures such as tree plantation, environment protection, contributing towards social upliftment, conversion of packing woods to school furniture, enhancing good relation with local populace etc.

- viii. The subcontractor shall carry out periodic air and water quality check and illumination level checking in his area of work place and take suitable control measure.

14. HOUSEKEEPING

- i. Keeping the work area and access roads 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 have to be done by subcontractor within quoted rate, on daily basis.
- ii. 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 subcontractor's bill. Such decisions of BHEL shall be binding on the subcontractor
- iii. Dedicated Housekeeping gangs shall be deployed, who shall be provided all required PPEs and safety training
- iv. Mass housekeeping shall be carried out for half a day in a week
- v. Proper housekeeping to be maintained at work place and the following are to be taken care of on daily basis. vi. All surplus earth and debris are removed/ disposed off from the working areas to identified locations.
- vii. Unused/Surplus cables, steel items and steel scrap lying scattered at different places/elevation within the working areas are removed to identified locations.
- viii. All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from workplace to identified locations.
- ix. 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 locations.
- x. Access and egress (stair case, gangways, ladders etc.) path should be free from all scrap and other hindrances. xi. Workmen shall be educated through tool box talk about the importance of housekeeping and encourage not to litter.
- xii. Labor 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.
- xiii. Fabricated steel structures, pipes & piping materials shall be stacked properly.
- xiv. 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.
- xv. Utmost care shall be taken to ensure over all cleanliness and proper upkeep of the working areas.

15. WASTE MANAGEMENT

- i. Take suitable measures for waste management and environment related laws/legislation as a part of normal construction activities. Compliance with the legal requirements on storage/ disposal of paint drums (including the empty ones), Lubricant containers, Chemical Containers, and transportation and storage of hazardous chemicals will be strictly maintained.
- ii. Details of E-Waste, Hazardous Waste, biomedical waste etc. and their disposal plan, shall be submitted to BHEL every 6 months as per provided **formats**.

15.1 BINS AT WORK PLACE

- i. Sufficient rubbish bins shall be provided close to workplaces.
- ii. Bins should be painted yellow and numbered.
- iii. Sufficient nos. of drip trays shall be provided to collect oil and grease.
- iv. Sufficient qty. of broomsticks with handle shall be provided.
- v. Adequate strength of employees should be deployed to ensure daily monitoring and service for waste management.

15.2 STORAGE AND COLLECTION

- i. Different types of rubbish/waste should be collected and stored separately.
- ii. Paper, oily rags, smoking material, flammable, metal pieces should be collected in separate bins with close fitting lids.
- iii. Rubbish should not be left or allowed to accumulate on construction and other work places.
- iv. Do not burn construction rubbish near working site.

15.3 SEGREGATION

- i. Earmark the scrap area for different types of waste.
- ii. Store wastes away from building.
- iii. Oil spill absorbed by non-combustible absorbent should be kept in separate bin.
- iv. Clinical and first aid waste stored and incinerated separately.

15.4 DISPOSAL

- i. Sufficient containers and scrap disposal area should be allocated.
- ii. All scrap bin and containers should be conveniently located.
- iii. Provide self-closing containers for flammable/spontaneously combustible material.
- iv. Keep drainage channels free from choking.
- v. Make schedule for collection and disposal of waste.

15.5 WARNING AND SIGNS

- i. Appropriate sign to be displayed at scrap storage area
- ii. No toxic, corrosive or flammable substance to be discarded into public sewage system.
- iii. Waste disposal shall be in accordance with best practice.
- iv. Comply with all the requirements of Pollution Control Board (PCB) for storage and disposal of hazardous waste.

16. TRAFFIC MANAGEMENT SYSTEM

16.1 SAFE WORKPLACE TRANSPORT SYSTEM

- i. Traffic routes in a work place shall be suitable for the persons or vehicles using them. This shall be sufficient in number and of sufficient size. This shall reflect the suitability of traffic routes for vehicles and pedestrians.
- ii. Where vehicles and pedestrians use the same traffic routes there shall be sufficient space between them. Where necessary all traffic routes must be suitably indicated. Pedestrians or vehicles must be able to use traffic routes without endangering those at work. There must be sufficient separation of traffic routes from doors, gates and pedestrian traffic routes.
- iii. For internal traffic, lines marked on roads / access routes and between buildings shall clearly indicate where vehicles are to pass.
- iv. Temporary obstacles shall be brought to the attention of drivers by warning signs or hazard cones.
- v. Speed limits shall be clearly displayed for each kind of vehicle.
- vi. Speed ramps preceded by a warning signs or marker are necessary.
- vii. The traffic route should be wide enough to allow vehicles to pass and re-pass oncoming or parked traffic and it may be advisable to introduce on-way system or parking restrictions.
- viii. Safest route shall be provided between places where vehicles have to call or deliver.
- ix. Avoid vulnerable areas/items such as fuel or chemicals tanks or pipes, open or unprotected edges and structures likely to collapse
- x. Safe areas shall be provided for loading and unloading.
- xi. Avoid sharp or blind bends. If this is not possible hazards should be indicated e.g. blind corner.
- xii. Ensure road crossings are minimum and clearly signed.
- xiii. Entrance and gateways shall be wide enough to accommodate a second vehicle without causing obstruction.
- xiv. Set sensible speed limits which are clearly sign posted.

- xv. Where necessary ramps should be used to retard speed. This shall be preceded by a warning sign or mark on the road.
- xvi. Forklift trucks shall not pass over road hump unless of a type capable of doing so.
- xvii. Overhead electric cable, pipes containing flammable hazardous chemical shall be shielded by using goal posts height gauge posts or barriers.
- xviii. Road traffic signs shall be provided on prominent locations for prevention of incidents and hazards and for quick guidance and warning to employees and public. Safety signs shall be displayed as per the project working requirement and guideline of the state in which project is done. Vehicles hired or used shall not be parked within the 15m radius of any working area. Any vehicle, that is required to be at the immediate/near the vicinity, shall be approved by the person in-charge of the site.

16.2 TRAFFIC ROUTE FOR PEDESTRIANS

- i. Where traffic routes are used by both pedestrians and vehicles road shall be wide enough to allow vehicles and pedestrians safely.
- ii. Separate routes shall be provided for pedestrians to keep them away from vehicles.

Provide suitable barriers/guard at entrances/exit and the corners of buildings.

- iii. Where pedestrian and vehicle routes cross, appropriate crossing shall be provided.
- iv. Where crowd is likely to use roadway e.g. at the end of shift, stop vehicles from using them at such times.
- v. Provide high visibility clothing for people permitted in delivery area.

16.3 WORK VEHICLE

Work vehicle shall be as safe stable efficient and roadworthy as private vehicles on public roads. Site management shall ensure that drivers are suitably trained. All vehicle e.g. heavy motor vehicle forklift trucks dump trucks mobile cranes shall ensure that the work equipment conforms to the following:

- i. A high level of stability.
- ii. A safe means of access/egress.
- iii. Suitable and effective service and parking brakes.
- iv. Windscreens with wipers and external mirrors giving optimum all round visibility.
- v. Provision of horn, vehicle lights, reflectors, reversing lights, reversing alarms.
- vi. Provision of seat belts.
- vii. Guards on dangerous parts.

- viii. Driver protection - to prevent injury from overturning and from falling objects/ materials.
- ix. Driver protection from adverse weather.
- x. No vehicle shall be parked below HT/LT power lines.
- xi. Valid Pollution Under Control certification for all vehicles
- xii. Wheel stopper shall be use during the parking of vehicle
- xiii. Helper to be deployed in each vehicle as per site requirement.

16.4 DAILY CHECK BY DRIVER

1. There should also be daily safety checks containing below mentioned points by the driver before the vehicle is used.

Brakes	Mirrors	Warning signals
Tires	Windscreen waters	Specific safety systems i.e. controls & interlocks
Steering	Wipers	

2. Management should ensure that drivers carry out these checks.

16.5 TRANSPORTATION OF PERSONNEL AND MATERIALS BY VEHICLES

- i. 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.
- ii. 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.
- iii. All overhangs shall be made clearly visible and restricted to acceptable limits
- iv. Load shall be checked before moving off and after traveling a suitable distance.
- v. 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.
- vi. Warning signs shall be displayed during transportation of material.
- vii. All vehicles used by BHEL shall be in worthy condition and in conformance to the Land Transport requirement.
- viii. Wheel stopper shall be use during the parking of vehicle
- ix. Helper to be deployed in each vehicle as per site requirement.

16.6 MAINTENANCE

All Vehicles used for transportation of man and material shall undergo scheduled inspections on frequent intervals to secure safe operation. Such

inspections shall be conducted in particular for steering, brakes, lights, horn, doors etc. Site management shall ensure that work equipment is maintained in an efficient, working order and in good repair. Inspections and services carried out at regular intervals of time and or mileage. No maintenance shall be carried below HT/LT power lines.

17. EMERGENCY PREPAREDNESS AND RESPONSE

- i. Emergency preparedness and response capability of site shall be developed as per Emergency Preparedness and Response plan issued by BHEL
- ii. Availability of adequate number of first aiders and fire warden shall be ensured with BHEL and its subcontractors
- iii. All the subcontractor's supervisory personnel and sufficient number of workers shall be trained for fire protection systems. Enough number of such trained personnel must be available during the tenure of contract. Subcontractor should nominate his supervisor to coordinate and implement the safety measures.
- iv. Assembly point shall be earmarked and access to the same from different location shall be shown
- v. Fire exit shall be identified and pathway shall be clear for emergency escape.
- vi. Appropriate type and number of fire extinguisher shall be deployed as per Fire extinguisher deployment plan and validity shall be ensured periodically through inspection
- vii. 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.
- viii. First aid center shall be developed at site with trained medical personnel and ambulance
- ix. Emergency contact numbers (format given in EPRP) of the site shall be displayed at prominent locations.
- x. Tie up with fire brigade shall be done in case customer is not having fire station.
- xi. Tie up with hospital shall be done in case customer is not having hospital.
- xii. Disaster Management group shall be formed at site
- xiii. Mock drill shall be arranged at regular intervals. Monthly report of the above to be given to BHEL HSE Officer as per prescribed BHEL formats xiv. Mock drill shall be conducted on different emergencies periodically to find out gaps in emergency preparedness and taking necessary corrective action

18. HSE INSPECTION

Inspection on HSE for different activities being carried out at site shall be done to ensure compliance to HSE 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 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.

Online/ App-based HSE Inspection system shall be used for inspection whenever provided by BHEL otherwise Hard-copy based system shall continue

 ☒ OK	☐ NOT OK
Contractor Name:	
Equipment Identification No :	
Inspection Date :	
Next Inspection Date :	
Inspected By :	

Every Inspected Equipment shall display above sticker

18.1 INSPECTION PLAN

Subcontractor shall prepare an inspection plan covering all areas/ activities/ equipment/ hazards and implement the same after getting approval of BHEL. Responsibility to ensure coverage of all areas/ activities rests with the subcontractor.

All Inspections shall be witnessed by BHEL – only then they shall be considered as valid

18.2 INSPECTION REPORTS

Monthly inspection reports as per plan shall be submitted to BHEL HSE Head

18.3 NON-CONFORMANCES

Any non-conformances identified during inspection observed shall be addressed on priority.

The responsibility of resolution shall rest with the Subcontractor Site In-charge. In case immediate closure of non-conformities is not possible:

- work to be halted in the area
- non-conformance to be generated and submitted to responsible person and BHEL
- non-conformance to be resolved through responsible agency / person Only after closure of non-conformances, work to be allowed to resume

18.4 DAILY HSE CHECKS

Both the Site Supervisors and HSE 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:

- i. Personal Safety wears & gear compliance.
- ii. Complying with site safety rules and permit-to-work (PTW).
- iii. Positions and postures of workers.
- iv. 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.

18.5 INDICATIVE LIST OF INSPECTIONS AND PERIODICITIES

Indicative list & periodicity of Inspections is given as under. It is the responsibility of the subcontractor to develop an inspection plan covering all areas & activities in the scope.

SL. No.	Format Name	Frequency of check (if applicable)
01	Inspection of First Aid Box	Monthly
02	Inspection of PPE	Weekly
03	Inspection of T&Ps	Monthly
04	Inspection of Cranes	Monthly
05	Inspection of Winches	Monthly
06	Inspection on Height Working	Weekly
07	Inspection on Welding & Gas Cutting	Monthly
08	Inspection on Electrical Installation	Monthly
09	Inspection on Elevator	Weekly
10	Inspection of Excavation	Weekly
11	Inspection of Labor Colony	Monthly
12	Inspection of Illumination Levels	Weekly

The checklists shall be provided by BHEL at Site. It is the responsibility of the subcontractor to ensure their availability before start of work

19.5.1 INSPECTION OF PPE

- i. PPEs shall be inspected by HSE officer at random once in a week as per provided **format** for its compliance to standard and compliance to use and any adverse observation shall be recorded in the PPE register.
- ii. The applicable PPEs for carrying out particular activities are listed below.

19.5.2 INSPECTION OF TOOLS & PLANTS (T&Ps)

- i. A master list of T&Ps shall be maintained by each subcontractor in provided **format**.
- ii. All T&Ps being used at site shall be inspected by HSE officer once in a month as per provided **format** for its healthiness and maintenance.
- iii. 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.
- iv. BHEL shall be given advance intimation of Third-Party Inspection. BHEL shall associate with Inspection as per discretion.
- v. The validity of T&P shall be monitored as per provided **format**

19.5.3 INSPECTION OF CRANES AND WINCHES

- i. 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.
- ii. Cranes and Winches shall be inspected by HSE officer once in a month as per provided **format** for healthiness, maintenance and validity of third-party inspection.
- iii. The date of third-party inspection and next due date shall be painted on cranes and winches.
- iv. The operators/drivers shall be authorized by sub-subcontractor based on their competency and experience and shall carry the I-card.
- v. The operator should be above 18 years of age and should be in possession of driving license of HMTV man & goods), vision test certificate and should have minimum qualification so that he can read the instructions and check list.

19.5.4 INSPECTION OF HEIGHT WORKING

- i. Any activity carried out at more than 2 m height is classified as height work.
- ii. Inspection of height working shall be conducted daily by Supervisors before start of work to ensure safe working condition including provision of
 - a. Fall arrestor
 - b. Lifelines – connected to rigid & independent structure
 - c. Safety nets deployed below all height work activities
 - d. Fencing and barricading
 - e. Warning signage
 - f. Covering of opening

- g. Proper scaffolding with access and egress.
- h. Illumination
- b. For full duration of height work, constant supervision to be maintained by dedicated HSE personnel
- c. Inspection on height working shall be conducted once in a week by HSE officer as per provided format.
- d. Medical fitness of height worker shall be ensured.
- e. Height working shall not be allowed during adverse weather.

19.5.5 INSPECTION OF WELDING AND GAS CUTTING OPERATION

- i. Supervisor shall ensure that no flammable items are available in near vicinity during welding and gas cutting activity.
- ii. Gas cylinders shall be kept upright.
- iii. Use of Flash back arrestor shall be ensured at both ends.
- iv. Inspection during welding and gas cutting operations shall be carried out by HSE officer once a month as per provided **format**.
- v. Use of fire blanket to be ensured to avoid falling of splatters during welding or gas cutting operation at height.
- vi. Availability of fire extinguisher at vicinity shall be ensured.

19.5.6 INSPECTION OF ELECTRICAL INSTALLATION / APPLIANCES

- i. Ensure proper earthing in electrical installation
- ii. Use ELCB at electrical booth
- iii. Electrical installation shall be properly covered at top where required
- iv. Use appropriate PPEs while working
- v. Use portable electrical light < 24 V in confined space and potentially wet area.
- vi. Inspection shall be carried out as per provided **format**.

19.5.7 INSPECTION OF ELEVATOR

- i. Elevators shall be inspected by concerned supervisors once in a week as per provided **format**
- ii. All elevators shall be inspected by competent person and validity shall be ensured.
- iii. The date of third-party inspection and next due date shall be painted on elevator.

19.5.8 INSPECTION OF EXCAVATION

Excavation activities shall be inspected as per provided **format**

19.5.9 INTERNAL/ EXTERNAL HSE AUDITS/INSPECTIONS

- i. All non-conformities and observations on HSE identified during internal or external HSE audit shall be disposed of by site in a time bound manner and reported back the implementation status.
- ii. Corrective action and Preventive action on HSE issues raised by certification body issued by BHEL shall be implemented by site and reported to Site management.

20. TERMS AND DEFINITIONS:

1. Incident

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

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".

3. Man-Hours Worked:

The total number of man hours worked by all employees including subcontractors working in the premises. It includes managerial, supervisory, professional, technical, clerical and other workers including contract labors. 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 workdays 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.

4. First Aid Cases:

First aids are not essentially all reportable cases, where the injured person is given medical treatment and discharged immediately for reporting on duty, without counting any lost time.

5. Lost Time Injury:

Any work injury which renders the injured person unable to perform his regular job or an alternative restricted work assignment on the next scheduled work day after the day on which the injury occurred.

6. Medical Cases:

Medical cases come under non-reportable cases, where owing to illness or other reason the employee was absent from work and seeks Medical treatment.

7. Type of Incidents & Their Reporting:

The three categories of Incident are as follows:

8. Non-Reportable Cases:

An incident, where the injured person is given medical help and discharged for work without counting any lost time.

9. Reportable Cases:

In this case the injured person is disable for 48 hours or more and is not able to perform his duty.

10. Injury Cases:

These are covered under the heading of non-reportable cases. In these cases, the incident caused injury to the person, but he still continues his duty.

11. Total Reportable Frequency Rate

Frequency rate is the number of Reportable Lost Time Injury (LTI) per one Million Man hours worked. Mathematically, the formula read as:

$$\text{Number of Reportable LTI} \times 1,000,000 / \text{Total Man Hours Worked}$$

12. Severity Rate:

Severity rate is the Number of days lost due to Lost Time Injury (LTI) per one Million Man hours worked. Mathematically, the formula reads as:

$$\text{Days lost due to LTI} \times 1,000,000 / \text{Total Man Hours Worked}$$

13. Incidence Rate:

Incidence Rate is the Number of LTI per one thousand manpower deployed.

Mathematically, the formula reads as:

$$\text{Number of LTI} \times 1000 / \text{Average number of manpower deployed}$$

14. HIRA:

Hazard Identification and Risk Assessment (HIRA) is a process of identifying Hazards in work area and then assessing them properly

15. Method Statement:

A method statement is prepared by the Execution/ Engineering Department detailing the steps, equipment, competencies and safety precautions required for carrying out any activity

16. Job Safety Analysis:

A job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job operation. In a JSA, each basic step of the job is to identify potential hazards and to recommend the safest way to do the job. Other terms used to describe this procedure are job hazard analysis (JHA) and job hazard breakdown.

17. Safety Walk:

It's conducted periodically by an official - it's a walk through a portion or whole of a site as a HSE officer who notes down HSE observations, speak to concerned workmen and supervisor on observation, get the same corrected with personal follow up- this sends out a strong message on Management's commitment to safety.

18. Heavy & Complex Lifting:

A heavy and complex lifting activity includes:

1. Lifting above 20 Tons
2. Tandem Lifting using multiple cranes
Total load exceeding 75% of capacity of crane. Depending up the condition of cranes, hydra cranes, winch machines & other lifting accessories
3. Lift of unusual difficulty or geometry or rigging
4. Lift over operating units
5. Any other lift as decided by site HSE / Erection

19. Safety Committee:

As per the BOCW, Safety Committee shall be constituted if there are more than five hundred or more construction workers are employed at any site. As per the Factories Act, 1948 it is for 250 workers. It shall be represented by equal number of representatives of employer and construction workers.

20. Night Work:

Work conducted after sunset when only a fraction of total manpower is available

ANNEXURES

ANNEXURE – A

Ambulance

Ambulance

1. When number of workers is <500:
If the distance to a major hospital capable of handling critical injuries expected at Site is ≤50 KM from Site, then 1 BLS (Basic Life Support)/ Type B Ambulance otherwise ALS* (Advanced Life Support)/ Type D Ambulance
2. If no. of workers increases to >2000 workers one additional BLS Ambulance to be deployed
3. Minimum Articles as per Schedule V of BOCW Central Rules to be ensured in each Ambulance. (given under for convenience)

*Final call to be taken at Site in consultation with all the contractors

**SCHEDULE V (BOCW CENTRAL RULES, 1998)
CONTENTS OF AMBULANCE VAN OR CARRIAGE
[SEE RULE 227]**

The Ambulance Van shall have equipment prescribed as under:

- a) General—a portable stretcher with folding and adjusting devices with the Head of the stretcher capable of being tilted upward. Fixed suction unit with equipment. Fixed oxygen supply with equipment. Pillow with case, sheets, blankets, towels, emergency bag, bed pan, urinal glass.
- b) Safety Equipment—Flaros with life of three thousand minutes, floor lights, flash lights, fire extinguishers (dry power type), insulated guntlets.
- c) Emergency Care Equipment—
 - i. **Resuscitation**—Portable suction unit, portable oxygen unit, bag valve mask, hand operated artificial ventilation unit, airways, mouth gag tracheostomy adapters, short spine board, I.V. FLUIDS with administration unit, B. P. manometer cuff stethoscope.
 - ii. **Immobilisation**—Long and short padded boards, wire ladder splints, triangular bandage—long and short spine boards.
- iii. **Dressing**—Gauze pads—100 mm x 100 mm universal dressing 250 x 1000 mm, roll of aluminium foils—soft roller bandages 150 mm x 5 mm yards adhesive tape in 75 mm roll safety pins, bandage sheets, burn sheets.
- iv. **Poisoning**—Syrup of Ipecac, activated charcoal pre packeted dose, snake bit kit, drinking water.
- v. **Emergency Medicines**—As per requirement (under the advice of construction Medical Officer).

ANNEXURE – B

HSE Displays

Annexure B-Specifications of HSE Displays

Page 1 of 2

A. Types of Displays

1. Based on Content

SN	Type
1.	HSE Hazards & Precautions Height Work, Housekeeping, Fire Safety, PPEs, Hot Work, Lifting & Rigging Activity, Sitespecific Hazards – eg. for Refineries, Nuclear plants etc.; COVID Precautions; Environment Protection etc.
2.	Other Displays, Signage etc. HSE Policy, ISO Certificate, Safety Statistics, Assembly Area Location/ Route, Emergency Contact Numbers, Site Safety Rules & Regulations, Speed Limit, Work in Progress, LockOut Tag-Out (LOTO) Boards etc.

2. Based on Mounting

[Type 1]	[Type 2]	[Type 3]
Flex Sign Boards of Wooden Frame – directly mounted on Structures (walls, stairs, railings etc.)	Flex Sign Boards with Wooden Frame – mounted on metallic/ wooden legs – preferably double-sided	Coloured weather-proof Paintings on Walls (after due concurrence of BHEL/ Customer – Type 1 in case of no concurrence/ space)

B. General Requirements:

- Displays should be weather-proof as per installation location, i.e. rain-proof, wind-proof and sunproof.
- Installation location and size to ensure visibility for the intended viewers (workers and moving personnel)
- Displays to have at least 50% graphical elements preferably (as applicable). Language should be understandable by majority of the workers
- Displays to be relevant to the hazards in the area
- Proper installation to ensure boards don't obstruct activities and should not be prone to fall so as to pose danger
- In case of multiple elevations each elevation to have displays for applicable hazards including Height-Work, Housekeeping
- For temporary work locations, posters/ boards may be erected and shifted after task is over
- Minimum size of displays should be A1 unless otherwise specified or as directed by BHEL HSE.
- In case of damage, displays shall be reviewed and repaired/ replaced
- In areas where night work is envisaged, fluorescent displays shall be installed and these should comprise of at least 20-30% of total displays

Annexure B-Specifications of HSE Displays

Page 2 of 2

C. Area-wise Displays

Below is list of Area-wise displays that are to be installed at Sites (Numbers, locations may be adjusted for specific requirements)

SN	Area	Suggested Subjects	Minimum Size	Minimum Quantity	Locations
1	Walls/ Foundations/ Cement Structures etc. belonging to the package area	Safety Hazards Prevention and other HSE Awareness content	[Type 3]	As per BHEL assessment from time to time	
2	Site Interior Roads belonging to the package area	At least every 20 meters: 1. Speed Limit Indication, Safe Driving board 2. Boards for hazard awareness	1. As needed [Type 2] 2. A1 or equivalent each [Type 2]	As indicated	Sides of Roads; Height to ensure good visibility
3	Specific Package Areas	A. Common At entry to respective Package/ Work Area, each contractor to put up daily updated board with following for each shift: 1. Scope of work and start date 2. Emergency Contact Numbers 3. Emergency Assembly Location, Escape Plan 4. Locations and supervisors of various gangs in the area, 5. Current Work permit Details 6. Safety Supervisor Location assignments - Names, Mobile Nos., Assigned Locations 7. Details (Name, Contact No. etc.) of Package In-charge - Contractor & BHEL 8. Details (Name, Contact No. etc.) of Safety In-charge - Contractor & BHEL 9. LTI Free Man-days & details of last LTI also to be indicated In addition, Area-Specific Displays as indicated in Table 1	A0 [Type 2]	1 per Package Area	Entry/ Ground Level

ANNEXURE – C

HSE Tools/Equipment/Devices

Annexure C-HSE Tools/ Equipment/ Devices

Following equipment conforming to relevant IS/ISO/BS Codes/ Standards in indicated quantities shall be ensured by subcontractor. This list is tentative, not exhaustive. Quantity and date/ period of deployment shall be as per site requirement.

A. HSE Tools/ Equipment/ Devices

SN	Item
1	Lifelines
2	Retractable Fall Arrestors
3	Safety Nets (10m X 5m) fire proof double mesh
4	Sky Climbers
5	Fire Blanket
6	Honey Bee Removal Suit & Kit
7	Scaffolding Pipes
8	Flashback Arrestors
9	Barricading Tape
10	Binoculars
11	Walkie-Talkies
12	LOTO kit
13	24-Volt light
14	Sand Buckets
15	Hard barricading Pipes
16	Standby Fire kits
17	Hand-held Megaphone
18	Small Public Address System
19	Foldable Stretcher
20	Height Rescue Kit (Non-Motorized)
	(Others:)

B. Test & Measurement Devices

SN	Device
1	ELCB Tester
2	Multi meter (Light cables)
3	Earth Resistance Meter
4	Lux Meter
5	Sound Meter
6	Anemometer
7	Breath Analyzer (Alcohol)
8	Multi-gas dozi-meter/ detector
9	Gas leakage detector / alarm
10	Gas monitor (confined space)
11	Radiation meter & Badges
12	Blood Pressure Monitor
13	Fire detectors
14	Hand held signalling light
	(Others)

ANNEXURE – D
Labour Colony

Annexure E-Minimum Requirements for Labor Colony

Page 1 of 2

1. These Guidelines suggest minimum requirements. However, additional requirements based on feasibility and circumstances, while adhering to directions of GOI/District Administration/Local Authority guidelines to be considered
2. Norms for social distancing, training/ awareness, face masks, disinfection, sanitization, gate entry, quarantine, medical, action in case of suspect cases of COVID and other communicable diseases etc. to be followed as per Govt. and BHEL guidelines issued from time to time
3. Labor colony to be developed as close to the Site as possible to avoid lengthy commute
4. A "Suggestion Register" shall be made available at the labor colony for residents. The feedback shall be reviewed on weekly basis and acted upon by concerned Contractor. Same shall be reviewed periodically by authorized BHEL Site Official.
5. **Canteens, Latrines & Urinals, Washing Facilities, Creches, Residential Accommodation and other infrastructure/ facilities:**
Numbers/ Quantities and Features of these facilities shall be in line with the following as applicable:
 - a. BOCW Act & State Rules
 - b. The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act & State Rules
 - c. Factories Act & State Rules
 - d. Other Relevant Acts & Rules
6. **Cleanliness & Hygiene/ Housekeeping:**
 - a. Regular cleaning of the labor colony to be ensured.
 - b. Daily cleaning of Sanitary facilities.
 - c. Proper drainage system to prevent water-logging
 - d. Regular fogging to prevent spread of mosquitoes
 - e. Prevention of foul smell through necessary interventions
 - f. Dust suppression as per requirement
 - g. Cutting of Grass at regular intervals and other necessary measures to prevent pests & reptiles
 - h. Stray animals to be banned from labor colony.
 - i. Outside every common facility, eg. Toilet, washroom, food hall/ canteen etc., provision of washbasin with flowing water and soap (preferably liquid soap) to be ensured
7. **Power Supply Layout:**
Electrical supply Layout of Labor Colony shall have the provision of Safety devices like MCBs, ELCBs etc. and to be clearly displayed

8. Washing & Drinking Water Availability

- a. Adequate water to be provided in line with: "Estimation of Water Requirements for Drinking and Domestic Use (Source: National Building Code 2016, BIS)"
- b. Drinking water tank to be cleaned every week and sticker for the same pasted on the tank
- c. Drinking water source should be tested as per IS 10500

9. Waste Disposal: Separate bins for dry, wet and biomedical waste to be installed. These bins to be evacuated regularly

10. Training & Awareness/ Displays

- a. **HSE Awareness Displays:** Posters/ banners/ boards to be displayed in labor colony. Subjects of displays shall be precautions for applicable hazards at work site.
- b. **Emergency Contact Numbers** including that of Doctor, Hospital, Labor Colony Supervisor, HSE Officials to be displayed prominently

11. Doctor Visits:

Regular and need-based visits by Doctors to be ensured through tie-ups etc.

12. Inspection & Review: Regular inspection of labor accommodation to be carried out by the Contractor as per prescribed format. Last inspection date, inspector and next due date to be prominently indicated near main gate

13. Provision of a Fair Price shop in the premises to be ensured as per requirement

14. Adequate arrangements to be ensured in case of children/ families

ANNEXURE – E
Toilets

Toilets (Latrines and urinals shall be ensured at Site and Labor Colony in accordance with the Inter-State Migrant Workmen Act, 1979 as given below:

LATRINES	URINALS
1. Latrines shall be provided in every establishment on the following scale, namely: - a. Where females are employed, there shall be at least one latrine for every 25 females; b. Where males are employed, there shall be at least one latrine for every 25 males: Provided that where the number of males or females exceeds 190, it shall be sufficient if there is one latrine for 25 males or females, as the case may be, up to the first 100, and one for every 30 thereafter 2. Every latrine shall be under cover and so partitioned off as to secure privacy, and shall have a proper door and fastenings.	1. There shall be at least one urinal for male workers up to fifty and one for female up to fifty employed at a time: Provided that where the number of male or female workmen, as the case may be, exceeds 500 it shall be sufficient if there is one urinal for every fifty females up to the first 500 and one for every 100 or part thereof thereafter. 2. The urinals shall be designed and located so as to ensure privacy.

Important:

1. Where workers of both sexes are employed, there shall be displayed outside each block of latrine and urinal a notice in the language understood by the majority of the workers 'For Men Only', or 'For Women Only', as the case may be.
2. The notice shall also bear the figure of a man or of a woman, as the case may be.
3. The latrines and urinals shall be conveniently situated and accessible to workers at all times at the establishment.
4. The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.
5. Latrines and urinals other than those connected with a flush sewage system shall comply with the requirements of the public health authorities.
6. Water shall be provided by the means of tap or otherwise so as to be conveniently accessible in or near the latrines and urinals.
7. At Site, on ground, Modular Bio-toilets as per industry standard specifications and regular professional cleaning shall be ensured. The toilets should be sufficient in number and easily accessible to workers from every work area
8. At Site, in various elevations, suitable urinals with proper drainage to be ensured at each elevation in line with IS 2064 (1993). Same to be cleaned regularly

ANNEXURE – F
Fire Extinguishers

Annexure G- Specs for Deployment of Fire Extinguishers and Fire Safety

SN	Type of Fire Risk (Class of Fire)	Extinguishing Medium & Relevant INDIAN STANDARD	Scale of Equipment (Minimum recommended)
1.	CLASS 'A' Fires involving ordinary combustible materials like wood, paper, textiles, rubber etc. (Ordinary hazard or low fire load)	WATER Soda acid type, water type (gas pressure) and water type (constant air pressure) IS: 934 -1976; IS: 940 -1976; IS: 6234 -1971	For every 600 square meter floor area or part, one 9-litre capacity. Minimum 4 numbers per floor or room; should not be required to travel more than 15 meter to reach any extinguisher.
2.	CLASS 'A' (Extra hazard & high fire load)	-do	-do – (Also, consult local fire authority).
3.	CLASS 'A' (Special hazards)	-do	-do – Extra provision For every 100 square meter floor area or part, one 4.5 Kg. CO ₂ ; minimum 2 numbers per room; should not be required to travel more than 10 meter to reach any extinguisher.
4.	CLASS 'B' (Fires in flammable liquids like oils, solvents, petroleum, products, varnishes, paints, etc. where blanketing effect is essential) (Storage and handling in small quantities)	FOAM / CARBON DIOXIDE / DRY CHEMICAL POWDER IS: 933 -1976; IS: 2878 1976; IS: 2171 1976; IS: 4308 -1982	For every 50 square meter floor area or part, 2 numbers 9 -liters foam or 5 kg dry powder; should not be required to travel more than 10 m in the area of storage to reach any extinguisher.
5.	CLASS 'B' (Bulk storage other than in tank form)	-do -	-do- (but minimum 3 numbers per room)
6.	CLASS 'C' (Fires involving gaseous substances under pressure where it is necessary to dilute the burning gas at a very fast rate with an inert gas or powder) (storage and handling of gas cylinders)	CARBON DIOXIDE / DRY CHEM. POWDER. The best way to extinguish such fire is by stopping the flow of fuel gas to the fire. Container is kept cool with water spray. IS: 2878 1976; IS: 2171 -1976; IS: 4308 -1982	For every 100 square meter floor area or part; 2 numbers, 10 kg powder extinguisher or 6 kg CO ₂ ; minimum 3 nos. per room; should not be required to travel more than 10 meter to reach any extinguisher.
7.	CLASS 'D' Fires involving metals like magnesium, aluminium, zinc, potassium etc. where the burning metal is reactive to water and which require special extinguishing media or technique	SPECIAL DRY POWDER IS: 2171 -1976 IS: 4861 -1968	For every 50 square meter floor area or part, 2 nos. 5 kg special dry powder; minimum 3 nos. per room; should not be required to travel more than 10 meter to reach any extinguisher.
8.	MIXED OCCUPANCY (electrical); Generators; Transformers; etc.	CARBON DIOXIDE DRY POWDER, IS: 2878 1976; IS: 2171 -1976	For every 100 square meter floor area or part one 10 kg CO ₂ . Minimum 2 numbers for every location should not be required to travel more than 10 meter to reach an extinguisher.

Note: Due to peculiarities of the power plant construction sites, there would be locations in the construction areas of Boiler, Turbine, Generator, Transformer, etc. where different types of fire risk (classes of fire) may co-exist. Special care shall be taken while selecting and installing portable fire extinguishers for such locations so that all types of fire risk that may co-exist, are adequately covered. Similar special care shall be taken for storage areas.

- a. All Electrical welding booths shall be equipped with appropriate Fire Extinguisher
- b. Appropriate Fire Extinguishers shall be made within easy reach of all welding operations
- c. Fire extinguishers shall be regularly tested and last checked date to be indicated on each. Master list shall be prepared with location and details
- d. Providing appropriate fire-fighting equipment at designated work place and nominate a fire officer/warden adequately trained for his job.
- e. Subcontractor shall provide enough fire protecting equipment of the types and numbers at his office, stores, temporary structure in labour colony etc. Such fire protection equipment shall be easy and kept open at all times.
- f. The fire extinguishers shall be properly refilled and kept ready which should be certified at periodic intervals. The date of changing should be marked on the Cylinders.
- g. All other fire safety measures as laid down in the "codes for fire safety at construction site" issued by safety coordinator of BHEL shall be followed.
- h. Non-compliance of the above requirement under fire protection shall in no way relieve the subcontractor of any of his responsibility and liabilities to fire incident occurring either to his materials or equipment or those of others.
- i. Emergency contacts nos. must be displayed at prominent locations
- j. Tarpaulin being inflammable should not be used (instead, only non-infusible covering materials shall be used) as protective cover while preheating, welding, stress relieving etc. at site.

ANNEXURE – G

Activity-Specific Precautions/ Controls

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16.5	Noise Mitigation

General

The philosophy of hierarchy of controls as below shall be followed



Fig. 1.1

It shall be ensured that there are multiple protections against any accident/ incident. For example, for height work there shall be safe platforms and walkways, Safety Nets and Lifelines for hooking double lanyard Safety harness by workers.

Monitoring and modifying worker behavior shall be part of ensuring safety. All personnel should be competent and trained for the job

Brief Safety guidelines for various hazardous activities are indicated below, besides the mandatory requirements based on Hazard Identification studies, HSE Procedures, Operational Control Procedures, Work Permits, applicable Indian Standard Codes and other provisions detailed in this document. Constant supervision at all times to be maintained by Execution & Safety Team to ensure implementation of these provisions.

1. WORK AT HEIGHT:

- a. All work at height above 2 meter 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 shall follow the checklist religiously by physically verifying the condition of the work area before recommending for approval.
- b. Prior to the start of work at elevation, the HSE Officer involved with the work must meet 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 Officer.
- c. Whenever a fall hazard or other exposure exists for working at heights more than 2.0m/6ft, 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).
- d. All Engineering and Administrative Controls including barricading, safe platform, Safety Nets etc. shall be made available at work location. Under no circumstances, there shall be total reliance on PPEs only
- e. **Safety Nets**
 - i. Contractor shall maintain sufficient stock of Safety Nets for deployment
 - ii. Safety Nets as per IS: 11057:1984 should be used extensively for prevention / arrest men and materials falling from height.
 - iii. The safety nets shall be fire resistant, duly tested and shall be of ISI marked.

- iv. Safety Nets shall be deployed below all platforms where height work is envisaged. Duration of work, delay shall be no excuses for non-installation of Safety Net
- f. Reaching beyond barricaded area without lifeline support, moving with support of bracings, walking on beams without support, jumping from one level to another, throwing objects and taking shortcut must be discouraged.
- g. Monkey Ladder shall be fitted with cages. Rope ladder should be discouraged.
- h. In case of pipe-rack, persons should not walk on pipes and walk on platforms only.
- i. In case of roof work, walking ladder/ platform should be provided along with lifeline and/ or fall arrestor.
- j. For chimney or structure painting, both hanging platform and men should be anchored separately to a firm structure along with separate fall arrestor.
- k. The procedures for the safety response to identified fall hazards developed and rescue plans must be reviewed with all individuals exposed to the hazards.
- l. The HSE Officer must establish an inspection process of fall protection systems. Some equipment requires documented inspections by its manufacture on a regular schedule. Such 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.
- m. 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 reuse and not be discarded into trash containers, as the worn or damaged equipment could be unintentionally re-used.
- n. Aerial lifting devices, excluding scissor lifts require the use of full body harnesses and lanyards in any elevated position.
- o. Where Height related works are applicable then rescue team (consist of 5- 10 person) shall be identified and trained for potential rescue.

1.1 Personnel fall protection system must include:

a. Safety Harness

All height workers must use Full Body Safety harness with double lanyards with shock absorber (only). The primary lanyard is never unhooked until the secondary lanyard is secure. The design of the working platform should be such that under no circumstances, worker should have both lanyards unhooked while at height.

b. Lanyard

- i. 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.
- ii. 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.

- iii. 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.

c. Lifeline

All lifelines in general are to be made of min 12mm dia. steel rope (plastic coated) and tied to columns with 3 clamps at each end. Wherever columns are not available to tie the lifelines, the vertical posts as per the design below are to be provided after carrying out drop load test initially. A load of 240kg to be dropped off the mid-point of lifeline in this test.

d. Lifeline Post

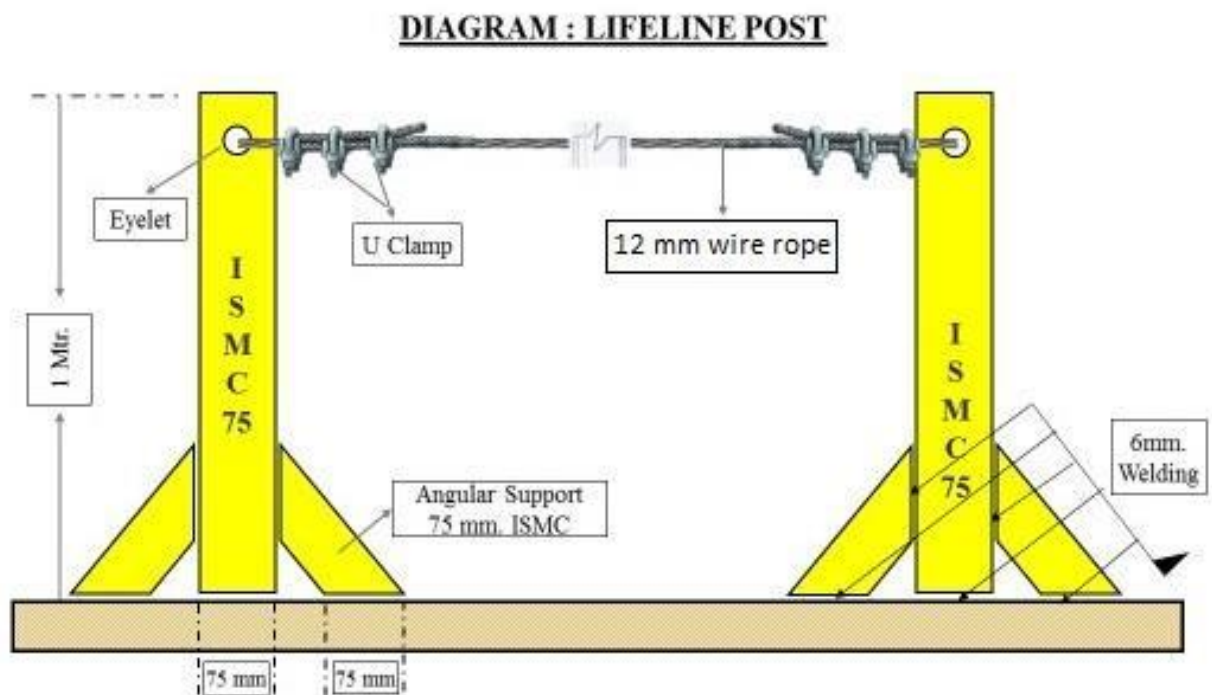


Fig. 2.1 Lifeline Post

- i. The support at vertical post shall be fixed at end-to-end (welded/ bolted). The maximum length of one end to another end shall be 6 meters
- ii. If the length of a lifeline is more than 6 meters, then intermediate vertical post(s) are to be used. Such intermediate post(s) will act as supports and the lifeline rope should simply pass through the eyelets (holes) of such supports without being anchored
- iii. The lifeline need not be wrapped / clamped to any intermediate post
- iv. Such intermediate posts must be used at an interval of every 6 meters
- v. The post(s) in which the original lifeline is to be installed should be capable of sustaining a tensile stress of 2268 Kgs.
- vi. In a horizontal lifeline installation, maximum allowable sagging is 500-600 mm
- vii. For a single spun lifeline, no more than 3(Three Nos.) persons are allowed to work; for more than two workers, another lifeline should be installed
- viii. Horizontal lifeline should be so installed that it does not impede safe movement of workers
- ix. All the installation work must be carried out by competent person with adequate knowledge

1.2 Working Platform

- a. Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform gangways provided is more than 3.6 m above ground level or floor level, they shall be closely boarded and shall have adequate width, which shall not be less than 750 mm and be suitably fenced.
- b. **Precautions against the fall of Materials, Persons and Collapse of Structures:**
 - i. Every opening in the floor or a building or in a working platform shall be suitably barricaded to prevent the fall of persons by providing suitable fencing or railing whose minimum height shall be 90 cm.
 - ii. 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. Hard barricading shall be made at such places made of scaffolding pipe & clamps covered with reflective net. 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.
 - iii. Guardrails (including scaffolding) erected over/adjacent working areas must have the guardrails screened (opening < 0.5), to prevent material from falling outside the platform/decking.
 - iv. Guardrails must be able to withstand a 200-pound force exerted in any one direction.
 - v. 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.
 - vi. All openings through which workers are liable to fall should be kept effectively covered or fenced and indicated in the most appropriate manner.
 - vii. Guardrails and toe-board/barricades and sound platform conforming to IS: 4912-1978 and other Indian laws and regulations as depicted below should be provided.

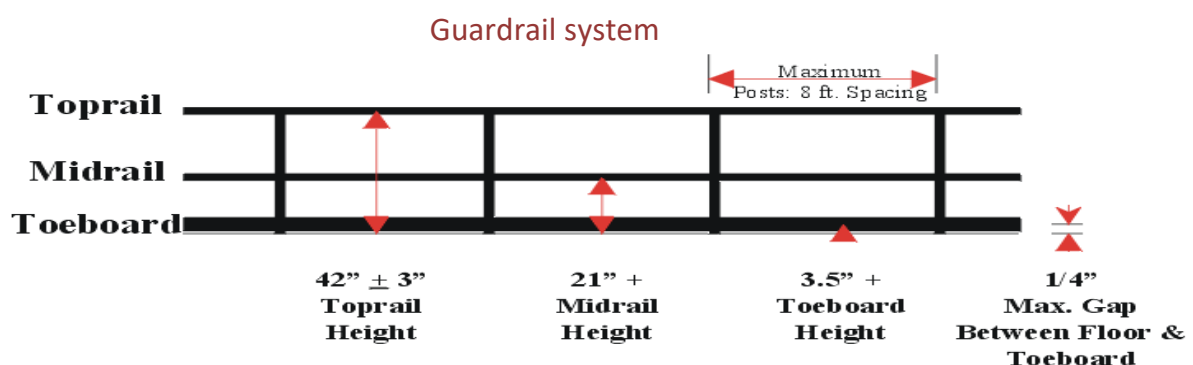


Fig. 2.2 Guard Rail System

- viii. 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.

- ix. The monkey ladders shall have sufficient fall arrestors. Adequate lifelines of 8mm steel wire rope shall be provided across the work area.
- x. The HSE officer shall recommend appropriate PPEs after analysing hazards and risks involved.

1.3 Scaffolding

All scaffolds shall be conformant to the relevant standards including IS 3696 and IS 4014 as applicable. A sketch of the scaffolds proposed to be used shall be prepared and approval of the BHEL Engineer obtained prior to construction / use. Only cup lock type scaffoldings will be allowed in site. Where cup lock type scaffolding arrangement is not feasible by the virtue of the location, in that case only pipe and clamp type scaffolding will be allowed.

- a. The scaffolding work must be carried out by a competent person, who shall train the scaffold users on safety aspects
- b. All scaffolds shall be erected / dismantled by scaffolding crew under direct supervision of competent scaffolding supervisors.
- c. 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. Bamboo scaffolding is not permitted for use on site.
- d. 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.
- e. Guard rails and toe boards shall be installed on all open sides and ends of platforms more than (2) meters above ground or floor
- f. Scaffold planks must be at least 5 cm x 25 cm (2" x 10") full thickness lumber scaffold grade or better.
- g. Scaffold planks shall not span distances greater than 2.5 meters (8 feet).
- h. 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.
- i. All scaffolding must be a minimum of two planks wide. No one may work from a single plank.
- j. Scaffold planks must be inspected before use. Planks that have been damaged must be removed from the site.
- k. Access ladders must be provided for each scaffold. Climbing the end frames is prohibited unless the design incorporates an approved ladder.
- l. Adequate mudsills or other rigid footing capable of withstanding the maximum intended load must be provided.
- m. 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.
- n. Do not overload scaffolds. Material should be brought up as needed. Scaffolding must not be loaded in excess of its rated capacity.
- o. Barrels, boxes, kegs, blocks or similar unstable object must never be used as work platforms or to support scaffold.
- p. 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.

- q. Employees exposed to overhead hazards while working on a scaffold will be protected by 5 cm (2") thick planks.
- r. 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.
- s. Wooden scaffolds shall not be used in areas where fire / fire products are expected
- t. Ropes made of jute / Plastic and other fire prone material shall not be used to tie up scaffolding components together
- u. The platform should have permanent hand rail and mid rail with Toe board without fail.
- v. 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.
- w. 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.

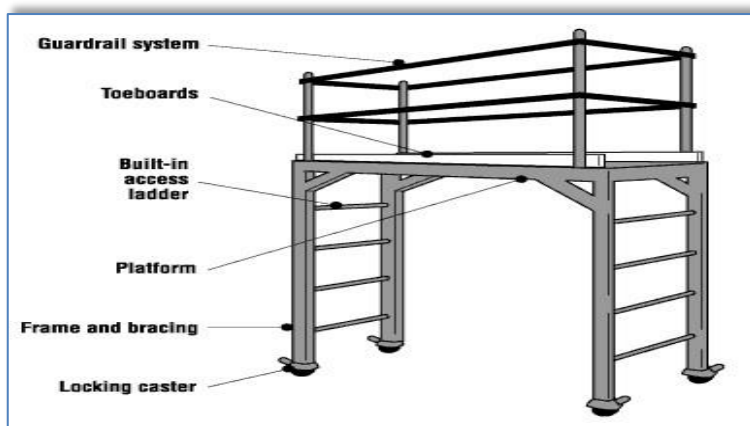
x. **Requirements for different types of Scaffolds:**

A. Suspended Scaffold

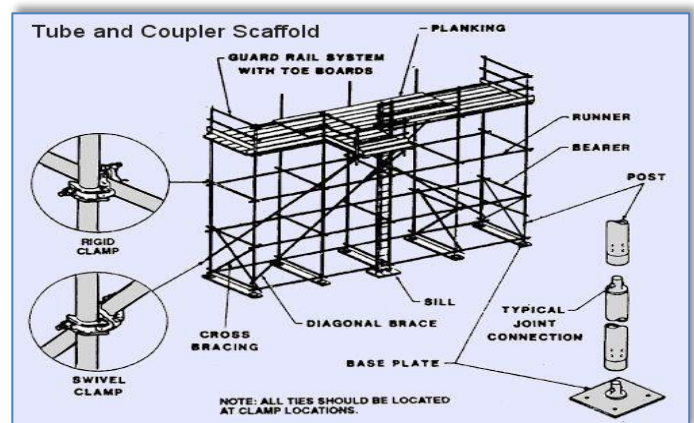
- i. Suspended scaffolds are platforms suspended by ropes, or other non-rigid means, from an overhead structure.
- ii. Requirements for use are to be preapproved by HSE Head, under a specific Permit to Work.

B. Rolling Scaffolds

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



Rolling Scaffold



Tube & Coupler Scaffold

Fig. 2.3 Types of Scaffolds

1.4 Ladder Safety

A sketch of the ladders proposed to be used shall be prepared and approval of the BHEL Engineer obtained prior to construction / use

a. Safe Use of Ladders:

- i. Fall protection is required when working on a ladder above 2 meters and when climbing above nearby guardrails.
- ii. Ladders must be inspected prior to use and by a competent person quarterly, with documentation.
- iii. Use portable ladders for height up to 4 M only
- iv. Provide fixed ladders for height above 4 M
- v. Place the ladder at an angle of 75 degrees (approx.) from the horizontal (1:4)
- vi. Extend ladder at least 1 M above the top landing
- vii. Secure top and bottom of the ladder firmly to prevent displacement- anti skid lining at the bottom
- viii. Ensure that the width of the ladder is not less than 300 mm and distance between rungs is not more than 300 mm
- ix. 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
- x. 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
- xi. Do not use ladders of conducting material near power lines, and only use ladders near power line or other energize system with exposed parts if they are confirmed locked-out and de-energized.
- xii. Stand no higher than the fourth rung from the top for carrying out any job standing on a ladder.
- xiii. Never reach out from a ladder to perform work where your belt buckle protrudes past the ladder rung.
- xiv. Always face the ladder while climbing up or down
- xv. 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.
- xvi. Avoid climbing up or down a ladder while carrying anything in hands. Lift tools, equipment and materials with a rope.
- xvii. Work from portable and extension ladders near guardrail where fall expose exists 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

2. EXCAVATION & CIVIL WORKS

All safety precautions shall be taken for foundation and other excavation marks as per IS-3764.

2.1 Excavation

The following safety measures are to be ensured before and during excavation:

- a. All Excavation activities more than with depth of 1.22 meter or more shall require and Excavation Work Permit
- b. Check for underground utilities like electrical / telephone cables, sewage, water lines and proper care has to be exercised to protect and prevent damage to it.

- c. Electrical cables and service lines to be identified using cable detector/locator device before carrying out the excavation work
- d. Proper and adequate slope is maintained while excavating
- e. Adequate shoring or sheeting is done wherever require to prevent soil sliding
- f. Safe access through ladder or steps for exit & entry to excavation
- g. No material /excavated soil is kept within one meter from the edge
- h. Safe way is planned and provided for movement of HEM /transport equipment near excavation
- i. Safety helmet and shoes/gum boots are provided and worn by the workmen at excavation works
- j. Dewatering arrangement is made where water seepage is prevailed.
- k. Stop blocks are provided to avoid vehicles reversing into the excavated trenches
- l. Danger signs /Caution boards are displayed at work spot
- m. Hard Barricading is provided at excavated pits. It should be made of scaffolding pipe and clamp with reflective nets.
- n. All Excavated area of depth 3mtr or more is to be hard barricaded with pipe.

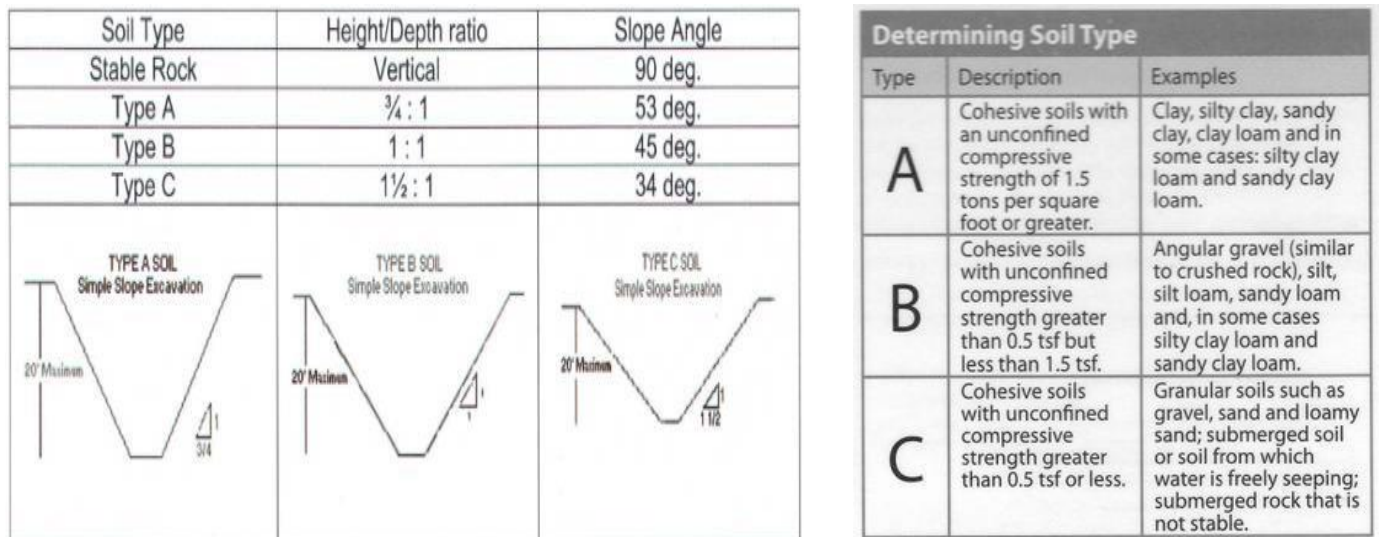


Fig. 3.1 Excavation Reference

2.2 Piling

Ensure the following precautionary measures before starting piling works:

- a. Inspection of piling equipment by responsible person for its condition before initiating piling operation.
- b. Checklist and OCP for piling to be prepared using manufacturer's instructions and used
- c. Testing and its certification wire rope, slings, D-shackles, chain pulley blocks using in the process of piling work by competent person
- d. Adequate support and secured foundation of the piling equipment to avoid toppling
- e. Hoses should be lashed and adequately secured
- f. Proper work platform is to be provided on piling frame
- g. Safe work procedures and close supervision to prevent unsafe acts of operators/any unsafe conditions that may arise
- h. Only experienced and trained operators are engaged for the piling operation
- i. Provision of Personal Protective Equipment (PPE) like safety shoes/gumshoes/safety helmet/safety belt etc. and its use by their workmen.

- j. Special care and precautions If work is near electrical live cables/ electrical equipment
- k. Cordoning of work area to prevent un authorized entry
- l. Guarding of revolving parts
- m. Specific measures to prevent over turning of pile driver/missing of hammer/ hammer movement out of range

2.3 Batching Plant Operation

Following Safety considerations for batching plant are to be ensured:

1. Modern type batching plant should be used in which all the moving parts are protected and emergency and safety features are incorporated.
2. Installation of external Electric moto-vibrators in the feeding hopper of all batching plants to reduce human intervention.
3. Installation of safety devices like pull-chord on both the sides of conveyor for stopping the conveyor in emergency
4. Workers carrying cement / sand to be given appropriate PPEs like respiratory masks & gloves.
5. Conveyor belt/rotating parts must be guarded properly.
6. Safety awareness shall be inculcated in workmen about the risk involved in rotating parts.
7. The agency shall ensure to erect the batching plant as per drawing including installation of all safety devices as provided by manufacturer and witnessed by BHEL Engineer in charge before starting of machine in future.
8. Safety audit to also focus on Batching plant.
9. The site shall impose penalty on the agency who has violated the safety norms as per contract.

2.4 Mobile Plant

Mobile plant includes tractors, trailers, dumpers, excavators, bulldozers, road rollers etc. for earthmoving purpose and concrete mixers, concrete transit mixtures, concrete pumps etc for concreting purpose. Due to the very nature of their function and movement in difficult terrains, congested areas, working in tandem with manual work and other operations the danger is inherent.

Automatic reverse camera with reverse horn connected with reverse gear is compulsory for all moving machineries.

Following Safety measures to be ensured for Mobile Plant:

- a. Where movement around site is involved, routes should be planned, obstruction free and well maintained
- b. Observe specified speed limits
- c. Operating personnel should be aware of associated risks and its preventive measures
- d. Only experienced, trained and authorized persons with valid license (wherever applicable) should operate the mobile equipment/vehicles
- e. Provide and use Warning lights and reverse horn for cautioning the people around
- f. Operation should be on level and stable ground with adequate working clearance.
- g. Loading of out riggers/stabilizers should be well within safe ground bearing capacity
- h. No person should be on equipment or vehicle during loading and unloading of material
- i. Operators should be protected by warning barriers or switching off power when working in close proximity of overhead power lines

- j. The equipment /vehicles should be well maintained and provided with effective brake system and other safety devices (wherever require)
- k. Rotating parts of equipment should be adequately guarded
- l. Provide necessary personal protective appliances and ensure its use by the operating personnel Ensure effective measures at source to control harmful emissions, dust, fumes contaminating atmosphere and cause health hazards to the operators and people in the vicinity.
- m. No overloading/over stressing of vehicles/plant is allowed
- n. Hoses, pipes, receivers, gauges and valves involved in carrying out hydraulic fluid/ compressed air should be checked for leaks and tested prior to operation.
- o. Adequate safe clearance for swing and movement is to be judged during operation of Concrete mixer
- p. Setting of machines on firm and level ground with wheel locked to prevent movement of machine
- q. Proper instructions and Special precautions are to be ensured to prevent entry in to the danger zone of projectile of bucket while dropping bucket
- r. Operator leaving work spot should ensure that the equipment/vehicle is kept in neutral position and place on firm and level ground.
- s. The hand brake should be kept in position and block road wheels as additional safety measure
- t. Blades/buckets should be kept low while moving
- u. The dozer blades should not be used as brakes except in emergency
- v. The ground should be examined for its bearing capacity and general safety especially when operating road roller at the edges of slopes, embankments.
- w. The roller should not be moved downhill with the engine out of gear
- x. If operating near excavations the following precautionary measures are to be ensured
- y. Barricading, edge protection to prevent fall of persons/vehicles over running while reversing etc.
- z. Suitable support system and adequate allowance to avoid the danger of side collapsing aa. Experienced signaller /attendant should be always accompanied with operator/driver for proper direction /signal and also to caution others in the working Zone during operation of mobile plant

2.5 Concrete Vibrators

- a. Revolving parts/belt drives should be adequately guarded and Vibrating unit shall be completely enclosed and have suitable overload relays and effectively earthed
- b. Ensure sufficient length of cable to the Vibrator.
- c. Ensure electric starters and other accessories are firmly fixed adequately supported
- d. Ensure locking of needle load while inserting needle in to the vibrator,
- e. Ensure periodical lubrication and maintenance

2.6 Concrete Mixers

- a. Setting of machines on firm and level ground with wheel locked to prevent movement of machine
- b. Proper instructions and Special precautions are to be ensured to prevent entry in to the danger zone of projectile of bucket while dropping bucket

3. WELDING & GAS CUTTING SAFETY (HOT WORK)

- a. All Hot Work shall require a Hot Work Permit
- b. Inbuilt Voltage Reduction Device (VRD) equipped arc welding machine will only be allowed for work.

- c. There shall be flash-back arrestors conforming to IS-11006 at both cylinder and burner ends. Damaged tube and regulators must be immediately replaced.
- d. All safety precautions shall be taken for welding and cutting operations as per IS-818.
- e. 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 ensured 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.
- f. Appropriate fire-fighting equipment is to be available in close proximity of any welding and gas cutting operations at all times suitable for the type of Fire.
- g. 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.
- h. Proper ventilation is required for any welding or torch operations performed in a confined space.
- i. 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, vapours, and gasses created by the welding and gas cutting processes.
- j. 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.
- k. 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.
- l. 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.
- m. Arc welding power supply cable shall be of proper rating and material, e.g. copper.
- n. 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.
- o. Valve caps shall be in place when cylinders are not in use. Valve caps shall never be used for lifting the cylinder vertically.
- p. Torches shall only be lit by approved strikers; never with matches, cigarette lighters, or hot-work.
- q. **Splatter / Slag Collector:**



Splatter / Slag Collector

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 patter/ slag collector or even MS Sheet. The passage of falling sparks or molten slag shall be barricaded till ground floor and any cable/ tubes/ any other objects interfering in the passages hall either be removed or covered with Fire-resistant sheet or MS Sheet.

r. COMPRESSED GAS

- i. 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.
- ii. Compressed gas cylinders shall be secured in an upright position with chain or appropriate means during storage & use. However, a trolley shall be used for transportation.
- iii. 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.
- iv. When cylinders are transported by powered vehicle they shall be secured in a vertical position.
- v. 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.
- vi. Gas cylinders are not allowed to be used in man-basket when occupied.
- vii. Cylinders containing oxygen or fuel gasses shall not be taken into confined spaces.
- viii. Oxygen cylinders shall be stored a minimum of 6 meters from fuel gas cylinders or shall have an approved firewall between them.
- ix. All cylinders shall be kept at a safe distance from welding or cutting operations or shielded from arc/ sparks / slag.
- x. All cylinders shall be placed where they cannot become part of the electrical circuit.

- xi. Oxygen and acetylene shall not be stored together. Oxygen must be separated from acetylene (or ANY fuel gas) or combustible material by at least 20ft or a barrier with a 30-minute fire resistance rating.
- xii. All Cylinders should be stored upright in a designated area with labels for the type of gas. All applicable precautions to be ensured during storage
- xiii. Oxygen and fuel gas regulators, hoses and associated equipment shall not be altered and shall be in proper working order while in use.
- xiv. 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. xv. All gas cylinders shall be stored in upright position. Suitable trolley shall be used for cylinder movement, the design of which shall be submitted to BHEL Engineer for approval.
- xvi. No of cylinders shall not exceed the specified quantity as per OCP
- xvii. Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dragged, struck or permitted to strike each other violently.
- xviii. All cylinder should be kept only in cylinder trolley. xix. Cylinder shall be transported in upright vertical position by suitable mean.

4. LIFTING & RIGGING SAFETY

- a. All Heavy / Complex Lifting operations as defined in Clause 6.12 shall require a Lifting Work Permit. A written rigging procedure and plan must be prepared for all individual heavy/ complex lifting operations.
- b. All the cranes and lifting tools & tackles shall be inspected on daily / weekly basis as well as monthly by expert as per applicable formats.
- c. In addition, inspection / certification as mandated by law shall be carried out wherein these shall be tested and certificates of fitness shall be obtained from 3rd party State Govt. approved competent agency before deploying at site and later periodically. BHEL shall be given advance intimation of any such inspections
- d. 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 operator's cabin of all the lifting equipment.
- e. Specifically designed heavy steel plates lifting clamps shall be used for lifting heavy metal sheets. Manmade lifting clamp chapa shall not be used for lifting/shifting of plates.
- f. Following requirements shall be mandatorily followed, wherever applicable:
 - i. The manufacturer's instruction for maintenance shall also be followed. All safety measures shall be followed.
 - ii. All tools tackles, lifting appliances; material-handling equipment etc. used by the subcontractor shall be of safe design and construction.
 - iii. The operators, slingers and signallers shall be qualified as per IS 13367 (part-1):2003 "Safe use of cranes- code of practices".
 - iv. There shall be a person responsible for co-ordination among cranes where multiple cranes are used, and lifting over load chart of the crane to be avoided.
 - v. Mobile phone should be banned for crane operator and lifting operation. Only walkie talkie shall be allowed in rigging/Lifting purpose.

g. Lifts/Movements between 5 Tons and 20 Tons:

- i. Shall include a rigging plan, detailing schematic representation of the handling/lifting operations that must be included on the Method Statement.
- ii. When performing similar lifts of identical items, only one rigging plan need be prepared, provided each of the lifts can be performed in accordance with the rigging plan.

h. Lifts/Movements Less Than 5 Tons:

- i. An equipment rigging plan is not required for lifts less than 5 tons, safety measures are covered in the JSA. This could change as per BHEL requirement

i. Personnel Lifts (Man-Basket / Jhoola):

The design of personnel man basket shall be submitted to BHEL Engineer for approval before use. Relevant permit (Height work & others as applicable) shall be completed prior to lifting any people, along with a rigging plan.

- i. A separate Lifeline / fall arrestor anchored to a fixed structure outside of Jhoola shall be provided for the workers inside the basket. All occupants of the basket shall have Safety Harnesses equipped with rope grabs, which are to be hooked to the vertical lifeline.
- ii. Man-basket shall be used where access through ladders or scaffolding is not feasible.
- iii. 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.
- iv. 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%.
- v. It shall have a door with double latches and shall open inside. Anchor points shall be identified within the man-basket.
- vi. The man-basket shall be thoroughly inspected and load tested and a trial run performed without personnel before being put to job.
- vii. It shall be treated as a lifting tool (T&P Item) and shall undergo same certification cycle and inspection as other lifting equipment.
- viii. An additional sling of required lifting capacity shall be fixed the man-basket main lifting point and attached to the crane above the ball or block.
- ix. While lifting man-basket, the crane shall maintain a uniform speed of lift without any swing.
- x. Once man-basket reaches the destination, the lift brakes shall be locked as long as the basket
a. remains at that point. The same care shall be taken in its descent.
- xi. 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.
- xii. Use of Rebar steel for making and monkey-ladder must be avoided.

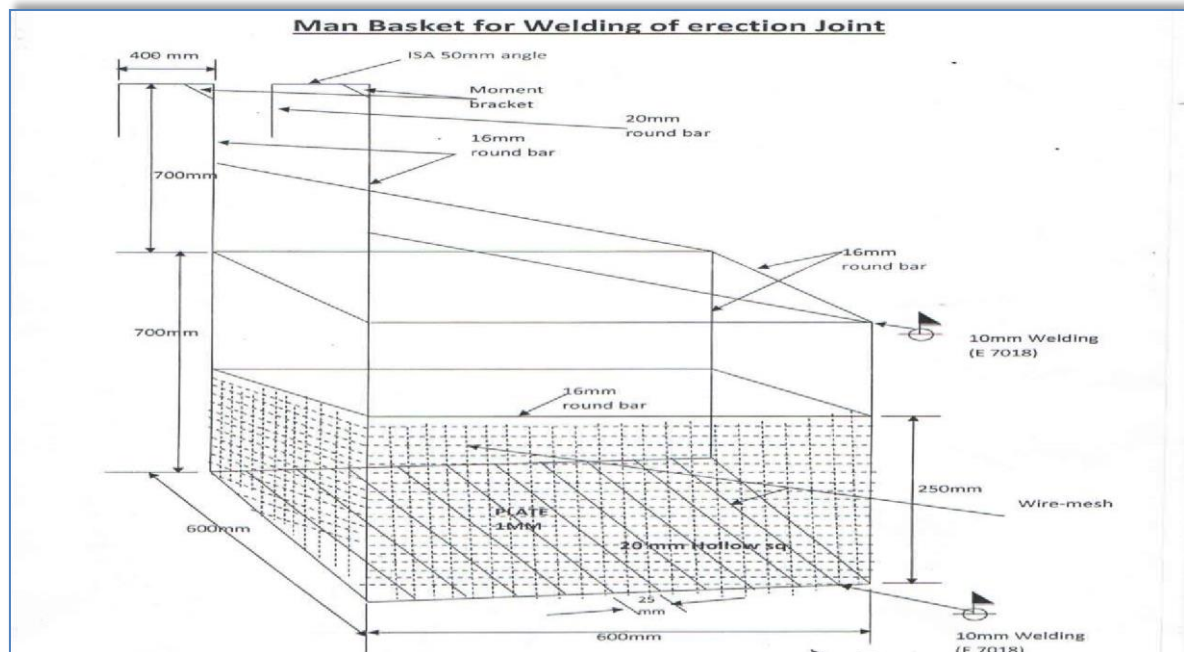


Fig. 5.1 Man Basket for Welding Erection Joint

4.1 Cranes & Hoisting Equipment:

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

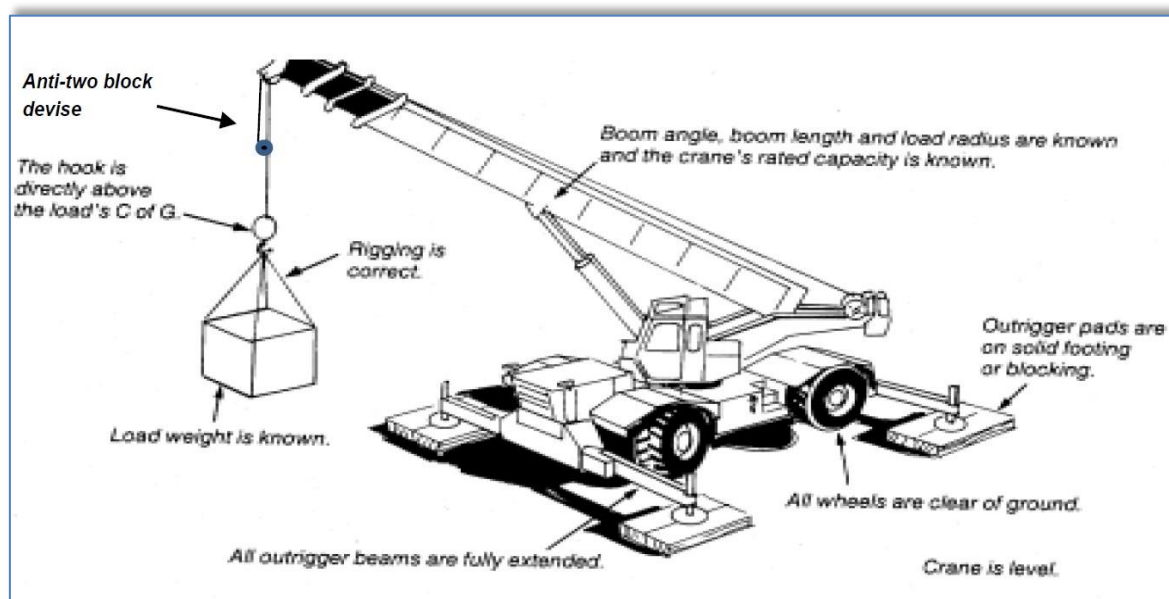


Fig. 5.2 Proper Crane Setup

- a. 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.
- b. Cranes shall have an Anti-Two-block safety device installed
- c. All mobile cranes shall have overload and backup alarms, load angle indicators and limit switches

- d. 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).
- e. No part of the lifting equipment or its load shall be within the distance as specified in the Indian Electricity Act from an energized power line
- f. 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.
- g. Make certain that the rigging personnel, material, and equipment have the necessary capabilities for the job and are in safe condition.
- h. 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.
- i. Mats/Pads must be used on all lifting equipment, equipped with outriggers.
- j. Pick and carry must have the load secured to the rig in front.
- k. Only BHEL Approved Plate Lifting Spreader Beam configuration shall be used (Sample in Fig. 11.3.5.3) I. Crane operators must follow the following:
 - i. Pass an annual Operator's Physical examination
 - ii. Carry a valid training certification card at all time while operating issued by the Govt. or other recognized institute.

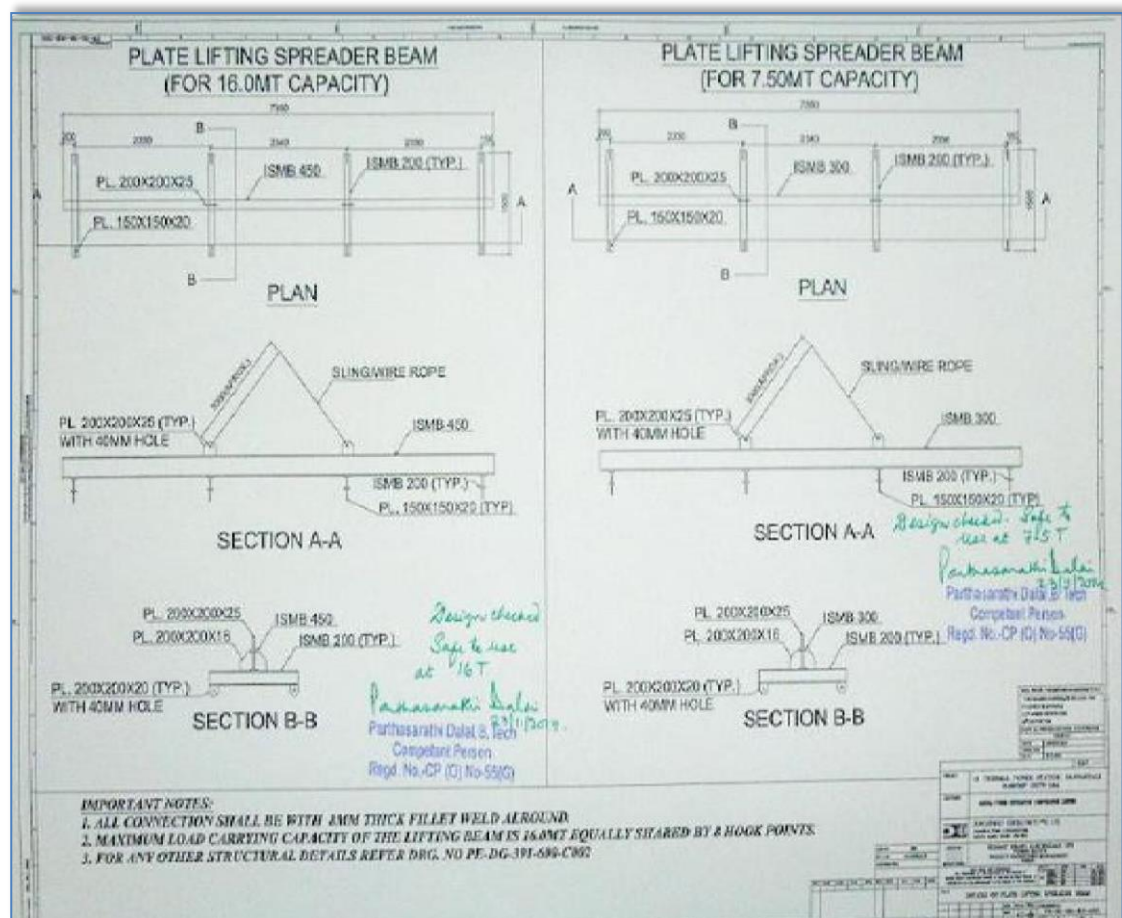


Fig. 5.3 Typical Plate Lifting Spreader Beam Configuration for 7.5 MT and 15 MT Loads

m. Safe Rigging Practices

- i. Review the planned operation and requirements with the operator and rigging crew.
- ii. Ensure a pre-lift meeting is conducted with crane operator, tagline operator, signal personnel, and Safety Manager.
- iii. 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 desired clearance by visual means.
- iv. Clear the lift area of all unnecessary personnel.
- v. Hydras shall only be allowed for loading & unloading works & shall not be allowed to move with load

n. Rules for Safe Rigging

- i. Use loops, thimbles and corner pads to prevent damage to slings when used around corners or on cutting edges.
- ii. 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.
- iii. Slings must not be pulled from between or under loads with load resting on the sling.
- iv. Keep all rope away from flame cutting or welding operations.
- v. Never use rope as sling material.
- vi. Never wrap a wire rope completely around a hook.
- vii. Do not bend wire rope near any attached fitting.
- viii. The sling must be selected to suit 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.
- ix. When using 3 and 4-legged sling configurations, any two legs must be capable of supporting the entire load.
- x. 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.
- xi. 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.
- xii. Properly rig all loads to prevent dislodgment of any part.
- xiii. Use guide ropes or tag lines to prevent the rotation or uncontrolled motion of the load when necessary.
- xiv. 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.
- xv. 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.
- xvi. 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.
- xvii. Multiple part lines must not be twisted around each other.
- xviii. The hook must be brought over the center of gravity of load before the lift is started.
- xix. 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.

- xx. Keep hands away from pinch points as the slack is being taken up.
- xxi. Leather gloves are recommended when handling wire rope.
- xxii. Avoid impact loading caused by sudden jerking when lifting or lowering. Lift the load gradually until the slack is eliminated.
- xxiii. Never ride on a load that is suspended.
- xxiii. Avoid allowing the load to be carried over the heads of any personnel.
- xxiv. 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.
- xxv. Never leave a load suspended unless emergency evacuation is required.
- xxvi. Never make temporary repairs to sling.
- xxvii. The capacity of a sling is determined by its angle, construction, type of hitch and size.
- xxviii. Never lift loads with one leg of a multi-leg sling until the unused legs are made secure.
- xxix. Never point load a hook unless it is especially designed and rated for such use.
- xxx. Make certain that the load is broken free before lifting and that all legs are taking the load.
- xxxi. When using two or more slings on a load make certain all slings are made from the same materials.
- xxxii. Lower the loads on to adequate blocking to prevent damage to the slings.
- xxxiii. Materials and equipment being hoisted must be loaded and secured to prevent any movement which could create a hazard in transit.
- xxxiv. The weight of the hook, load block and any material handling devices must be included when determining crane capacity.
- xxxv. Calculated weights cannot exceed load chart without written approval.
- xxxvi. Personnel must be completely clear of loads being picked up or set down by crane. Tag lines will be used to control the loads. Loads must not be touched by hand while placing/ moving.

o. Slings

The following are rules for safe use of synthetic slings:

- i. Synthetic slings must be marked to show the rated capacity for each type of hitch and type of web material.
- ii. Nylon web slings must not be used where fumes, vapours, sprays or mists or liquids of acids or phenolic are present. Web slings with aluminium fittings must apply in this category.
- iii. **Synthetic web slings must be removed from service and destroyed if any of the following conditions are present:**
 - a. Acid or caustic burns
 - b. Melting or charring of any part of the sling surface
 - c. Snags, punctures, tears or cuts
 - d. Broken stitches

- e. Distortion of fittings
- f. Synthetic web slings of polyester or nylon must not be used at or come in contact with temperatures in excess of 82°C
- g. Polypropylene web slings must not be used at or come in contact with temperatures in excess of 93°C
- h. Insulated hooks must be tested yearly to ensure insulation integrity to at least manufacturer's specifications.

p. Wire Rope Slings must be removed from service and destroyed if any of the following conditions are present:

- i. 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.
- ii. Wear or scraping of one-third the original diameter of outside wires.
- iii. Kinking, crushing, bird caging or any other damage resulting in distortion of the wire rope structure such as:
- iv. Evidence of heat damage.
- v. End attachments that are cracked, deformed worn.
- vi. Corrosion of the rope or end attachments.

q. Metal mesh slings must be immediately removed from service if any of the following conditions are present:

- i. A broken weld or broken brazed joint along the sling edge.
- ii. Reduction in wire diameter of 25 percent due to abrasion or 15 percent due to corrosion.
- iii. Lack of flexibility due to distortion or corrosion.

r. Requirements of Plate Clamps:

- i. The rated load of the plate clamp must be marked on the main structure.
- ii. Care must be taken to make certain the load is correctly distributed for the plate clamp being used.
- iii. Do not allow load or plate clamp to come into contact with any obstruction.
- iv. The plate clamp must not be used for side pulls or sliding the load.
- v. When lifting stainless steel or special alloys, ensure plate clamp is designed for use on the specific metal.

s. Signalling Practices:

- The "slinger" is responsible for attaching and detaching the load to and from the crane. He shall:
 - have received appropriate training on general safe lifting operations;
 - be capable of selecting lifting gears suitable for the loads;
 - liaise with the operator and direct the movement of the crane safely.
- The "signaller" is responsible for relaying the signal from the slinger to the crane operator. He shall:
 - have received appropriate training on general safe lifting operations;
 - be able to direct the movement of the crane and loads.

Suggested hand signals



Note: During the lifting operation, either the slinger or signaller shall communicate with the operator. Other communication methods (e.g., wireless walkie-talkies, telephones, etc.) may also be used.

Fig. 5.4 Recommended Signalling Practices

5. DEMOLITION WORK

Before any demolition work is commenced and also during the process of the work the following shall be ensured, besides using the Work Permit:

- All roads and open areas adjacent to the work site shall either be closed, suitably protected or restricted for movement
- 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.

6. T&PS GENERAL

- All T&Ps/ MMEs should be of reputed brand/appropriate quality & must have valid test /calibration certificates bearing endorsement from competent authority of BHEL.

- b. Subcontractor to also submit monthly reports of T&Ps deployed and validity test certificates to BHEL safety Officer as per the format/procedure of BHEL.
- c. Tagging and punching in all lifting tool is compulsory with SWL, sr. no. and due date.
- d. All T&Ps shall be inspected by authorized Third Party agency as per applicable frequency. BHEL shall be kept informed of any such scheduled inspection
- e. All T&Ps shall be internally inspected in each quarter and colour coded.

7. CHEMICAL HANDLING

- a. Displaying safe handling procedures & MSDS for all chemicals such as lube oil, acid, alkali, sealing compounds etc. at work place.
- b. Where it is necessary to provide and/or store petroleum products or petroleum mixture & explosives, the subcontractor shall be responsible for carrying out such provision / storage in accordance with the rules & regulations laid down in the relevant petroleum act, explosive act and petroleum and carbide of calcium manual, published by the chief inspector of explosives of India. All such storage shall have prior approval if necessary from the chief inspector of explosives or any other statutory authority. The subcontractor shall be responsible for obtaining the same.
- c. The used containers of chemicals shall be segregated and disposed of suitably
- d. In case the used containers need to be re-used, all traces of the chemical to be removed by thorough cleaning with detergents etc. under trained supervision

8. ELECTRICAL SAFETY

- a. Only electricians licensed by appropriate statutory authority shall be employed by the subcontractor to carry out all types of electrical works. The subcontractor shall maintain adequate number of qualified electricians to maintain his temporary electrical installations.
- b. No PDB or any other distribution board shall be more than 03 (three) years of purchase. Only modern PDB with industrial sockets as shown in layout below to be allowed to use at site.
- c. Power supply to all equipment at site to be routed through MCBs of appropriate rating. A 'Power Supply Distribution Plan' shall be prepared and submitted to BHEL Engineer for approval
- d. All power supplies through cables shall be underground or overhead with height > 3mtrs.
- e. All power distribution boxes shall be locked and the key controlled by site management of concerned subcontractor.
- f. All individual equipment & tools at site shall be powered through Earth Leakage Circuit Breakers of 30 mA sensitivity.
- g. These MCBs and ELCBs shall be regularly tested as per Clause 14
- h. All fuses and fuse wires shall be of standard size and rating.
- i. All electrical appliances used in the work shall be in good working condition and shall be properly double earthed other than armour earthing.
- j. All extension boards shall have separate switches for all sockets / connections.
- k. All portable electric tools used by the subcontractor shall have safe plugging system (industrial top & socket) to source of power and be appropriately earthed.
- l. Providing adequate no. of 24 V sources and ensure that no hand lamps are operating at voltage level above 24 Volts especially in confined spaces like inside water boxes, turbine casings, condensers etc.

- m. Electrical appliance shall have proper earthing and for appliances equal to & more than 415V shall have two separate earthing (as per IS-3043-1987)

n. Portable Electric Lights

- i. 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).
- ii. They must be visually checked before each use and periodically while in use to assure their original integrity is maintained.
- iii. Cords with cuts, breaks, deep abrasions, etc. shall be taken out of service immediately.
- iv. Repairs to extension cords shall only be performed by qualified/ licensed electricians.
- v. Must not be allowed to lie in wet or potentially wet areas.

o. Underground Cables:

- i. 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.
- ii. 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.
- iii. Such precautions may include halting the operation if appropriate.
- iv. 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.
- v. Any and all underground lines that are discovered or become severed must be considered energized on both sides, and be treated accordingly.
- p. Details of earth resource and their test date to be given to BHEL safety officer as per the prescribed formats of BHEL
- q. The subcontractor shall use only properly insulated and armoured cables and conform to the requirement of Indian Electricity Act and Rules for all wiring, electrical applications at site.
- r. BHEL reserves the right to replace any unsafe electrical installations, wiring, cabling etc. at the risk & cost of the subcontractor.
- s. No maintenance work shall be carried out on live equipment
- t. Adequate precautions shall be taken to prevent danger for electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public
- u. The subcontractor shall carefully follow the safety requirement of BHEL/ the purchaser with the regard to voltages used in critical areas.
- v. 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.
- w. The sub-contractor shall supply modern power distribution board of different combination (1-phase & 3phase). All the distribution of power should be through modern PDB. Equipment drawing is mentioned below.

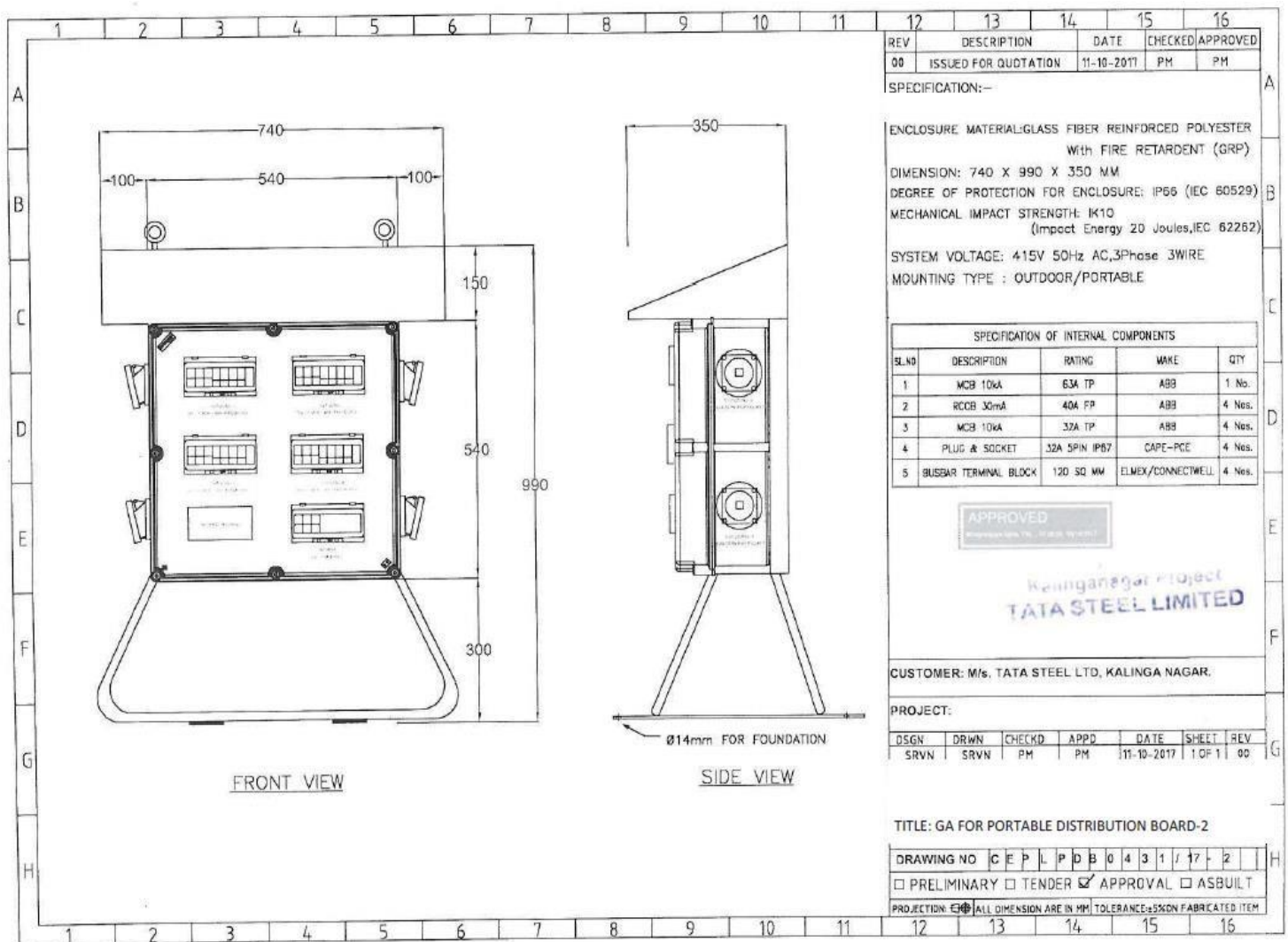


Fig. 9.1 Layout of a modern Power Distribution Board

x. General Electrical Safety

- 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 (industrial top and socket).
- Splices in electrical cords are not permitted. Repairs 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 service, 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.

- viii. 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.
- ix. Energized wiring in junction boxes, circuit breaker panels and similar places must be covered and locked at all times.
- x. Areas with live high voltage wires or terminals must be barricaded against entry and warning signs posted Danger – High Voltage and Authorized Personnel Only.
- xi. Personnel should never work on energized equipment, de-energizing (lockout/tag out) the equipment is always the first requirement.
- xii. The lockout and tag out procedure will be used when testing or working on, or around, energized installation.
- xiii. Working around energized equipment should never be done alone. A second electrician must always be available for assistance.
- xiv. If lockout/tag out 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/aprons, face shields, and other protective equipment like insulated tools, blankets, mats, etc. must be used.
- xv. 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.
- xvi. 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.

y. Qualified Persons for Electrical Works

(One who is trained and wiremen licensed to Govt. of Respective State and familiar with the construction, operation and safety hazards of the equipment upon which they are permitted to work.)

- i. 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.
- ii. 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:
- iii. Qualified persons must be capable of working safely on energized circuits; iv. Must be familiar with the proper use of special precautionary techniques and procedures based on equipment and exposure; and
- v. 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.

- vii. 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 know their limitation and stop work if not qualified on what equipment they were to work on.

- viii. 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.

z. Mandatory PPEs of electrical work on LV & HV

- i. HV arc flash suit with protective hood (for protection of face and head) as specified for hazard risk category-4 in NFPA-70E or similar IS specification for working on HT switch gear (for all voltage >690 V) to the concerned licensed electrician or competent person.
- ii. LV arc flash jacket/FR as specified for hazard risk category-4 in NFPA-70E or similar IS specification having ATPV rating of 8.5 to 9 cal/cm² for working on LV (>260V and ≤690V) to the concerned licensed electrician or competent person.



- iii. The LV arc flash jacket as shown above shall be worn continuously while working on LV (>260V and ≤690V). The color specification of LV arc flash jacket should be blue.
- iv. Electrical hand gloves should have following specification: Flame resistance, arc flash and cut protection of voltage rating (>260V and ≤690V).
- v. Electrical safety over shoe of relevant IS make for foot protection of licensed electrician or competent person while working in HV & LV line or equipment.

9. USE OF HAND TOOLS AND POWER-OPERATED TOOLS

a. 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.

b. Hand Tools

- i. The subcontractor 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.

c. 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 substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side;
- xv. No fastener shall be driven into a palled area caused by an unsatisfactory fastening;
- xvi. Only non-sparking tools shall be used in an explosive or flammable atmosphere;
- xvii. All tools shall be used with the correct shield, guard or attachment as recommended by the manufacturer.

d. Abrasive Wheels and Tools

- i. All grinding wheel must be ISO certified only.
- ii. All grinding machines shall be supplied with sufficient power to maintain the spindle speed at safe levels under all conditions of normal operation;
- iii. Grinding machines shall be equipped with suitable safety guards; iv. 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;
- v. 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;
- vi. Cup type wheels used for external grinding shall be protected by either revolving cup guard or a band type guard;
- vii. 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;
- viii. Portable abrasive wheel used for internal grinding shall be provided with suitable safety flanges;
- ix. When safety flanges are required, they shall be used only with wheels designed to fit the 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.

e. Wood Working 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 re-tensioned 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.

10. START UP, COMMISSIONING AND TESTING:

There are various activities involved prior to commissioning- the major ones are -Hydraulic Test, Steam Blowing, Transformers Charging, Boiler Light Up, Rolling and Synchronisation and Full loading of unit.

- i. These activities shall be personally supervised by the site executive along with the commissioning engineer.
- ii. Appropriate Work Permits shall be taken as applicable
- iii. The readiness of upstream and downstream system shall be ensured before taking up.
- iv. These shall be handled strictly by the authorized 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.
- v. Entry of persons to the area of activity shall be suitably restricted and the emergency functions like Ambulance, first aid center and Fire station shall be intimated about the plan well in advance.
- vi. Tag-in/ Tag-out shall be in place while charging transformer and whenever necessary.
- vii. Electricians with valid wiremen license only shall be permitted to work on power lines.
- viii. The area and the passage shall be adequately illuminated.

11. FIRE SAFETY

- a. The Fire Prevention, Protection and Preparedness 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
 - i. Inception of fire
 - ii. Loss of life or personal injury
 - iii. Loss of Property
 - iv. Interruption of operations
- b. 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 addition to their own fire equipment.
- c. Fire Protection, Prevention and Preparedness 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.
- d. 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
- e. 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.
- f. 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.

12. PAINTING:

- a. Requirements provide a detailed procedure to be implemented by all concerned employees and subcontractors involved in painting activities.

- b. Significant Environmental Hazards:
 - i. Chemical hazard due to inhalation of lead fumes (lead containing paint)
 - ii. Chemical hazard due to inhalation of VOC's from painting operations
 - iii. VOC's from painting and coating operation
 - iv. Disposal of paints and coats drums
- c. Control Procedure for Painting:
 - i. Chemical products used in painting and coating operation shall have proper MSDS sheet in place. Whenever any doubt arises with respect to handling and safety point of view it should be accessed to all concerned.
 - ii. Toxic substances and hazards relate the toxic chemicals shall be identified.
 - iii. Proper PPE shall be used including plastic gloves appropriate overall etc.,
 - iv. Arrangement for cleaning of spillage shall be ensured
- d. Only trained workers shall be allowed and proper training should be imparted to the works.
- e. 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.
- f. Ventilation or exhaust facility shall be provided at place where painting and coating operations are carried out.
- g. 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.
- h. Smoking, open flames or sources of ignition shall not be allowed in places where paints and other flammable substances are stored.
- i. A caution board in national /regional language "**smoking strictly prohibited**" shall be displayed in the vicinity.
- j. Suitable fire extinguishers/sand buckets shall be kept available at places where flammable paints are stored, handled or used.
- k. 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 trained and fit tested.
- l. 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.
- m. Workers shall thoroughly wash their hands and feet before leaving the work.

13. "HAZARDOUS ENERGY" CONTROL PROCEDURE/ LOCKOUT/TAGOUT (LOTO)

Hazardous Energy Control Procedures, known as "Lockout/Tagout (LOTO)" refers to specific practices and procedures to safeguard employees from the unexpected energization or startup of machinery and equipment, or the release of hazardous energy during service or maintenance activities.

Contractors must develop and submit a written LOTO program This requires that a designated qualified individual turns off and disconnects the machinery or equipment from its energy source(s) before performing service or maintenance and that the authorized employee(s) either lock and tag the energy- isolating device(s) to prevent the release of hazardous energy and test the machine or equipment to verify that the energy has been isolated effectively.

a. Minimum Requirements:

The following are minimum requirements that must be included in the Contractor's LOTO program:

- i. Inspection of equipment by a trained individual who is thoroughly familiar with the equipment operation and associated hazards.
- ii. Identification and labeling of lockout devices. Purchase of locks, tags, and blocks Development of a standard written operating procedure, permitted through a controlling authority that is followed by all workers.

b. General Requirements

The following steps must be taken to protect workers that install or service equipment and systems:

Follow the hazardous energy procedures and statutory regulations. Follow the manufacturer's service/repair instructions. Identify and label all sources of hazardous energy. Before beginning work, accomplish the following:

- i. De-energize all sources of hazardous energy
 - ii. Disconnect or shut down engines or motors.
 - iii. De-energize electrical circuits.
 - iv. Block fluid (gas or liquid) flow in hydraulic or pneumatic systems.
 - v. Block or secure machine parts against motion.
 - vi. Block or dissipate stored energy.
 - vii. Discharge capacitors.
 - viii. Release or block springs that are under compression or tension.
 - ix. Vent fluids from pressure vessels, tanks, or accumulators—but never vent toxic, flammable, or explosive substances directly into the atmosphere
- c. Lockout and tag out all forms of hazardous energy including electrical breaker panels, control valves, etc. Make sure that only one key exists for each of your assigned locks and that access to the key is controlled. Verify by test and/or observation that all energy sources are de- energized.
- d. After completion of the work, accomplish the following:
- i. Inspect repair work before removing the lock and activating the equipment.
 - ii. Make sure that only the worker that installed the lock removes his/her assigned lock.
 - iii. Make sure that all workers are clear of danger points before re-energizing the system.

e. LOTO Procedure**PURPOSE AND SUMMARY**

This procedure provides the requirements and responsibilities of Hazardous Energy Control and the process for Lockout / Tag out (LOTO) of energy isolating devices (valves, circuit breakers, disconnect, etc.). Its use shall ensure that machinery, equipment, or systems are isolated from all potentially hazardous energy to prevent unexpected energization, startup, or release of stored energy which may cause personnel injury or property damage.

This procedure applies to all BHEL personnel and subcontractors working on the WBPDC (1X660MW) STAGE- III projects where equipment must be taken out of service for the performance of work activities such as installation, maintenance, repair, construction, or equipment removal. The procedure may also be

used to isolate equipment of which the energization or operation may present danger to personnel or property. Lockout / tag out are not required for electrical equipment that can be unplugged from the source and the person performing the work has control of the plug.

This procedure shall be applied to prevent injury or damage caused by the unexpected release of active or stored energy. Hazardous energy sources could be in the form of the following: • Electrical

- Hydraulic
- Chemical
- Thermal
- Mechanical
- Pneumatic

Preplanning of work activities includes the identification of all potential hazardous energy sources so that they may be properly controlled and isolated, locked, and tagged out.

Prior to initiating work activities on or around locked out / tagged out equipment, the equipment must be tested and tried by or in the presence of the person(s) performing the work activities. **RESPONSIBILITIES**

- The Engineers in Charge is responsible for implementing and enforcing this procedure and approving lockouts /tag outs that impact the operation of the project.
- The Engineer in Charge responsible for authorizing Lockout /Tag out Requests.
- The Lockout / Tag out Coordinator is responsible for maintaining the Lockout / Tag out Log. Each shift should have a designated Lockout / Tag out Coordinator.
- The Isolator is responsible for determining the proper isolation devices and device positions required to isolate all potential energy sources so that the work stated on the Lockout /Tag out Request Permit may be safely performed. The Isolator must be familiar with the equipment and energy type(s) that require isolation. For this reason, in some cases the Isolator may be more than one person (i.e. Engineer, System Operator and/or Electrician). The Isolator shall position the specified device points, and apply locks and tags, and sign the tags and the LOTO Permit isolation point blocks.
- The Safety Manager is responsible for conducting an annual audit that is documented to ensure all procedures and requirements are current and being followed as written.

DEFINITIONS

Affected Employee: -

An employee whose job requires him/her to operate or use machinery or equipment on which servicing or maintenance is being performed under a lock out/tag out procedure or whose job requires him/her to work in an area in which servicing or maintenance is being performed under a lockout/tag out procedure

Authorized Employee: -

An employee who implements a lockout/tag out procedure on machinery, equipment, or systems in order that servicing or maintenance may be performed. Often an authorized employee and an affected employee may be the same person.

Danger “Do Not Operate” Tag

A tag used to identify energy isolation devices and specify the required position of the device. The tag should be affixed to the isolation device such that it is in plain view of anyone attempting to operate the

device. The tags shall be sequentially numbered and shall specify the lockout/ tag out request number. The tag shall also state the purpose, and the expected duration of the lockout /tag out

Isolation Device

A device that is designed and intended to prevent the passage of energy. These devices, usually located at the energy source, are typically valves, circuit breakers, etc. Isolation devices should have a means of being locked in position

Lockout Device

A device that uses a positive physical means such as a lock, either key or combination type to maintain an energy isolation device in the safe position and prevent the in advertent energization of machinery, equipment, or systems. Device locks should serve no other purpose other than hazardous energy control isolation

Lockout Tag out Request Permit

A pre-numbered form used to request that machinery, equipment or systems be taken out of service. A Lockout/Tagout Request Permit may be initiated by any one requiring energy isolation for work activities or for taking faulty equipment out of service

Lockout / Tag out Request Log

A record of all Lockout /Tag out Request Permits shall be maintained by the Lockout /Tag out Coordinator.

PROCEDURE

1. REQUESTING A LOCKOUT / TAGOUT PERMIT

When machinery, equipment, or systems are partially or completely taken out of service for work activities or equipment protection, a lockout / tag out shall be requested. The requestor shall be familiar with scope of work required and shall provide a brief description of the work on the Lockout / Tag out Request Permit. The requestor shall also provide the proposed start time and estimated duration of lockout / tag out. If familiar with the machinery, equipment, or system to be taken out of service, the requestor may identify the devices that are required to be isolated. The LOTO Request Permit shall be forwarded to the Authorized Lockout / Tag out Coordinator for reviewed and signature, along with Permit to Work number to be entered on the LOTO Request Permit.

- a. The Lockout / Tag out Coordinator shall record the necessary information on the Lockout / Tag out Request Log and forward the request to the Engineer in Charge for approval.
- b. The Safety Manager or Engineer in Charge shall review the Lockout / Tagout Request Permit for impact on project operations. Project operations could be impacted by the equipment being taken out of service or by the required isolation to take the equipment out of service. If project operations are impacted by the Lockout / Tagout, the request shall be forwarded to the Engineer in Charge for approval.
- c. The Engineer in Charge shall provide the lockout / tag out isolation points necessary to perform the task stated on the request. The device identification, device location, device position, and locking mechanism shall be entered into the appropriate blocks on the Lockout / Tag out Request Permit.
- d. The Engineer in Charge indicates approval of the Lockout / Tagout Request Permit by signing in the appropriate space on the request. If the Lockout /Tag out Request Permit is rejected, the Engineer in Charge shall return it to the requestor, via the Lockout / Tagout Coordinator with a written explanation of the rejection.

- e. Once approved, the Lockout / Tag out Request Permit shall be forwarded to the Lockout / Tag out Coordinator to assign tags and locks.
- f. The log shall show current status of all Lockout / Tag out Request Permits from submittal to approval, through lifting of locks and tags to final closeout. The log shall be maintained by the Lockout / Tag out Coordinator in their office.

2. PLACEMENT OF LOCKS AND TAGS

- a. The tags shall be filled out to match the information on the LOTO Request Permit. Appropriate locks for the types of isolation devices specified shall be collected and placed with the tags and the Lockout / Tag out Request Permit.
- b. The isolator(s) shall take the device locks, tags, and the Lockout / Tagout Request Permit to position the specified isolation devices, sign and hang the tags, and place the locks. If the isolator does not agree with or understand the Lockout / Tagout Request Permit, or has a problem performing the isolation, the problem should be brought to the attention of the Safety Representative or Area Supervisor immediately and the lockout / tag out should be postponed until the situation is resolved.
- c. Once the Isolator has placed all “locks” on isolation points, they will “test” and “try” the machinery, equipment, or system to ensure all hazardous energy has been completely removed and the isolation is one totally accomplished, and has initialed and signed the Lockout /Tag out Request Permit indicating all isolation points have been confirmed. Examples of “lock”, “test” and “try”:
 - by checking that all locks on the LOTO Request Permit have been applied and are in the specified position open/closed, on/off, etc.; metering test of electrical circuits, opening of drain valves, checking pressure gauges or indicators; and try by pushing start buttons and on/off switches, etc.
 - Testing shall be performed by person(s) knowledgeable of the energy source(s) being isolated (e.g., an electrician should meter electrical circuits).
- d. A copy of the completed Lockout /Tag out Request Permit shall remain with the Work Package and used as part of the daily Pre-Job Briefings

3. WORKING UNDER A LOCKOUT / TAGOUT REQUEST

- a. Prior to starting the work activity, the person(s) performing the work shall review the Lockout / Tag out Request Permit and place the necessary tags and personal locks on the identified isolation devices. Personal locks may be placed only on devices that have already been locked and tagged in accordance with the Lockout / Tag out Request Permit.
 - All personal locks shall be accompanied by a tag that is signed and dated by the worker(s) and specifies the work activity being performed.
 - Personal locks should be of a different color than device locks for ready identification.
- b. Verification of the effectiveness of the isolation by the Isolator shall be performed for Worker’s working under the lockout / tag out, by demonstrating the checks on “lock”, “test” and “try”,
- c. When the work activity is finished, personal locks and tags shall be removed and the Safety Representative shall be notified that the Lockout / Tagout is no longer required. If work under a lockout / tag out is to be delayed or interrupted for a period in excess of 24 hours, personal locks shall be removed until the work restarts. Personal locks shall be removed prior to the worker(s) leaving the project at the end of shift unless the key(s) are maintained at the project.

4. REMOVAL OF LOCKS AND TAGS

- a. When the lockout / tag out is no longer required, the Safety Representative or Area Supervisor shall obtain the Lockout / Tagout Request Permit from the work package for LOTO removal. Prior to removing locks or tags that may allow equipment to be energized, a check shall be made to verify that the equipment is free to safely operate (i.e., will not cause damage or injury). The locks and tags shall be removed and returned to the Lockout / Tagout Coordinator. Isolation devices may be repositioned at the discretion of the Engineer in Charge according to operational requirements. The Isolator shall complete the Lockout / Tagout Request Permit indicating each lock and tag has been removed and the Safety Representative or Area Supervisor forward to the Lockout / Tagout Coordinator.
- b. The Lockout / Tagout Coordinator shall discard the tags and maintain the completed Lockout / Tagout Request Permit for future reference.
- c. In the event that an employee leaves the job site without removing the personal lock I tag, the following measures shall be taken and documented. The measures listed below are a minimum set of guidelines and under all circumstances, refer to the site-specific safe work plan for detailed procedures:
 - Attempt calling / contacting the employee to return to the site for removal.
 - In the event an employee cannot be contacted, the Site Manager and Safety Manager shall sign an Emergency Lockout/Tagout Removal Form, which has been completed by the Area Supervisor.
 - Employee shall be notified upon returning to the site, prior to beginning any work.

5. INTERRUPTION OF A LOCKOUT / TAGOUT

Operational Emergency

The Engineer in Charge / Safety Manager /Area Supervisor may deem it necessary to temporarily remove the locks and tags from isolation devices, prior to the end of the work activity. The standard procedure for removal of locks and tags shall be followed. Extreme caution shall be taken by the Isolator removing the locks and tags to prevent personnel injury.

Testing

When the performance of a work activity requires the functional testing of a machine, component, or system, the locks and tags may be temporarily removed in accordance with the tag removal, to perform the test. As a result of the testing, if it is determined that the equipment needs further work, the locks and tags shall be positioned back on to the device. If it is not necessary to replace all the locks and tags, then the unnecessary locks and tags may be returned to the Lockout / Tagout Coordinator. The Engineer in Charge shall initial the Lockout / Tag out Request Permit in the removal block to indicate that these locks and tags have been removed. When testing has been satisfactorily completed, the locks and tags shall be removed.

ISOLATION DEVICES

- In most industrial applications, there are isolation devices that were not designed to accommodate a locking device. In these instances, an acceptable alternative that physically obstructs or prevents the use of the isolation device shall be found. Chains shall be placed on valves or electrical panels. Wires shall be determinate, pulled back, taped, and secured.
- If an isolation device does not accept a lock, a tag only is acceptable; however, all possible precautions shall be undertaken to provide a level of safety for the workers. The tag shall be readily visible to anyone attempting to operate the device.
- If more than one Lockout / Tagout Request Permit requires that a single isolation device be locked and tagged, a lock and tag for each request shall be placed. Each lock in itself prevents the inadvertent operation of the device.

In a multiple lockout / tag out procedure, each person working on the machinery or equipment must place a lock or tag on the energy isolating device. If the energy isolating device will not accept multiple locks or tags, a hasp (a multiple lockout device, may be used. The locks or tags must be placed in such a way that energy cannot be restored to the machinery or equipment until every lock or tag is removed. As each employee involved no longer needs to maintain lockout / tag out protection that employee removes his - her lock and/or tag. The employee attaching the lock or tag is the only person authorized to remove the lock or tag.

The training must include recognition of hazardous energy source, type and magnitude of energy available, methods and means necessary for energy isolation and control. Each authorized employee shall receive adequate training. The training should address that all affected employees are instructed in the purpose and use of the energy control procedure. There should be training provisions included for any other employee whose work operations are or may be in an area where energy control procedures may be utilized. The employee training should also address when tag out systems are used including the limitations of a tag (tags are warning devices and do not provide physical restraint). The training should also include that a tag is not to be removed without authorization. The tag is never to be ignored or defeated in any way. Retraining is required when there is a change in job assignments, in machines, a change in the energy control procedures, or a new hazard is introduced. All training and I or retraining must be documented with employee's name and dates of training.

The lockout / tag out program must be reviewed at least annually. The review must ensure that procedures are being followed and that they are effective. A documented review of the inspection must include the date, the equipment, employees involved & the inspector. The inspector must be someone other than those actually using the lockout / tag out in progress.

#1. Danger (DO NOT OPERATE) Tags





#3. Lockout / Tagout Request Permit

		LOCKOUT / TAGOUT REQUEST PERMIT		LOTO Request Permit No.:				
				Work Permit No.:				
Equip. Out of Service:	LOTO Date Required by: ____/____/____	Estimated Duration:		LOTO Requested				
				Date:				
Scope of Work:				LOTO Authorization				
				Signed by:				
				Date:				
				LOTO Removal Authorization Signed by:				
				Date: Time:				
Tag No.	Device to be Tagged / Locked I.D. No.	Device Location	Device Position OPEN / CLOSE D -	Lock No.	Tag/Lock Placed by Print/Sign - Date/Time		Tag /Lock Removed by Print/Sign - Date/Time	
			ON/OFF					
Comments Instructions: Attachment 3. Lockout / Tag out Request Permit:								

#4. Lockout / Tag out Request Log

LOTO Permit No.	Request or Name	Equipment & Location	Est. Work Completed Date	Approval Date	LOTO Placed Date	LOTO Removed Date	Comments

14. RISK ASSESSMENT

Risk and Hazard Analysis

In order to produce an overall Project EHS Plan, a project must be assessed for its risks. There are two components to the risk and hazard analysis. The procedure used to examine and plan for the identified risks and hazards is called a General Hazard and Risk Assessment.

JSA/HIRA review

Prior to commence the following activities Method statement and JSA/HIRA to be prepared by the concern engineer in coordination with EHS officer and submit to the client for review and approval. After getting approval the work will be started under PTW after clearance. For HIRA and criteria for the defining the high, medium & low risk the relevant annexure be referred. In case any deviations required in the approved method statement the concerned engineer/supervisor has to prepare additional HIRA/JSA to cover the new activities and associated risk. Following activities to be covered,

- Deep excavation (more than 5 feet)
- Significant concrete pouring (like heavy foundation, TG deck, Slab casting etc.)
- Confined entry
- Blasting
- Working on electrical/ energized equipment's
- Steel erection more than 5-Ton weight
- Working at height prior to completion of stairs/ladders/hand railing etc.

Definition:

HAZARD - Any potential or present danger to persons or property within the project site, e.g., oil on the floor is a hazard.

INCIDENT - An unintended happening that may result in injury, loss or damage, e.g., Slipping on the oil is an Incident.

INJURY – Physical harm, the result of an Incident, e.g., a sprained wrist from the fall would be an injury.

Hazard Analysis Document

- For high risk and dangerous work identified, the Applicant shall complete and submit a Hazard Analysis Document together with the PTW request. It will be a JSA (Job Safety Analysis) or Preliminary Hazard Analysis Checklist. And it shall be reviewed and approved by respective Construction and HSE Representatives.
- Issues such as work interface, coordination, drawings, toolbox meetings and work type/duration shall be detailed and included with supporting documentation for the Applicant's request for PTW.
- If applicable, Hazard Analysis Document shall be used as the foundation for development of Safe Work Method Statement. Each hazard identified shall be addressed in the Safe Work Method Statement and be submitted as part of the Applicant's submittal package.

Evaluation of Sub-contractor Risk Assessments includes

- Experience and expertise in performing similar type work.
- Duration of work performed
- Location of the work to be performed.
- Nature of the work to be performed.
- Potential for a subcontractor performing the work to expose themselves, other persons or employees, to hazards.
- Potential for exposure to work site hazards.

Review of Subcontractor specific issues

Preventive and protective measures must be introduced according to the following order of priority

- Eliminating the hazard by removing the activity from the work process. Examples include substitution with less hazardous chemicals, using different manufacturing processes, etc.
- Controlling the hazard at its source through use of engineering controls. Examples include local exhaust ventilation, isolation rooms, machine guarding, acoustic insulating, etc.
- Minimizing the hazard through design of safe work systems and administrative or institutional control measures. Examples include job rotation, training safe work procedures, lock-out and tag-out, workplace monitoring, limiting exposure or work duration, etc.
- Providing appropriate personal protective equipment (PPE) in conjunction with training, use, and maintenance of the PPE.

15. HSE PREPAREDNESS FOR ADVERSE CLIMATES AND WEATHER

All Preventive and Precautionary measures to ensure Health & Safety of workers in all possible adverse weather conditions based on the analysis of the local area conditions to be taken by the subcontractor

15.1 SUMMER

1. The Working Time and Lunch Hour will be as per instruction of Statutory Authorities (no work between 11am to 3:30pm). However, in case temp comes down due to rain/cloudy weather work will continue as per normal routine.
2. During long lunch break, worker will be allowed to go back home for rest. Those who will like to stay back will avail at the facility of rest shed or other designed area.
3. They will be allowed to take small break during work as per their need.
4. Water sprinkling will be done on roads to reduce dust concentration.
5. Workers will be provided with adequate cool drinking water and Butter milk/Lemon water etc.
6. Adequate ORS stock will be made available at the work location in the First-Aid Box for use as needed and at First-aid Centre for emergency need.
7. Fire prevention shall be on high alert, with removal of dry grass and bushes, etc, inside and outside the surrounding work areas. No smoking, and control of open flame/sparks shall be maintained and monitored.
8. Worker will be informed about the Do's and Don'ts to be followed during summer in the Pre Job Brief.

Dos & Don'ts

1. Drink plenty of cool water and other non-alcoholic fluid and keep body well hydrated.
2. Eat salt in food to replenish loss of salt through sweating.
3. Avoid over physical exercise.
4. Have adequate sleep at night.
5. Eat light and less spicy food
6. Avoid eating food which was cooked long time ago.
7. Nobody should use small water bodies such as pits, running rain water through crevices etc. for drinking and cleaning purpose as it may be unhygienic.

Emergency Handling

In case of emergency due to heat disorder:

1. Rescue the victim from workplace and place under shed.
2. If to be rescued from height, use stoke basket or rescue kit.
3. Inform Ambulance immediately.
4. If nearby any air conditioned room/shed is available, place him inside the room/shed.
5. Administer First aid by trained First aider for Heat Disorder
6. If conscious, give him ORS solution to drink.
7. If required send the victim hospital immediately.

15.2 MONSOON

A. Height Work & Structural Safety:

1. Ensure that all height work platforms are barricaded and avoid any highly hazardous
2. Height work.
3. Ensure that all personnel have good quality and intact safety shoes
4. Stop all dangerous height work during rain
5. Explain Do's and Don'ts to workers during Tool Box Meetings
6. Ensure that there are no weak structures, boards etc. that can fall during high winds
7. Do not allow any loose material (e.g. GI sheet, Ply board, empty cement bag, aluminium foil, foam sheets etc.) on roof sheds or top of structures.
8. Do not permit any one to ride up or come down scaffolds frame work during heavy wind or rain.
9. Provide "anchor" of adequate strength to scaffolds and other high-rise structures.
10. All rest sheds and GI sheds will be anchored into the round and wall and roof panels will be secured with J hook to prevent shed from blowing over or parts/pieces becoming airborne. Proper earthing per IS standard is also to be installed.
11. Do not go alone nor permit anyone to stay at tower-tops, roof-tops, high structures or on electrical poles during the course of stormy weather or heavy rain.

B. Electrical:

1. All electrical connections / loads have to be routed through ELCB / RCCB (residual current circuit breaker) whose rating should be 30mA.
2. RCCB operational checks need to be done DAILY / WEEKLY during monsoon season.
3. Avoid joints on power cables which need to be laid over-head or under-ground, better not to have any joint at all. In case joints become essential, such cables must be housed rigidly and insulation must be provided as per approved standard. The joint shall be suitable for outdoor use.
4. All electrical distribution board shall be properly covered at top and sides to protect from rain water. Extension boards shall be protected from rain water.
5. Ensure proper "earthing" for each and every electrical appliance.
6. Double earthing need to be provided for 3-phase power supply and for voltage more than 220V.
7. Provide lightening arrestors at the top of Boiler 3 and boiler 4 and rest sheds which are not covered by existing lightening arrestor of other installation.

C. Others:

1. Maintain smooth flow on open drains. i.e. no obstruction or blockade shall be made on storm water drains. If required, make temporary drains.
2. Arrange back-filling of excavated pits on war-footing basis.
3. Arrange bringing down booms of all cranes, hydra machines during stormy weather (wind speed 4050 km/hr)
4. Confirm that all gantry cranes are effectively choked to prevent rolling and toppling.
5. Do not forget to deep ready a dew battery operated lights at site-offices during rainy season.
6. Avoid using wet damp clothes.
7. Hard Barricade excavated zone filled with water with scaffolding pipe & clamp with reflective net
8. Engage diesel operated water pump to dewater work area. For electrically operated water pump, the starter shall be protected from rain water. All rotating parts shall be guarded. Ensure availability of sufficient water pumps.

D. Health and hygiene:

1. Monsoon reduces the immunity of our body and makes us vulnerable to many diseases which are commonly associated with this season. It is time for us to keep our body challenging against disease by boosting our immunity and taking safety measures against these diseases.
2. The diseases associated with monsoon are Malaria, Jaundice, Gastro-intestinal infections, like typhoid, cholera etc. apart from these viral infections like cold and cough also make their presence felt. Majority of above said diseases are on account of:
3. Puddle of water formed due to rain become breeding grounds for mosquitoes which spread disease like, malaria and dengue fever. As a precautionary measure against mosquito-bite disease one can use mosquito net around the end which is better choice to mosquito repellents like mats and coils.
4. Pollution of drinking water during monsoon is very common. It is very necessary to drink clean and pure water when water-borne monsoon diseases like diarrhoea and gastro-intestinal infections threaten us.
5. Walking in dirty water during rainy season leads of numerous fungal infection which affect toes and nails. Diabetic patients have to take a special care about their feet. Keeping feet always dry and clean is very necessary. Avoid walking in dirty water. Keep shoes socks and raincoats dry and clean.

E. Workmen will be made aware of following Do's and Don'ts:

1. Do not sleep in daytime.
2. Avoid over physical exertion.
3. During lightning and thunder storm, do not take shelter under tree. Take shelter inside rest shed or store room.
4. Wash vegetables with clean water and steam them well to kill germs.
5. Avoid eating un-cooked foods and salads should be washed properly before consumption.
6. Drink plenty of water and keep body well-hydrated.
7. Always keep the surrounding area dry and clean. Don't allow to get water accumulated around.
8. Keep body warm as viruses attack immediately when body temperature goes down.
9. Do not enter air conditioned room with wet hair and damp cloths.

10. Dry your feet and webs with soft dry cloth whenever they are wet.
11. Eat light and less spicy food.
12. Avoid eating food which was cooked long time ago.
13. Eat salt in food to replenish loss of salt through sweating.

15.3 EMERGENCY WEATHER CONDITIONS

Cyclone/Severe thunder storm

In the event of Cyclone/Severe thunder storm, alert will be issued by subcontractor on notification received by Govt. authorities/Metrological departments Customer or BHEL. **The actions required during cyclone/rough weather:**

1. Check and advice subcontractors to clean-up work area. Pick up all loose and unused material of respective supervisor's area.
2. Tie to secure all gas cylinders to avoid displacement and unsafe conditions which could be due to wind pressure.
3. Secure portable electricity generating sets and other equipment, pumps, hoses etc.
4. Make preparation for removal of water logging.
5. Take review of work activity and make preparation for removal of equipment and material from vulnerable areas.
6. Isolate/turn off all electrical power form the main panel/switches. Secure and anchor panels properly.
7. Recheck anchorage/tie of all temporary structures/sheds, tall objects, cranes, rigs, scaffolds etc. to avoid toppling due to wind force.
8. Cranes boom shall be secured, either locked or lowered the booms as reasonably and practicably possible and rigs to safe position for the safety point of view.
9. Group up all trash barrels, wooden pallets, forms; wooden decks etc. and anchor properly.
10. Welding machines, air compressors and such equipment are to be grouped together and secured to the stable objects. Welding leads, electrical cables, hoses are to be rolled up and secured properly.
11. Set on site vehicles on high ground in the site area with brakes set firmly.
12. Anchor all tanks, vessels, gas cylinders that may be moved by high wind and water.
13. Evacuate job site.

Personnel Evacuation:

1. Personnel Evacuation will be required if predicted wind speed and storm surge heights are beyond acceptable limits as per the instructions from Govt. Authorities/ Metrological departments or Customer.
2. Once the warning is received for personnel evacuation, an emergency response team shall be formed. The team will work with local authorities and other agencies formed/deployed to evacuate and transport all personnel involved in the project to the cyclone shelter.
3. Cyclone may be 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".

4. After the cyclone, do not go outside until officially communicated about safe situation outside. Use recommended routes for returning. Do not panic or rush while returning.
5. Checking of gas leaks and well-being of electrical appliances is essential before leaving the site.
6. Follow local communications for official warning and advice. The construction Manager shall also obtain updates from customer/metrological departments and communicate to the personnel on project site.

15.4 PREVENTION OF COVID-19 (COVID-19 HERE TO BE READ AS COVID-19 AND OTHER PANDEMICS/ COMMUNICABLE DISEASES) AT PROJECT SITE & LABOUR COLONY:

Resumption of Construction Activities after Lock Down and Prevention of Coronavirus Infection during Site Operations and OCP 61A: Prevention of COVID-19 Infection in Labor Colony will be strictly followed. **A.**

Preventive measures at project site:

- BHEL and Agencies shall nominate COVID Marshalls, who will be responsible for monitoring the COVID prevention measures and apprising management on the same.
- Mandatory health check-up for every worker/ official joining the site
- All activities to be carried out using least amount of paperwork and physical proximity as far as possible.
- **HSE Observer App** to be used to monitor HSE Activities and follow up with agencies for closure of nonconformities.

a. Strict Control at the Gate/ Banning Entry to Anyone Not Wearing Masks

- i. Security personnel at the gate may erect a barricade preferably approx. 10 meters from the gate and only allow personnel who are wearing proper masks inside.
- ii. Public address system may be used to warn any non-compliant visitors
- iii. Near entry gate, round markers at minimum 1-meter distance to be ensured so that distancing is ensured
- iv. A hand-wash or hand sanitiser facility is preferable at the gate to allow entry after hand wash or hand sanitisation. These are also to be provided at key locations to enable hand wash / hand sanitisation before starting work, before eating, etc.
- v. Gutkha, Paan, tobacco etc. to be banned from the site. Spitting to be strictly prohibited.

b. Screening at Gate with Contactless Thermometer & Action on Suspected Cases

- i. Security Personnel at the Gate to screen each person entering the premises using a non-contact infrared thermometer, which is duly serial numbered and calibrated.
 - ii. In case any site worker/ official is found to have fever more than 99 Degrees Fahrenheit or found coughing/ sneezing, he/she may be advised rest till recovery and entry to be permitted after obtaining clearance from medical officer/assistance/attendants.
- Parcel to be collected from gate by concerned person preferably with provision of Special Box
 - Any construction material received at site, unless properly sanitized, to be kept undisturbed for at least 3 days and to be used only after that period.
 - During Toolbox Talks, minimum 1-meter distance between any two workers to be ensured

c. During site execution activities:

For all site execution activities, social distancing is to be maintained. In case this is not possible due to nature of work, speciality of work, etc, ensure sensitisation of the labour/staff involved and use of

appropriate PPEs, especially mandatory face mask. In any case, close working to be allowed only in special circumstances and ensuring these activities are preferably time staggered to the extent possible

d. In office premises:

- i. Sharing of items like pens, water bottles etc. in office premises to be avoided
- ii. Doors preferably to be in open condition to avoid contact
- iii. All common touch points to be frequently disinfected in a day.

e. Regular disinfection of all Areas, Equipment and facilities

- i. A dedicated disinfectant gang to be identified for the task by each agency. The disinfectant gang to be provided full body suits for the task.
- ii. All areas (including office premises, site areas, chairs, tables, furniture etc.), tools & equipment to preferably be disinfected by dedicated gang every day before resumption of work.
- iv. Common touch points like handrails, lift buttons, door/window knobs or handles, vehicle door handles, taps, conference room & dining hall tables/chairs, common sofas/chairs, visitor sofa/chairs, files & folders, etc to preferably be disinfected regularly at frequent intervals every day.
- v. Pool vehicles, to be disinfected after every use. Social distancing to be maintained inside the common pool vehicles as per Govt./ statutory body guidelines.

f. Disinfecting the operator/driver touch points of Vehicles/cranes, T&Ps etc.

Disinfection to also be carried out for all Cranes, Vehicles, Equipment, consoles, T&Ps etc. which come into contact with operating personnel.

g. Posters on COVID-19

Sufficient Posters on COVID-19 to be ensured across the site in languages understood by most workers.

h. Brief guidelines for hand washing are as below:

- i. Soap to be provided at each wash basin and replenished regularly.
- ii. Washing with soap for at least 20 seconds is recommended.
- iii. As a general guideline, for every 100 workers, 1 wash-basin may be provided at site areas.
- iii. Close queue to be avoided near wash-basins and 1-meter distance to be maintained. Round markers at 1-meter distance can be ensured as guidance

Composition of Disinfectant:

- i. Readily available 1% hypochlorite solution or 4%
- ii. Liquid chlorine-1% solution
- lii. Surgical spirit-95% alcohol content
- iv. Hand sanitizer should have: Isopropyl alcohol-75%, Glycerol-1.45%, Hydrogen Peroxide-0.125%

B. Prevention of COVID-19 Infection in Labor Colony:

- Spacing of minimum 2 meters between living areas of workers inside a room may be maintained. Preferably, the living area of each worker may be partitioned using sheet of cloth, plastic etc.
- Rooms to be properly ventilated as far as possible
- Sanitation to be given prime importance and personal hygiene to be promoted
- Face masks shall be worn by everyone inside the colony premises
- Spitting of Pan. Gutkha etc. inside the colony and urinating etc. outside the toilets to be strictly avoided
- Regular visits by Doctors to the labor colony can be arranged on non-working day for check-up of all workers

- **Identification of “COVID Wardens” (CWs) by each agency for maintaining the following:**
 - i. Keeping an eye on the health of workers and report any suspected cases of fever, coughing etc. to the management
 - ii. Keeping an eye on the social distancing measures in the labor colony and report any non-conformances to the management.
 - iii. Educate the workers about social distancing and COVID prevention measures.
- Training/ Awareness regarding COVID-19 to be provided to workers regularly.
- Workers to be instructed to maintain social distancing of minimum 1 m at all time
- **Posters on COVID-19:** Sufficient Posters on COVID-19 to be ensured across the labor colony in languages understood by most workers.
- All workers to be instructed to inform any suspected cases of illness (individual or others) to an emergency contact number of CW, the emergency contact numbers and CW contact numbers to be displayed at prominent locations
- **Inspection & Review**
 - i. Daily Inspection by concerned COVID Wardens and reporting to Agency
 - ii. Regular inspection by Agency & BHEL

15.5 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.
- 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

Parameter	Night Noise level dBA	Daytime Noise Level dBA
At 1-meter from each piece of equipment	85	85
At Property boundary	70	70

ANNEXURE – H
First-Aid Box

Details & Contents of First Aid Box as per Contract Labor (Regulation & Abolition Act), Central Rules, 1971

- (1) The first-aid box shall be distinctively marked with a Red Cross on a white background and shall contain the following items, namely:

(a) For establishments in which the number of contract labor 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)	1 copy of the First-Aid leaflet issued by the Director General, Factory Advice Service and Labor Institutes, Government of India.
(xviii)	A bottle containing 100 tablets (each of 5 grains) of aspirin
(xix)	Ointment for burns
(xx)	A bottle of suitable surgical anti-septic solution

(b) For establishment in which the number of contract labor exceeds fifty each first-aid box shall contain the following equipment:

(i)	12 small sterilized dressings
(ii)	6 medium size sterilized dressings
(iii)	6 large size sterilized dressings.
(iv)	6 large size sterilized burn dressings
(v)	6 (15 grams) packets sterilized cotton wool
(vi)	12 pieces of sterilized eye pads in separate sealed packets.
(vii)	12 roller bandages 10 cm wide.
(viii)	12 roller bandages 5 cm wide.
(ix)	One tourniquet.
(x)	A supply of suitable splints.
(xi)	Three packets of safety pins.
(xii)	Kidney tray.
(xiii)	Sufficient number of eye washes bottles filled with distilled water or suitable liquid clearly indicated by a distinctive sign which shall be visible at all times.
(xiv)	4 per cent Xylocaine eye drops, and boric acid eye drops and soda by carbonate eye drops.
(xv)	1 (60ml) bottle containing a two percent alcoholic solution of iodine
(xvi)	One (two hundred ml) bottle of mercurochrome (2 per cent) solution in water.
(xvii)	1 (120ml) bottle containing Sal volatile having the dose and mode of administration indicated on the label.
(xviii)	1 roll of adhesive plaster (6 cmX1 meter)
(xix)	2 rolls of adhesive plaster (2 cmX1 meter)
(xx)	A snake bite lancet.
(xxi)	1 (30 grams) bottle of potassium permanganate crystals.
(xxii)	1 pair scissors
(xxiii)	1 copy of the First-Aid leaflet issued by the Director-General, Factory Advice service and labor Institutes, Government of India.
(xxiv)	a bottle containing 100 tablets (each of 5 grains) of aspirin
(xxv)	Ointment for burns
(xxvi)	A bottle of a suitable surgical anti septic solution.

- (2) Adequate arrangement shall be made for immediate recoupment of the equipment when necessary.



BHARAT HEAVY ELECTRICALS LIMITED

Centre of Excellence (CoE) , Karkhiyaon, Varanasi

Name Of Work:

**Construction of Propulsion Manufacturing Block
Foundation and Miscellaneous Enabling Works at
BHEL CoE, Karkhiyaon, Varanasi**

Tender Enquiry No. : COE/VNS/CVL/2023/001

VOLUME-1C

SPECIAL CONDITIONS OF CONTRACT (SCC)

BIDDER

(Signature with Name, Designation and Date)

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CHAPTER - I

General Intent of the Specifications

1.0 INTENT OF THE SPECIFICATION

- 1.1 The intent of this specification is to provide services for execution of the project according to most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for the proper and efficient services towards installation/ Construction of the plant shall not relieve the contractor of the responsibility of providing such services / facilities to complete the work or portion of work awarded to him. The quoted / accepted rates / price shall deem to be inclusive of all such contingencies.
- 1.2 The work shall conform to dimensions and tolerances given in various drawings and documents that will be provided during execution. If any portion of works is found to be defective in workmanship and not conforming to drawings / documents or other stipulations, the contractor shall dismantle and re-do the work duly replacing the defective materials at their own cost, failing which recoveries, as determined by BHEL, shall be effected from contractor's bills.
- 1.3 It is not the intent of this specification to specify herein all the details of Civil works, erection and commissioning. However, the system shall conform in all respects to high standards of quality and workmanship for performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgments is not in full accordance herewith.
- 1.4 The omission of specific reference to any construction, fabrication / erection or other method, equipment or material necessary for proper and efficient working of the plant shall not relieve the tenderer of the responsibility of providing such facilities to complete the work at quoted rates. Any mismatch/ defect found due to mistake in fabrication / erection shall have to be rectified by the vendor free of cost. Inspection by BHEL does not relieve vendor of his responsibility of executing quality erection.

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- 1.5 The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management. The contractor should ensure proper planning and successful and timely completion of the work to meet the overall project schedule. The contractor must deploy adequate quantity of tools & plants, modern / latest construction aids etc. He must also deploy adequate trained, qualified and experienced supervisory staff and skilled personnel.
- 1.6 Following shall be the minimum responsibility of contractor and have to be provided within finally accepted rates / prices.
- 1.6.1 Achieving Proper out-turn / Turn-over as per BHEL plan and commitment.
- 1.6.2 Completion of work as per BHEL Schedule. For this, the contractor, just after mobilization, has to submit detail work completion schedule along with their resource/T&P deployment plan in line with contract schedule for review/approval by BHEL.
- 1.6.3 Good quality and accurate workmanship with good aesthetics value for the works done.
- 1.6.4 Repair and rectification.
- 1.6.5 Preservation / Re-conservation of all components/ structures during storage / erection / construction/ commissioning till handing over.

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CHAPTER - II

General Services to be Rendered by the Bidder

2.0 GENERAL SERVICES TO BE RENDERED BY THE BIDDER

- 2.1 Services for construction, fabrication, and erection under the contract shall include but not be limited to the following:
- 2.2 Issuing materials from store / open yard from time to time for construction/ erection as per the construction programme. The Contractor shall be the custodian of all the materials issued till the structure/ plant/equipment is officially taken over by the owner / BHEL after satisfactory completion of work.
- 2.3 Transport of material to their respective places of erection.
- 2.4 Deployment of all skilled and unskilled manpower required for erection, supervision of erection/ construction, watch & ward, commissioning and other services to be rendered under this specification.
- 2.5 Deployment of all erection tools & tackle, construction machinery, transportation vehicles and all other implements in adequate number and size, appropriate for the erection work to be handled under scope of this specification except otherwise specified.
- 2.6 Supply of all consumables, e.g. welding electrodes, cleaning agents, diesel oil, lubricant etc. as well as materials required for temporary supports, scaffolding etc. as necessary for such erection work, unless specified otherwise.
- 2.7 Providing support services for the contractor's staff e.g. construction of site offices, temporary stores, residential accommodation and transport to work site for personnel, watch and ward for security and safety of the materials under the Contractor's custody etc. as required.
- 2.8 Maintaining proper documentation of all the site activities undertaken by the Contractor as per the Proforma mutually agreed with BHEL, Submission of monthly progress reports and any such document as and when desired by BHEL/owner, taking approval of all statutory authorities, Inspector of Explosives etc. as applicable for respective portions of work fall under the jurisdiction of such statutes of laws.

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- 2.9 Any other service, although not specifically called for but required for a contract of the size and nature indicated in the specification.

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CHAPTER - III

General Technical Requirements (Codes & Standards)

3.0 GENERAL TECHNICAL REQUIREMENTS (CODES AND STANDARDS)

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

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CHAPTER - IV

Obligations of Contractor

4.0 OBLIGATIONS OF CONTRACTOR

4.1 CONSUMABLES & OTHER ITEMS

- 4.1.1 The contractor shall provide within finally accepted price / rates, all consumables (excepting those indicated in BHEL scope) like welding electrodes (including alloy steel and stainless steel), filler wires, TIG filler wires (over & above as supplied by the unit along with the plant materials, which will be given free of cost to bidder), gases (inert, welding, cutting), soldering material, dye penetrants, radiography films, etc. Other erection consumables such as tapes, jointing compound (As applicable), grease, mobile oil, M-seal, Araldite, petrol, CTC / other cleaning agents, grinding and cutting wheels are also to be provided by the contractor. Steel, packers, shims, wooden planks, scaffolding materials hardware items etc. required for temporary works such as supports, scaffoldings are to be arranged by the contractor. Sealing compounds, wooden/concrete sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by the contractor.
- 4.1.2 All the shims, gaskets and packing, which go finally as part of plant equipment, shall be supplied by BHEL free of cost.
- 4.1.3 It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of consumables. Non-availability of any consumable materials or equivalent suggested by BHEL cannot be considered as reason for not attaining the required progress or for additional claim.
- 4.1.4 It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of electrodes etc. before procurement of welding electrodes. On receipt of electrodes at site these shall be subjected to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number, date of expiry etc. and produce test certificate for each lot / batch with correlation of batch / lot number with respective test certificate. No electrode without a valid test certificate will be used.
- 4.1.5 BHEL reserves the right to reject the use of any consumable including electrodes, gases, lubricants / special consumables if it is not found to be of the required standard / make /

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purity or when shelf life has expired. Contractor shall ensure display of shelf life on consumable wherever required and records maintained.

4.1.6 Storage of all consumables including welding electrodes shall be done as per requirement / instruction of the Engineer by the contractor at his cost.

4.1.7 In case of improper arrangement for procurement of any consumable, BHEL reserves the right to procure the same from any source and recover the cost from the Contractor's first subsequent bill at market value plus the departmental charges of BHEL from time to time. Postponement of such recovery is normally not permitted. The decision of Engineer in this regard shall be final and binding on the Contractor.

4.1.8 All charges on account of any kind of taxes and duties on materials obtained from any source for carrying out the works in the scope of the contractor shall be borne by the contractor.

4.2 **TOOLS AND PLANTS / MONITORING AND MEASURING EQUIPMENT (MMEs)**

4.2.1 **T&Ps and MMEs to be provided by Contractor**

4.2.1.1 All T&Ps and MMEs excepting those specifically indicated in BHEL scope are to be provided by the Contractor. Record of availability of T&Ps and MMEs with Valid Fitness/Calibration Certificate of T&P & MME's need to be submitted on monthly basis by contractor to site package in charge. Contractor has to make his own arrangement at his cost for completing the formalities (including arrangement of Road permits/ e-way bill, if any) if required with Tax authorities, for bringing their materials, plants and equipments at site for the execution of work under this contract.

4.2.1.2 All suitable cranes, lifting and transport equipments for material handling at stores/yard/siding of BHEL are included in scope. BHEL's cranes will not be available for this purpose unless otherwise specifically permitted as per contract conditions

4.2.1.3 All T&Ps to be deployed by the contractor shall have the approval of BHEL Engineer with regard to brand, quality and specification.

4.2.1.4 Indicative list of Major T&Ps in the scope of Contractor are given in the Technical Conditions of Contract. Bidders to note that these are only indicative and as such all other T&P necessary for timely and satisfactory completion of work in scope shall be mobilized by Contractor.

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- 4.2.1.5 Timely deployment of adequate T&Ps/MME's is the responsibility of the contractor. The contractor shall be prepared to augment the T&P/MME's at short notice to match the planned programme and to achieve the milestones.
- 4.2.1.6 Contractor shall maintain and operate his tools and plants in such a way that major breakdowns are avoided. In the event of major breakdown, contractor shall make alternative arrangements expeditiously so that the progress of work is not hampered.
- 4.2.1.7 In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make alternative arrangement at the risk and cost of the contractor. Decision of BHEL shall be final and binding on the contractor.
- It is not obligatory on the part of BHEL to provide any tools and tackles or other materials other than those specifically agreed to do so by BHEL. However, depending upon the availability, BHEL handling equipment and other plants may be made available to the contractor on payment of hire charges as fixed, subject to the conditions laid down by BHEL from time to time. Unless paid in advance, such hire charges, if applicable, shall be recovered from contractor's bill/ security deposit or any other due payment in one instalment.
- 4.2.1.8 The T&P to be arranged by the contractor shall be in proper working condition and their operation shall not lead to unsafe condition. The movements of cranes, and other equipment should be such that no damage / breakage occurs to foundations, other equipments, material, property and men. All arrangements for the movement of the T&P etc. shall be the contractor's responsibility.
- 4.2.1.9 Use of welding generators / rectifiers only shall be permitted for welding. Use of welding transformers will be subject to specific approval of BHEL engineer.
- 4.2.1.10 The contractor at his cost shall carry out periodical testing of his construction equipment. Test and calibration certificates shall be furnished to BHEL.
- 4.2.1.11 Contractor shall ensure deployment of serviced and healthy T&Ps including cranes, lifting tackles, wire ropes, manila ropes, winches and slings etc. History card and maintenance records for major T&Ps will be maintained by the contractor and will be submitted to BHEL Engineer for inspection on monthly basis. Fitness certificate / Test Certificates of T&P shall have to be submitted before it is put in use. Identification for such T&Ps will be done as per BHEL Engineer's advice.
- 4.2.1.12 Contractor shall ensure deployment of reliable and calibrated MMEs (Inspection measuring and Monitoring equipment). The MMEs shall have test / calibration certificates from authorized / Government approved / accredited agencies traceable to

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National / International standards. Each MME shall have a label indicating calibration status i.e. date of calibration, calibration agency and due date for calibration. A list of such instruments deployed by contractor at site with its calibration status is to be submitted to BHEL Engineer on monthly basis in prescribed format for control.

- 4.2.1.13 Re-testing / re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such MME so that work does not suffer when the particular instrument is sent for calibration. If any MMEs not found fit for use, BHEL shall have the right to stop the use of such item. It will be necessary for the contractor to deploy proper item. Any readings taken by the defective instrument will be recalled and repeat the readings taken by that instrument with a proper one. In case he fails to do so, BHEL may deploy MMEs and retake the readings at contractor's cost.
- 4.2.1.14 BHEL shall have lien on all T&P, MMEs and other equipment of the contractor brought to the site for the purpose of work awarded by BHEL. BHEL shall continue to hold the lien on all such items throughout the period of contract / extended period. The contractor and / or his sub-contractors, without the prior written approval of the Engineer, shall remove no material brought to the site for the purpose of work awarded by BHEL.
- 4.2.1.15 The month wise T&P deployment plan to execute the work is to be submitted as per relevant format as per the instruction of BHEL. It shall be the contractor's responsibility to deploy the required T&P, for timely and successful completion of the job, to any extent.
- 4.2.2 **Obligations in respect of T&Ps and MMEs provided by BHEL**
- 4.2.2.1 T&P / MMEs being provided by BHEL to sub-contractor free of hire charges shall be shared by other subcontractors working for BHEL at site and the allotment done by BHEL Engineer shall be final and binding.
- 4.2.2.2 BHEL T&P will be issued in basic assembled condition. Additional loose components / sub-assemblies / attachments as and when necessary, will be issued by BHEL. Assembly of such additional loose components/sub-assemblies/ attachments is in contractor's scope.
- 4.2.2.3 In case of non-availability of the T&Ps to be provided by BHEL due to breakdown, major overhauls, distribution pattern or any other reason, the contractor shall plan / amend / alter his activities to meet erection / commissioning targets in consultation with BHEL.
- 4.2.2.4 Unless otherwise specified elsewhere in the contract, the contractor shall engage trained and experienced operators for the operation of BHEL's T&Ps. Their skill / performance will be checked by BHEL Engineer before they are allowed to operate the same. However, checking of skills by BHEL does not absolve the contractor of his responsibilities for proper

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and safe handling of equipment, consistent good performance of operators and regular performance evaluation of operators.

4.2.2.5 The day to day operation and maintenance of BHEL's T&Ps (**Other than cranes**) shall be carried out by contractor as per manufacturer's / BHEL's maintenance schedule at his cost. The contractor shall arrange, at his own cost, trained operators, fuel and other consumables for their operation. The contractor has to arrange for fixing of the spares; supervision in specialized cases will be provided by BHEL. BHEL supplied T&Ps shall be maintained in good working condition during the entire period of use. T&Ps in defective / damaged condition shall be rectified promptly to the full satisfaction of BHEL engineer. Contractor shall maintain records for maintenance of major T&Ps. These shall be made available for Inspection whenever required. In case of any lapses on the part of the contractor, BHEL at its own discretion shall get the servicing / repair of equipment done at the risk and cost of the contractor along with BHEL overheads. Further, if there are breakdowns / damages due to negligence of the contractor, the complete service / repair charges and cost of all the spares damaged with BHEL overheads shall be recovered from contractor's RA bills.

4.2.2.6 Increasing / shortening of the crane boom to suit work requirements shall have to be arranged by the indenting contractor at his cost including restoration to a state as directed by BHEL. All necessary manpower tools, support, consumables, illumination etc. will have to be arranged by contractor at his cost. If required, contractor has to return the crane with original boom.

4.2.2.7 The rate quoted shall be inclusive of cleaning the site of any vegetation, dressing and levelling etc., required for commencement of site activities. The rates shall also be inclusive of final micro grading before handing over. No separate payment will be made towards the same.

However, in construction projects of this magnitude it is possible that all the areas / approaches may not be ready. In such cases backfilling of approaches where ever necessary, consolidation of ground and arrangement of sleepers / sand bag filling etc. for safe operation / movement of equipment including cranes / trailers etc. shall be the responsibility of the contractor at his cost. No compensation on this account shall be payable.

4.2.2.8 In the event of contractor not using and maintaining BHEL T&Ps according to BHEL's instructions. BHEL will have the right to withdraw such item without any notice and no claim in this regard shall be entertained and contractor shall be responsible for delay in execution on this account.

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- 4.2.2.9 The contractor shall furnish regular utilization report of the BHEL T&Ps, as per requirement of BHEL.
- 4.2.2.10 Any loss / damage to any part of BHEL T&Ps and MMEs shall be to the contractor's account and any expenditure on these accounts by BHEL will be recovered from the contractor's bill in case the contractor fails to make good the loss.
- 4.2.2.11 It shall be responsibility of the contractor to take delivery of T&Ps and MMEs from stores or place of use of other contractor at project site, transport the same to site and return the same to BHEL store / place as intimated by Engineer in project site in good working conditions after use.
- 4.2.2.12 The contractor shall return BHEL T&Ps and MMEs issued to him in good working condition as and when desired by BHEL (on completion or reduction of workload). If contractor delays return of T&P and MME, hire charges as applicable shall be levied by BHEL from time, it was requisitioned till the time of actual return.
T&Ps and MMEs returned in damaged / unserviceable condition shall be got repaired by BHEL at its own discretion and entire cost of repair with BHEL overheads shall be recovered from the contractor.
- 4.2.2.13 Replacement cost including BHEL overheads in respect of irreparable / completely damaged / non return of T&Ps and MMEs shall be recovered from the contractor's running / final bills.
- 4.2.2.14 **Obligations in respect of Cranes provided by BHEL**
- a) BHEL will make available the cranes (as per Technical Conditions of Contract) free of charge to the contractor on sharing basis mainly for the purposes enumerated/ indicated therein. BHEL cranes have to be shared with other agencies / contractors of BHEL. The allocation of cranes shall be the discretion of BHEL engineer, which shall be binding on the contractor.
- b) In case BHEL cranes /EOT (Electrically operated trolley) are covered under AMC awarded by BHEL, then the day-to-day upkeep and running maintenance as described above are excluded from scope. However, any additional helpers if any required during Preventive / Breakdown Maintenance, Assembly / disassembly shall be provided by contractor at no extra cost.
- BHEL may also provide cranes through crane hiring agencies in which case the day-to-day upkeep and running maintenance shall be excluded from scope of contractor.

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- c) Minor consumables like cotton cloth, cotton waste, etc. is to be supplied by Contractor. All spares and lubricants/grease is excluded from scope. Contractor to give the requirements of these items well in advance in case the cranes provided by BHEL are BHEL owned cranes.
- d) Unless otherwise specified, trained operators for BHEL owned cranes shall be provided by the contractor. These operators should possess valid license for heavy vehicle.
- e) BHEL cranes /EOT (Electrically operated trolley) will be withdrawn for regular and capital maintenance as per the respective schedule of maintenance. As far as possible such schedules will be intimated to the contractor in advance and may be adjusted depending on the work requirements at site. However no claim whatsoever will be entertained on account of non-availability of cranes.
- f) Where the services of the cranes provided by BHEL are to be shared by other agencies / contractors of BHEL, the contractor's responsibilities defined above will also be apportioned accordingly to the beneficiary agency. Working arrangements in this regard will be done at site by BHEL engineer and in any case his decision shall be final and binding.
- g) Major breakdowns will be attended to by BHEL. However, in case of breakdowns or damages due to negligence of the contractor, the complete service / repair charges including cost of spares shall be to the account of the contractor, along with BHEL overheads.

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CHAPTER - V

Responsibilities of Contractor (in Respect of Labour, Supervisory Staff)

5.0 RESPONSIBILITIES OF CONTRACTOR IN RESPECT OF LABOUR, SUPERVISORY STAFF, ETC.

- 5.1 Refer relevant clauses of General Conditions of Contract (GCC) also in this regard
- 5.2 The contractor shall deploy all the necessary skilled/semiskilled/ unskilled labour including highly skilled workmen etc. These workmen should have previous experience on similar job. They shall hold valid certificates wherever necessary. BHEL reserves the right to insist on removal of any employee of the contractor at any time if he is found to be unsuitable and the contractor shall forthwith remove him.
- 5.3 Contractor shall also comply with the requirements of local authorities/ project authorities calling for police verification of antecedents of the workmen, staff etc.
- 5.4 It is the responsibility of the contractor to engage his workmen in shifts and or on overtime basis for achieving the targets set by BHEL. This target may be set to suit BHEL's commitments to its stakeholders or to advance date of completion of events or due to other reasons. Prior Information will be communicated by BHEL to contractor for arrangement of required manpower and T&P/MME's at no extra cost to BHEL. The decision of BHEL in regard to setting the erection and commissioning targets will be final and binding on the contractor.
- 5.5 Contractor shall provide at different elevation suitable arrangement for urinal and drinking water facility with necessary plumbing & disposal arrangement including construction of septic tank. These installations shall be maintained in hygienic condition at all times.
- 5.6 The Contractor in the event of engaging 20 or more workmen, shall obtain Independent license under the Contract labour (Regulation and Abolition) Act 1970 from the concerned authorities based on Form-V issued by the BHEL. In order to issue Form-V by BHEL, Contractor shall fulfill all Statutory requirements like Insurance Policy, PF Code/PF Account number etc. as per the requirement of BHEL.
- 5.7 Contractor shall deduct the necessary amount towards Provident Fund and contribute equal amount as per Government of India laws. This amount will be deposited regularly to the provident Fund Commissioner. BHEL may insist for submission of the account code duly certified by PF Commissioner.
- 5.8 Contractor may also be required to comply with provisions of ESI Act in vogue if applicable and submit evidence to BHEL.

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- 5.9 BHEL may insist for witnessing the regular payment to the labour. They may also like to verify the relevant records for compliance with statutory requirements. Contractor shall enable such facilities to BHEL. Documentary proof of Labour wage payment with bank seal and sign should be submitted every month with RA Bill. All Labours should be provided with Labour ID Card as per format prescribed by Labour department.
Contractor shall also provide monthly declaration for the current month regarding payment of wages, PF, ESI etc. payable to all the engaged workers as per existing labour laws and practice.
- 5.10 Contractor shall deploy only qualified and experienced engineers/ supervisors. They shall have professional approach in executing the work. Refer Clause No. 2.4
- 5.11 The contractor's supervisory staff shall execute the work in the most professional manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that the assembly and workmanship conform to dimensions and tolerances given in the drawings/instructions given by BHEL engineer from time to time.
- 5.12 The supervisory staff employed by the contractor shall ensure proper outturn of work and discipline on the part of the labour put on the job by the contractor. Also in general they should see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL or BHEL's client.
- 5.13 It is the responsibility of the contractor to arrange gate pass for all his employees, T&P etc. for entering the project premises. Necessary coordination with BHEL officials is the responsibility of the contractor. Contractor to follow all the procedures laid down by the BHEL for making gate passes. Where permitted, by BHEL, to work beyond normal working hours, the contractor shall arrange necessary work permits for working beyond normal working hours. Contractor shall also arrange deputation of required supervisors, safety officers and all necessary arrangements to the satisfaction of BHEL engineer for extended hour working/night shift working.
- 5.14 The actual deployment will of Labour and Engineer / supervision staff shall be so as to satisfy the erection and commissioning targets set by BHEL. If at any time, it is found that the contractor is not in a position to deploy the required engineers / supervisors / workmen due to any reason, BHEL shall have the option to make alternate arrangements at the contractor's risk and cost. The expenditure incurred along with BHEL overheads thereon shall be recovered from the contractor.
- 5.15 Contractor shall not deploy women labour at night.

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CHAPTER - VI

Material Handling, Storage & Preservation

6.0 MATERIAL HANDLING, STORAGE AND PRESERVATION ETC.

6.1 MATERIAL HANDLING AND STORAGE

- 6.1.1 All the equipments/materials furnished under this contract shall be received from the project stores, sheds / storage yards and transported to pre assembly area / erection site and stored in the storage spaces in a manner so that they are easily retrievable till the contractor erects them. **While drawing/lifting material from BHEL stores, the contractor shall ensure that the balance / other materials are stacked back immediately. No claim is admissible on this account.**
- 6.1.2 While BHEL will endeavor to store / stack / identify materials properly in their open / close / semi closed / tarpaulins covered storage yard / shed, it shall be contractor's responsibility to assist BHEL in identifying materials well in time for erection. They should take the delivery of the same, following the procedure indicated by BHEL, and transport the material safely to pre-assembly yard / erection site in time, according to program.
- 6.1.3 The contractor shall take delivery of Construction material/ consumables (as specified in tender conditions) from storage area after getting the approval of BHEL Engineer on standard indent forms. All the construction material/consumables shall be handled carefully by contractor to prevent any damage or loss.
- 6.1.4 The contractor shall identify and deploy necessary Engineers / supervisors / workmen for the above work in sufficient number as may be needed by BHEL, for areas covering their scope.
- 6.1.5 All the equipment shall be handled very carefully to prevent any damage or loss. No untested wire ropes / slings etc. shall be used for unloading / handling. Valid fitness/load test certificate need to be submitted before execution of erection/lifting/handling work. The equipment shall be properly protected to prevent damage either to the equipment or to the floor where they are stored.

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- 6.1.6 Contractor shall ensure that while lifting slings shall be put over the points indicated on the structure/ erection component or as indicated in the manufacturer's drawings. Slings / shackles of proper size shall be used for all lifting and rigging purposes. All care shall be taken to safe guard the structure/ erection component against any damage. Dragging of piping / erection component should be avoided. In case of any damage the cost shall be recovered from the contractor, for those structure/ erection component which are issued, stored, erected by contractor.
- 6.1.7 Approach road conditions from the stores / yards to the erection/ construction site may not be equipped and ideal for smooth transportation of the material. Contractor may have to be adequately prepared to transport the materials under the above circumstances without any extra cost. The contractor may familiar himself with soil conditions at site.
- 6.1.8 Contractor shall be responsible for examining all the plant and materials issued to him and notify the Engineer immediately of any damage, shortage, discrepancy etc. before they are moved out of the stores / storage area. The contractor shall be solely responsible for any shortages or damages in transit, handling, storage, theft and erection of the material once received by him. Materials once taken over will be deemed to have been received in good condition and in correct quantities except for intrinsic defects which cannot be observed by visual and dimensional inspection and weighing. As the erection work will be spread in different areas / locations of the project, contractor has to arrange sufficient number of watch / ward personal to avoid any pilferage of materials which are under custody of the contractor.
- 6.1.9 The contractor shall maintain an accurate and exhaustive record-detailing out the list of all equipment received by him for the purpose of erection and keep such record open for the inspection of the engineer at any time.
- 6.1.10 All the material in the custody of contractor and stored in the open or dusty locations must be covered with suitable weather proof / fire retardant covering material wherever applicable and shall be stacked up on raised level above ground. All covering materials including blocks and sleeper shall be arranged by the contractor at his cost.
- 6.1.11 If the material belonging to the contractor are stored in area other than those earmarked for his operation the engineer will have the right to get it moved to the area earmarked for the contractor at the contractor's risk and cost.

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6.1.12 The contractor shall be responsible for making suitable indoor storage facilities to store all material & equipment (drawn by the contractor from BHEL stores), which require indoor storage till the time of their utilization. The Engineer will direct the contractor in this regard, which item in his opinion will require indoor storage, and the contractor shall comply with Engineer's decision.

6.1.13 All materials issued by BHEL shall be utilized as directed by Engineer-in-Charge or most economically in the absence of such direction. The contractor shall ensure that all surplus / damaged / scrap / unused material, packing wood / containers/ special transporting frames etc. are returned to BHEL at a place in project area identified by the Engineer. The contractor will maintain an account for all items received and returned to BHEL. Any shortage in returning such items shall be chargeable to the contractor except allowable wastage as specified in SCC/TCC.

6.1.14 The contractor shall hand over all parts / materials remaining extra over the normal requirement with proper identification tags to the stores as directed by the concerned BHEL engineer.

6.1.15 It shall be the responsibility of the contractor to keep the work / storage areas in neat, tidy and working conditions. All surplus/unusable packing and other materials shall be removed and deposited at location(s) specified by BHEL within the project premises. If required weighing of the same within the project premises will have to be carried out.

6.2 PRESERVATION OF COMPONENTS

6.2.1 After taking delivery from BHEL's stores, plant materials storage shall be subjected to the following protection besides other provisions indicated in these specifications elsewhere.

6.2.1.1 Items stored outdoors shall be stacked up at least six inches (6") off the ground. Items should not be stored in a low lying area where water logging is a possibility. Contractor should have sufficient numbers of wooden / concrete / steel sleepers for the job.

6.2.1.2 Insulation materials shall be stored indoors or otherwise protected against getting wet/ damaged, using suitable measures and should be protected from direct rain.

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6.2.2 The contractor shall effectively protect the finished work from action of weather and from damage or defacement and shall cover the finished parts then and there for their protection.

6.2.3 Any failure on the part of contractor to carry out works according to above clauses will entail BHEL to carry out the job from any other party and recover the cost from contractor.

6.3 HANDLING OF MATERIALS ISSUED BY BHEL:

6.3.1 Materials shall be issued by BHEL based on the weighment basis/linear measurements & sectional weight. However, on specific request of the contractor **“as a special case to expedite the job”** the consignment received at BHEL stores can directly be diverted to the work site following issuance procedure of BHEL. Quantity of such direct issues shall be as per the Challan/dispatch document/LR received with the consignment. In such cases, Contractor shall do unloading of materials from trucks/lorry at their own cost.

6.3.2 All materials issued by BHEL shall be stacked, stored above ground level **by use of concrete or wooden sleepers. No materials shall remain on ground at any time.** All concrete or wooden sleepers required for stacking the materials shall be arranged by contractor (successful bidder of this package) at his own cost within the quoted rates. All other equipments like winches, D-Shackles, slings of various sizes, max puller, pulley blocks, jacks, trucks, trailers etc. required for such handling of steel from BHEL stores/storage yard etc. shall be arranged by contractor within quoted/accepted rates.

All materials stored by contractor shall be in accordance to standards/specifications and instruction of BHEL. Utilization of these material shall also be done in such a manner so that wastage on account of long storage/storage beyond shelf life can be avoided. Any loss/damage of material on this account will be attributable to the contractor.

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6.3.3 The contractor shall take delivery of the materials from the designated place within the project premises at his own cost and store the same at his stores as per standard norms. Open land for such purposes as available shall be provided by BHEL on free of cost basis. Temporary barbed wire fencing of the open storage yard is to be done by the contractor and is included under the scope of his work. Contractor shall also remove grass, bushes, trees etc. wherever required off the land provided to him and shall make proper continuous up keeping of the open yard /land by removing grass, bushes trees etc. and same is included under the scope of his work & No extra payment shall be made to the contractor in this regard. The bidder shall make complete arrangement of necessary security personnel to safeguard all such materials in his custody. Materials issued will be used only for construction of permanent works. The contractor shall take care of material issued by BHEL and shall protect the same from theft, damage and weathering. Excessive rusting of steel in custody of agency/contractor must be avoided. **In case, due to any cause attributable to the contractor, such rusting of steel occurs rendering the same unusable, then such quantity of steel shall be recovered from the interim payment at the penal rate specified in the tender.**

6.3.4 **ISSUE OF STEEL:**

6.3.4.1 **The steel shall be issued to the contractor on the following basis:**

- i. Structural Steel: Weighment basis (Unit – MT)
- ii. Reinforcement Steel and Earthing Rod: Weighment basis (Unit-MT)
- iii. MS Rails: Weighment Basis (Unit-MT)

6.3.4.2 All the steel (structural, reinforcement, earthing rod/GI flats, GI foundation bolts, etc.) issued by BHEL shall be properly accounted for. The total quantity of steel required for the work will be calculated from the approved Bar Bending schedule, fabrication drawings, approved laps, chairs and lugs etc. The measurement for payment as well as for accounting shall be based on the sectional weights as indicated in the following IS/BS/EN specifications.

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6.3.4.3

Sr No	Name of Standard	Name of Section
1	IS: 808-1964	Beams, Channels and Angles
2	IS: 1730-1961	Plates, Sheets and Strips/Flats
3	BS4-1: 1993	UB/UC sections
4	IS: 12778/equivalence with EN-19-57	For NPB sections
5	IS: 12778/equivalence with EN-53-62	For HE/WPB sections
6	IS: 1786 or grade -1 of IS432 (Part-I)	Rounds including deformed high yield strength bars.
7.	IS:4923-1997	Hollow section

In case any such sectional weights are not available in the above documents, the manufacturer recommendation/BHEL instruction shall be binding.

- 6.3.4.4 The steel issued to the contractor shall be mainly in standard length and sections as received from the supplier. However, the contractor shall be bound to accept the steel in length as available in the project stores and no claims for extra payment because of issue of non-standard length will be entertained.
- 6.3.4.5 The contractor shall satisfy himself of the quality and quantity of the materials at the time of taking delivery from BHEL stores. No claims whatsoever will be entertained by BHEL because of quality or quantity after the materials are taken by the contractor from BHEL stores.
- 6.3.4.6 The contractor shall submit to BHEL well in advance of before Three month from requirement, a statement indicating estimated quantity of cement and steel required during a quarter. In addition, the contractor shall also furnish the estimated requirement of steel during a month by the third week of the previous month indicating his requirement.

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- 6.3.4.7 Bidders shall ensure that no lamination material is taken over by them from BHEL.

The contractor must note that cement and steel required for the contractor's enabling job like store/ site office/batching plant/temporary works etc. shall be arranged by the contractor at his own cost.

All temporary structures constructed/installed/erected are to be dismantled and removed as per instruction of BHEL

- 6.3.4.8 Bidder to give requirement of Material in BHEL Scope well in advance of before Three month from requirement. Any delay in raising the requirement of these item leading to delay in placement of order, will be Contractor responsibility and its attributable delay in erection will be responsibility of Bidder only.

6.4 RETURN OF MATERIALS (BHEL Free Issued Material) -- NOT APPLICABLE

- 6.4.1 **Return of Cement:** Sealed cement bags remaining unused and in perfectly good condition at the time of completion or termination of the contract shall be returned promptly, (within 15 days from assessment) if BHEL/ engineer is satisfied of the physical condition of the cement. Return of such cement to the project stores / place as identified within the project area by engineer/ BHEL will not entitle contractor to handling and incidental charges. Surplus sealed and good conditioned cement bags will be taken back on weighment basis.

- 6.4.2 **Return of Reinforcement Steel and Structural Steel including Scrap:** All surplus steel and all wastage materials will be taken back on weighment basis. Surplus, unused and untampered steel shall be sorted section-wise and returned separately at a place directed by BHEL/Engineer within the project area. For return of such materials, contractor will not be entitled to any handling and incidental charges. All wastage / scrap (including melting scrap, wastage, and unusable scrap) shall be promptly returned to the stores and a receipt obtained for material accounting purposes. Scrap for reinforcement steel and structural steel shall be returned separately.

6.4.3 Scrap and Serviceable Materials:

- 6.4.3.1 All structural steel of length above 2 Meter except M.S Plate shall be considered as **serviceable materials** provided the materials is in good and acceptable condition. Structural steel in length less than 2 Meter Shall be treated as scrap.
- 6.4.3.2 Plates having both side greater than 1 Meter OR if any side is less than 1 Meter but greater than 0.5 Meter and the total area is equal or greater than 2 sq. Meter shall be considered as **serviceable material**.
- 6.4.3.3 All pipe measuring 2 Meter and above in length shall be treated serviceable materials provided they are in good and acceptable condition. Pipe in less than 2 Meter length shall be treated as Scrap.

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6.4.3.4 All TMT measuring 3 Meter and above in length shall be treated as **serviceable material** provided they are in good acceptable condition. TMT in less than 3 Meter shall be treated as scrap.

6.4.4 **Cement, Steel Consumption and wastage:**

6.4.4.1 **Cement Consumption:**

The theoretical consumption of cement shall be based on the following:

- a. For design mix concrete as per approved design mix.
- b. For nominal mix concrete work, as per minimum cement as specified or as approved by engineer-in-charge.
- c. For item of works, where volume mix is permitted in writing by the BHEL, for masonry works, plaster other miscellaneous items, the cement consumption shall be governed by the "Statement of cement consumption" attached to the latest version of Delhi Schedule of Rates (DSR) unless otherwise specified in the specifications or the drawing of contract or mutually agreed by engineer-in-charge and the contractor.
- d. Actual consumption = Issue – Surplus/ unused quantity of cement returned in good condition by the contractor to store. (No sweep cement will be taken back by BHEL).

6.4.4.2 **Cement Wastage:**

- a. **Allowable wastage:** One and half percent (+1.5%) of theoretical consumption of cement.
- b. For any material issued by BHEL to the contractor free of cost, and which is not accounted for by the contractor to BHEL, then recovery for such material shall be affected at penal rates.

Sl no.	Cement consumption	Basis of issue & penal recovery
C1	Theoretical consumption (without considering any wastage or loss).	Free
C2	Actual consumption being Limited to one and half percent (+1.5%) of aforesaid theoretical consumption towards allowable wastage.	Free
C3	Actual consumption beyond one and half percent (+1.5%) of above (C1).	Penal rate

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6.4.4.3 Reinforcement Steel, MS earthing rod, GI gratings, Foundation bolts and MS Rails Consumption

The theoretical consumption of various sections and/or diameter of reinforcement and earthing rod steel shall be based on approved construction drawing and bar bending schedule. Weight shall be calculated considering the sectional weights as per Indian standards. No extra cost shall be payable to the contractor for any deviation in weights for the different procedures adopted for issue and calculation of the theoretical consumption including rolling tolerances.

- a. Actual consumption = Issue – Surplus.
- b. Surplus = un-tampered, unused, uncut QTY of steel **including serviceable material** returned by the contractor to BHEL store along-with relevant documents.
- c. Wastage = Actual consumption – Theoretical consumption.

6.4.4.4 Reinforcement Steel, MS earthing rod, Foundation bolts and MS Rails Wastage

- a. **Allowable Wastage:** (+3%) of the theoretical consumption shall be considered as allowable wastage.

Wastage and scrap shall be as per actual weight basis		
Sl. no.	Reinforcement steel & MS earthing rod	Basis of issue & penal recovery
R1	Theoretical consumption (without considering wastage and scrap or loss)	Free
R2a	Wastage limited to plus three percent (+3%) of aforesaid theoretical consumption (R1) towards allowable wastage and returned to BHEL Store.	Free
R2b	Wastage limited to plus three percent (+3%) of aforesaid theoretical consumption (R1) towards allowable wastage but not returned to BHEL Store.	Penal Rate
R3	Wastage beyond THREE percent (+3%) of the theoretical consumption above (R1).	Penal rate

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6.4.4.5 Structural Steel (Rolled Sections and Plates etc.)**Consumption**

The theoretical consumption of various sections shall be based on approved drawings. Weights shall be calculated considering the sectional weights as per Indian standard. No extra shall payable to the contractor for any deviation in weights for the two different procedures adopted for issue and calculation of the theoretical consumption including rolling tolerances.

- a. Actual consumption = Issue – Surplus.
- b. Surplus = un-tempered, unused, uncut quantity of steel **including serviceable material** returned by the contractor to BHEL store.
- c. Wastage = Actual consumption – Theoretical consumption.

6.4.4.6 Structural Steel Wastage

- a. **Allowable wastage:** 4% (FOUR percent) of the theoretical consumption shall be considered as wastage. Wastage shall be considered as cut pieces and scrap material, measured as per actual weight basis. Invisible wastage, if any, shall be considered to be included in the specified 4 % allowable wastage.

Sl no	Structural steel including SS plate	Basis of issue & penal Recovery
S1	Theoretical consumption (without considering any wastage, scrap or loss) as per specification & drg.	Free
S2a	Wastage limited to plus four percent (+4%) of aforesaid theoretical consumption (S1) towards allowable wastage (including invisible wastage limited to 0.5%) and return to BHEL Store.	Free
S2b	Wastage limited to plus four percent (+4%) of aforesaid theoretical consumption (S1) towards allowable wastage (including invisible wastage limited to 0.5%) but not returned to BHEL Store.	Penal Rate
S3	Wastage beyond four percent (4%) of the aforesaid theoretical consumption (S1).	Penal rate

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6.4.4.7 Reconciliation of Materials:

- a.** The contractor shall submit a reconciliation statement of cement and steel issued to the contractor with each RA Bill.
- b.** At the time of submission of bills, the contractor shall properly account for the material issued to him as specified herein to the satisfaction of BHEL certifying that the balance material is available in the contractor custody at site.
- c.** At the time of submission of bills, if it is noticed by BHEL that the wastage is high and calls recovery at the penal rate, then, BHEL will proceed for recovery for the excess wastage as per penal recovery rates as specified.
- d.** If at any point of time, BHEL finds there is a difference in physical and theoretical balance, where the contractor fails to provide necessary reconciliation, the decision of penal recovery/withhold of amount at penal rate by BHEL shall be final and binding to the contractor till proper records are submitted to and verified by BHEL.
- e.** The reference drawings for actual material consumption to be used for the purpose of reconciliation shall be drawings prepared by the BHEL and drawings approved by BHEL for fabrication works and such other drawings approved by BHEL. This shall also include the bar bending schedule prepared by the contractor and approved by BHEL.

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CHAPTER - VII

Drawings & Documents

7.0 DRAWINGS AND DOCUMENTS

- 7.1 The detailed drawings/revised drawings/documents, specifications available with BHEL engineers will be made available to the contractor during execution of work at site. The contractor will also ensure availability of all drawings / documents at work place. Contractor to ensure that hard/soft copies of the drawings not be forwarded and transmitted in any form detrimental to the interest of BHEL.

BHEL can issue hard copy or soft copy of the drawings as available. It shall be the responsibility of the contractor to provide print outs for additional copies to site as per requirement.

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

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CHAPTER - VIII

Inspection & Quality

8.0 INSPECTION AND QUALITY

8.1 Inspection, Quality Assurance, Quality Control

8.1.1 Preparation of quality assurance log sheets as per approved FQP and protocols with BHEL / consultants / statutory authority, welding logs, NDE records, testing & calibration records and other quality control and quality assurance documentation as per BHEL engineer's instructions, is within the scope of work / specification. These records shall be submitted to BHEL for approval from time to time.

8.1.2 The protocols between contractor and BHEL shall be made prior to installation for correctness of foundations, materials, procedures, at each stage of installation, generally as per the requirement of BHEL. This is necessary to ensure elimination of errors or keeping them within tolerable limits and to avoid accumulation and multiplication of errors.

8.1.3 A daily log book should be maintained by every supervisor / engineer of contractor on the job in duplicate (one for BHEL and one for contractor) for detailing and incorporating alignment/clearance / centering / leveling readings and inspection details of various construction/ erection activities etc.

High pressure welding details like serial number of weld joints, welders name, date of welding, details of repair, heat treatment etc. will be documented in welding log as per BHEL Engineer's instructions.

Record of radiography containing details like serial number of weld joints, date of radiography, repairs, if any, re-shots etc. shall also be maintained as per BHEL Engineer's instructions.

Record of heat treatments performed shall be maintained as prescribed by BHEL.

8.1.4 The performance of welders will be reviewed from time to time as per the BHEL standards. Welders' performance record shall be furnished periodically furnished for scrutiny of BHEL's Engineer. Corrective action as informed by BHEL shall be taken in respect of those welders not conforming to these standards. This may include removal/ discontinuance of concerned welder(s). Contractor shall arrange for the alternate welders immediately

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- 8.1.5 All the welders shall carry identity cards as per the Proforma prescribed by BHEL/ Consultant. Only welders duly authorized by BHEL/ consultant shall be engaged on the work.
- 8.1.6 Contractor shall provide all the Measuring Monitoring Equipments (MMEs) required for completion of the work satisfactorily. These MMEs shall be of brand, quality and accuracy specified by BHEL Engineer and should have necessary calibration and other certificates as per the requirement of BHEL Engineer. Decision of BHEL Engineer regarding acceptance or otherwise of the measuring instruments/ gauges/ tools for the work under this specification, is final and binding on the contractor. BHEL may give an indicative list of MMEs required for this work and to be made available by the contractor. The list will be reviewed by BHEL and the contractor shall meet any augmentation needed wherever required.
- 8.1.7 It is the responsibility of the contractor to prove the accuracy of the testing / measuring / calibrating equipments brought by him based on the periodicity of calibration as called for in the BHEL's quality assurance standards/BHEL Engineer's instructions.
- 8.1.9 BHEL have already been accredited with ISO 9001 certification and as such this work is subject to various audits to meet ISO 9001 requirements. One particular aspect which needs special mention is about arrangement of calibration of instruments by the contractor. Contractor shall ensure deployment of reliable and calibrated MMEs (Measuring and Monitoring Equipments). The MMEs shall have test/ calibration certificates from authorized/ Government approved/ Accredited agencies traceable to National/ International Standards. Re-testing/ re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such MMEs so that work does not suffer when the particular equipment/ instrument is sent for calibration. Also if any MMEs not found fit for use, BHEL shall have the right to stop the use of such item and instruct the contractor to deploy proper item and recall i.e. repeat the readings taken by that instrument, failing which BHEL may deploy MME and retake the readings at Contractor's cost.
- 8.1.10 Re-work necessitated on account of use of invalid MMEs shall be entirely to the contractor's account. He shall be responsible to take all corrective actions, including resource augmentation if any, as specified by BHEL to make-up for the loss of time.
- 8.1.11 In the courses of erection, it may become necessary to carry repeated checks of the work with instruments recently calibrated, re-calibrated. BHEL may counter / finally check the measurements with their own MMEs. Contractor shall render all assistance in conduct of such counter / final measurements.

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- 8.1.12 Total Quality is the watchword of the work and Contractor shall strive to achieve the Quality Standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and Quality Standards.

8.2 Stage Inspection By FES / QA Engineers

- 8.2.1 Stage inspection of any work, if required as per BHEL, shall be arranged by Contractor without any additional cost implication.

- 8.3** The Quality Management System of BHEL have already been certified and accredited under ISO 9002 standards in this regard. The basic philosophy of the Quality Management System is to define the organizational responsibility, work as per documented procedures, verify the output with respect to acceptance norms, identify the non-conforming product / procedure and take corrective action for removal of non-conformance specifying the steps for avoiding recurrence of such non-conformities, & maintain the relevant quality records. The non-conformities are to be identified through the conduct of periodical audit of implementation of quality systems at various locations/stages of work. Suppliers / vendors of various products / services contributing in the work are also considered as part of the quality management system. As such the contractor is expected not only to conform to the quality management system of BHEL but also it is desirable that they themselves are accredited under any quality management system standard.

8.4 Field Quality Assurance

- 8.4.1** Contractor shall carry out all activities conforming to the approved Field Quality Plan (FQP) as revised from time to time. Total quality shall be the watchword of the work and contractor shall strive to achieve the quality standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and quality standards. Contractor shall provide the services of quality assurance engineer as per the relevant clauses.

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CHAPTER - IX

Health Safety & Environment Obligations

9.0 OCCUPATIONAL HEALTH, SAFETY & ENVIRONMENT MANAGEMENT / QUALITY ASSURANCE PROGRAMME:

BHEL is certified for ISO 9001. Quality of work to BHEL's satisfaction and fulfillment of system requirements are the essence of ISO 9001 certification. BHEL have HSE certification (ISO 14001: 2015 & ISO 45001:2018) and therefore Contractor also shall organize / plan/ perform all their activities to meet with the applicable requirements of these standards.

9.1 HSE (Health, safety & Environment):

Contractor will comply with HSE (Health, Safety & Environment) requirements of BHEL as per the "HSE Plan for Site Operations by Subcontractor" (Chapter-XV of Vol-1B TCC) or equivalent document issued by BHEL along with tender. In case of any ambiguity between these two documents, document issued by BHEL will be followed.

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CHAPTER - X

RA Bill Payment

10.0 RA Bill Payments

- 10.1 The contractor shall submit his monthly RA bills with all the details required by BHEL on specified date every month covering progress of work in all respects and areas for the previous calendar month.
- 10.2 Mode of payment and measurement of work completed shall be as per relevant clauses of General Conditions of Contract.
- 10.3 Release of payment in each running bill including PVC Bills where ever applicable will be 100% of the value of work admitted as per stages of progressive pro rata payments.
- 10.4 The payment for running bills will normally be released within 30 days of submission of running bill complete in all respects with all documents. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc. and other dues in the meanwhile.
- 10.5 BHEL shall release payment through Electronic Fund Transfer (EFT)/RTGS. In order to implement this system, Contractor to furnish details pertaining to his Bank Accounts where proceeds will be transferred through BHEL's banker, as per prescribed formats.
Note: BHEL may also choose to release payment by other alternative modes as applicable.
- 10.6 Paying Authority shall be the Construction Manager of the Site. Any change in the paying Authority shall be intimated to the Contactor accordingly.

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CHAPTER - XI

Other Special Conditions of Contract

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1. DEFINITIONS:

In the Contract (as hereinafter defined) the following words and expressions shall have meanings hereby assigned to them, except where the context otherwise requires: (In alphabetical order)

1.1 Approved/Approval:

Approved/Approval shall mean and include approved/approval accorded by the Project Manager in writing.

1.2 Approved Equal:

Approved Equal shall mean an alternative product or service approved by the Project Manager as being equivalent to that specified in the Contract Documents.

1.3 Architect:

Architect shall mean **M/s ARCOP**, having its registered office at A-15 , Pamposh Enclave, Greater Kailash, Part-I, New Delhi-48

Structural Consultants:

Structural Consultants shall mean **M/s. ARCOP**, A-15 , Pamposh Enclave, Greater Kailash, Part-I, New Delhi-48

1.4 Basic Rate - Material:

Basic Rate shall mean the landed cost at site including all taxes, royalties, cartage, handling etc. but excluding wastage.

1.5 Communication:

Wherever in the Contract provision is made for giving or issue of any notice, consent, certificate or determination by any person, unless otherwise specified such notice, consent, approval, certificate or determination shall be in writing and the words 'notify', 'certify' or 'determine' shall be construed accordingly.

1.6 Construction Programme

Construction Programme shall mean the programme to be furnished by the Contractor as per relevant clause.

1.7 Contractor's Representative:

The Contractor's Representative shall mean the person or party duly appointed by the Contractor to act for and on its behalf on a day-to-day basis during the construction of the Work and the Project. Any action to be taken by the Contractor may be taken on the Contractor's behalf by the Contractor's Representative. The Contractor's Representative shall be considered a "key person" for purpose of the contract.

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1.8 Contract Value:

Shall mean the sums referred to in the Contract Documents for the Contractor's performance of the Work. The Contract value shall be inclusive of all taxes including ESIC, PF, Conditions of Contract contribution and all other statutory taxes and levies if any applicable to the contractors/workers etc. The contract value shall include GST, which shall be quoted separately in the Schedule of Rates.

The Contract is neither a fixed lump sum contract nor a piece work contract, but is an item rate contract to carry out the Work according to the actual measured quantities at the rates contained in the Priced Schedule of Rates along with estimated quantities with Detailed Specifications. The Contract value shall not exceed the amount indicated in the Letter of Acceptance, unless otherwise approved in the Change Orders. Amounts in excess of this number, not approved in advance by the BHEL's Representative shall be at the Contractor's expense. The Contractor has to closely monitor the quantities and cost and obtain an Approval from the BHEL well in advance for any change outside the scope of the Work which would cause the cost of the Work to exceed the Contract Value as indicated in the Letter of Acceptance. Prices will be firm until the end of the contract.

No escalation in prices shall be allowed for any reason whatsoever during the period of the project. Claims for revision in rates / prices or compensation in any other form whatsoever shall not be entertained by the BHEL on account of fluctuations in the following but not limited to:

- Foreign Exchange Rates
- Cost of Materials
- Electricity & Water charges
- Labour wages & conditions
- Statutory payments like PF, ESIC, etc.
- Royalties and patent rights
- Licenses and permit fees
- Insurance Charges
- Freight charges / transportation costs
- Cost of fuel & lubricants
- Or any other rates, costs or conditions whatsoever.

1.9 Contract Period:

Contract Period means the period during which the Contract shall be executed or agreed between Contractor and BHEL in the Contract.

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- 1.10 **Consultant:**
Shall mean any person or persons duly appointed by the BHEL / Architect to act as 'CONSULTANT' to render consultancy services in any area/field of activity connected with and arising out of the Contract under a separate agreement setting out the consultant(s) responsibilities and terms.
- 1.11 **Daywork Schedule:**
Daywork Schedule means the document so named which are comprised in Conditions of Contract.
- 1.12 **Defect(s) Liability Period:**
Defect(s) Liability Period is the period after Virtual Completion and any period extended as a result of rectification of the Work/change orders, between the Virtual Completion and the Final Completion of the Work, and during which period the Contractor shall be bound to replace and/or rectify and make good all defective materials, equipment and/or workmanship which arise in the Works or come to notice subsequent to the Virtual Completion of the Works and prior to the Final Completion of the Works.
- 1.13 **Drawings:**
'Drawings' means all drawings, details and sketches along with the technical information therein, furnished by the Architect through the Project Manager to the Contractor under the Contract and any modifications of such drawings or such other drawings as may be from time to time be furnished or approved in writing by Project Manager. All drawings, samples, patterns, models, operation and maintenance manuals and other technical information of a like nature submitted by the Contractor shall also be referred as 'drawings'.
- 1.14 **Final Completion:**
Final Completion will be deemed to have been achieved when at the end of the Defects Liability Period a Final Completion Certificate has been issued by the Project Manager when all the requirements of the Contract have been met and complied with and when all the defective items of Work and defects have been replaced and/or rectified and made good as directed by and to the satisfaction of the Project Manager / BHEL.
- 1.15 **Insolvency:**
The term "Insolvency" means any act of insolvency as defined by the Presidency Towns Insolvency Act or the Provincial Insolvency Act or any amending statute.
- 1.16 **Labour Rate:**
Labour: As per Local Administration labour rates notified and fixed from time to time.

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- 1.17 **BHEL:**
BHEL shall mean Bharat Heavy Electricals Limited a company registered under Indian Companies Act 1956, with its Registered Office at BHEL HOUSE, SIRI FORT, NEW DELHI – 110 049, or its Authorised Officers or its Site Engineers or other employees authorised to deal with any matters with which these persons are concerned on its behalf.
- 1.18 **BHEL's Representative:**
BHEL's Representative shall mean and include the Project Manager and / or any other person duly appointed and authorized by the BHEL to act for and on its behalf at the Site during the progress of construction of the Project.
- 1.19 **Project:**
Project shall mean and include the execution of the Work to be performed under this Contract plus works of all later phases necessary to complete the construction to make it habitable, according to the standards adopted by the Project Director.
- 1.20 **Project Director (PD)/ Project Manager(PM):**
The Project Director (PD) shall be duly appointed by the BHEL. The Project Director is authorized to represent and act on behalf of the BHEL on a day-to-day basis during all packages of construction of the Project. All communications, approvals and decisions to be taken in connection with the Architect's Services and those of the BHEL shall be communicated to and enforced by the Project Director. Project Manager(PM) shall be appointed by Project Director (PD)
- 1.21 **Singular or Plural / Typographic Errors:**
Words in the singular also include the plural and vice versa, where the context so requires. Words implying persons include persons and corporations. Typographic or spelling errors shall not be cause to vitiate the contract.
- 1.22 **Site:**
The Site shall mean the location of **BHEL CoE Karkhiyaon Varanasi (UP)**.
- 1.23 **Specifications:**
"Specifications" shall mean and include the specifications for the Work included in the Architect's / Consultant's Drawings, the Works Technical Specifications and Priced Bill of Quantities, and any modification thereof or addition thereto.
- 1.24 **Sub-contractors:**
"Sub-Contractors" shall mean and include the persons, firms, companies or agencies who after approval of the Project Manager, have entered into a direct Contract with the Contractor in respect of any part of the Work and any later package of the Project, and include the Sub-contractors' legal

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representatives, successors and permitted assignee. The Contractor shall have full responsibility for the actions and work of any Subcontractor whether contracted by the Contractor to perform portions of the Work or for any later package of the Project.

- 1.25 **Tender:**
“Tender” shall mean and include the Contractor’s offer to construct and maintain the Work in strict accordance with the Contract Documents as set forth on the Tender Form
- 1.26 **Temporary Works:**
Temporary works mean all temporary works of every kind required for the execution of the works by the Contractor.
- 1.27 **Terms “/”, “and”, “or”, “and/or”:**
The terms “/”, “and”, “or”, “and/or” used in context with the description or enumeration of two or more items or components of work of documentation or anything similar shall mean as is relevant and applicable to the text and context.
- 1.28 **Urgent Works:**
“Urgent works” shall mean any urgent measures which in the opinion of the Project Manager becomes necessary during the progress of the work to obviate any risk of accident or failure or which become necessary for security for completing the overall project within the stipulated time.
- 1.29 **Tests on completion:**
Tests on completion shall mean all the system testing required to be done by the Contractor, to the entire satisfaction of BHEL, prior to Handing over the facility.
- 1.30 **Unforeseeable:**
Unforeseeable means not reasonable foreseeable and against which adequate preventive precautions could not be taken by an experienced contractor by the date of submission of the Tender.
- 1.31 **Change Order:**
Change Order means any change approved as a Change Order.
- 1.32 **Vendors:**
“Vendors” shall mean and include all suppliers, contractors, sub-contractors, and trade contractors engaged for same / later phase(s) of the Project, when such Vendors are in Contract with the Project Manager / BHEL.
- 1.33 **Virtual Completion:**
Virtual completion will be deemed to have been achieved upon a Virtual Completion Certificate being issued by the Project Manager, when the Work, according to the Project Manager, have been

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completed in every respect in conformity with the Contract Documents and any change /Variation / rectification orders and are ready and fit for the intended purpose, complete with all systems and services having been tested and commissioned.

1.34 Written Notice:

Written Notice shall be deemed to have been duly served if delivered in person to the **authorized representative** of the firm / company for whom it is intended, or if delivered at and a written delivery receipt obtained or sent by registered mail to the last business address known to them, who gives the notice.

1.35 Work:

"Work" shall mean and include the items of work included in this Contract Document, all materials, Plant & machinery, equipment, tools and labour necessary to complete all components of the Project in full compliance with the requirements of the Contract Document.

1.36 Working day, Day, Week and Month:

Working Day shall mean and include any day from Monday to Saturday (both days inclusive) excluding Public Holidays. Work at site shall continue over Sundays and all holidays excepting statutory Government public holidays.

"Day" shall mean a calendar day of 24 hours each.

"Week" shall mean 7 days without regard to the number of hours worked in any day in the week.

"Month" shall mean English Calendar month, without reference to the number of days worked during this period.

1.37 Public Holiday:

'Public Holiday' shall mean any day which is declared as a public holiday by the Government of India or the State Government.

1.38 SHE Plan

"SHE plan" means Environmental, Health and Safety Plan prepared by the Contractor for implementation at site, based on and including, without limitation to various Clauses of the Conditions of Contract pertaining to Safety, Health and environment; and approved by the Project Director.

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2. SCOPE, EXTENT, INTENT ETC.:**2.1 Scope:**

The following Special Conditions shall be read in conjunction with the “General Conditions of Contract”. The following clauses shall be considered as an extension of and not as a limitation of the obligation of the Contractor (s). If there are any provisions in the General Conditions of Contract, which are at variance with the provisions in these Special Conditions, the Provisions in these special conditions shall take precedence.

The general character and the scope of the Work shall be as illustrated and defined in the Drawings, Specifications, Schedule of Rates/ *Bill of Quantities* and other Contract Documents.

2.2 Extent:

The Contractor shall carry out and complete the Work under the Contract in every respect, and his work shall include the supply of all labour, equipment, materials, plant and machinery, tools, transportation, form work, scaffolding and everything else necessary for the proper execution and completion of the Work in accordance with the Contract Documents and to the directions and satisfaction of the Project Manager. The Contractor shall be fully responsible and liable for everything and all matters in connection with or arising out of or being a result or consequence of his carrying out or omitting to carry out any part of the Work. Where any parts of the Work may be executed by Sub-Contractors, such responsibility and liability of the Contractor shall cover and extend to the work of all such Sub-Contractors.

2.3 Intent:

The Contract Documents are complementary and what is called for by any one shall be binding as if called for by all. Wherever it is mentioned in the Contract Documents that the Contractor shall perform certain work or provide certain facilities, it is understood that the Contractor shall do so at his own cost. Materials or work described in words which so applied have a well-known technical or trade meaning shall be held to refer to such recognized standards as are applicable.

2.4 Instructions of Project Manager:

The Project Manager may from time to time, issue further supplementary Drawings, written instructions, details, directions, and explanations, which shall be collectively referred to as the Instructions of Project Manager. The Contractor shall forthwith comply with and duly execute the work comprised in such Instructions of Project Manager, provided always that verbal instructions, directions and explanations given to the Contractor or his works representative by Project Manager shall, if involving a variation, will be got confirmed in writing from the Project Manager, by the contractor.

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2.5 Approval of Project Manager:

Approval of the Project Manager shall always mean approval in writing. The onus shall be on the Contractor to obtain all the necessary approvals in writing. Such approvals, however, shall not relieve the Contractor of any of his responsibilities under the Contract.

2.6 Increases/Decreases to scope of Work:

The Project Manager reserves the right to increase or decrease the scope of the Work on any or all items or to change the nature of the Work involved in any or all items or to completely delete any items of the Work under the Contract.

2.7 Items of work for completion:

The Contractor is bound to carry out any items of work necessary for the completion of the Work even though such items of work may not be expressly described in the Contract Documents / Drawings.

3. PROJECT MANAGER AND CONTRACTOR'S REPRESENTATIVE:

The status, duties and responsibilities of the Project Manager, and Contractor's Representative shall be as detailed below:

3.1 Role and responsibilities of the Project Manager:

- i. The BHEL will be represented for the purpose of the execution of the Contract by the Project Manager. The Project Manager shall be responsible for the day-to-day supervision, quality control checks, progress monitoring, co-ordination and direction of the Work, and generally to ensure that the Work is carried out in all respects in strict conformity with the Contract Documents.
- ii. The Project Manager shall have the authority to stop the work whenever such stoppage may be necessary to ensure the proper execution of the Work. The Contractor shall provide all the necessary facilities to the Project Manager in the performance of his duties. The Contractor shall refer all matters relating to the performance of the Contract to the Project Manager.
- iii. The Project Manager shall observe sound and established engineering practices using latest standards, codes and regulations, as applicable for the purpose specified and suitable for respective uses intended.

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- iv. The Project Manager shall exercise intimate, constant and continuous supervision and control over the workmanship and materials, plant, machinery, equipment etc used in the Work and may when required, get them inspected.
- v. The Project Manager shall check the measurements of the Contractor's bills and forward the same for payments.
- vi. To process the bills and release payments to the Contractor as appropriate.
- vii. **PROFESSIONAL INTEGRITY AND TEAM SPIRIT:** It is the intent of the Project Manager that this Project will be executed in a spirit of teamwork and full professional integrity.

3.2 Decision:

- i. The Project Manager shall make decisions on all matters relating to the execution and progress of the Work, including the claims and queries of the Contractor. The decision, opinion, direction and interpretation of the Project Manager, with respect to any or all matters shall be final and binding on the Contractor.

3.3 Role and responsibilities of the contractor's representative:

- i. The Contractor shall be represented at the Site by the Contractor's Representative. The Contractor's Representative shall be on Site at all times during performance of the Work and the Project Coordination Services and shall be responsible for the day-to-day interaction with the Project Manager.
- ii. The Contractor's Representative shall have the authority to make and communicate all decisions called for in this Contract to be made by the Contractor or the Contractor's Representative. The Contractor's Representative shall be responsible for the day-to-day supervision and overseeing of the Project Coordination Services, including, without limitation, the implementation Plan.

3.4 Architect's Role and Obligations:

- i. The Architect shall be responsible for undertaking the design, the specification and the production of drawings for the Work.

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- ii. The Architect shall be responsible for periodic supervision of works to evaluate contractor's works and to ensure that the work is executed as per the desired quality standards, integrity, building design, safety, statutory compliance and conformance with design, conceptual and contractual intent.
- iii. The Architect shall be responsible to issue control samples and to inspect samples/ mock-ups to ensure that they are as per the desired specifications and quality standards.
- iv. The Architect shall review, verify, evaluate and provide its recommendation to the Project Manager on the shop-drawings, design calculations, product data, samples, mock-ups, selection of sub-contractors etc. proposed by the Contractor.
- v. Where necessary the Architect shall perform plant inspection at workshops of the contractor.
- vi. The Architect shall assist the Project Manager in joint inspection of the buildings on their completion to maintain and provide list of items to complete, defects to correct, virtual & final completion certificates to the Project Manager.
- vii. The Architect shall make and communicate all decisions to the Project Manager as called for in this Contract to be made by the Architect.

3.5 Access for Architect and Project Manager to The Works:

The Project Manager, the Architect, and their respective consultants shall at all times have access to the Work and the Site and to the workshops or other places of the Contractor where the Work is to be so prepared and in workshops or other places of Sub-Contractors and suppliers. The Contractor shall by a term in its Sub-Contracts so far as possible, secure a similar right of access to those workshops or places for the Project Manager, Architect, and their respective consultants and shall do everything for the purposes of carrying out inspections to ascertain and ensure that work is being carried out in conformity with the Contract Documents or for any other purpose in connection with the Work under the Contract.

3.6 Contractor's responsibilities:

The Contractor shall have the following responsibilities in carrying out the Work and the Project Coordination Services, respectively:

- i. The Contractor shall, on the instruction of the Project Manager, immediately dismiss from the Work any person employed thereon by him who may, in the opinion of the Project Manager, be incompetent or who engages in unlawful or disorderly conduct, and such persons shall not be re-employed on the Work without the prior written permission of the Project Manager.
- ii. Contractor shall indemnify the BHEL for loss suffered by the BHEL on account of any act/omission/neglect of the Contractor's, workers, employees, Sub-Contractors etc.
- iii. The Contractor shall comply with all safety standards to the satisfaction of the Project's Manager.

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- iv. The Contractor shall take full responsibility for the management & supervision of the Sub-Contractors.
- v. The Contractor shall ensure that all Sub-Contractors engaged exercise all such skill, care and technical competence as represents a high standard within their respective professions or trades as is appropriate for the satisfactory execution of their work and services.
- vi. The Contractor shall not assign/sublet any part of this Contract to any other agency without the consent of the Project Manager. The Project Manager reserves the right to review and approve each Sub-Contractor which the Contractor recommends at any time to engage to perform any services before such Sub-Contractor is hired or performs any service.
- vii. The Contractor shall be responsible for the care of the Work and the management and supervision of the Sub-Contractors.
- viii. The Contractor shall exercise constant and continuous supervision and control over the workmanship, materials, plant, machinery, equipment etc used in the Work and report on the status of the same to the Project Manager.
- ix. The Contractor will be responsible for obtaining all necessary permits, approvals, certificates and the like.
- x. All the obligations and responsibilities of the Contractor under the Contract shall be discharged by him subject to the satisfaction of the Project Manager.
- xi. Any activity conducted or responsibility assumed by the BHEL shall not relieve the Contractor of any of its obligations and responsibilities under the Contract.
- xii. The contractor shall use latest standards, codes and regulations, as applicable for the purpose specified and suitable for respective uses intended. The contractor must keep at site the latest IS codes in CD form for quick referencing.
- xiii. The contractor shall ensure that all work complies with statutory norms and regulations.
- xiv. The contractor shall ensure that technically competent persons or firms holding valid licenses shall only carry out any special service installations included in the scope of the Work.

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- xv. **SITE INSTRUCTION FILE:** The Contractor shall maintain a Site instruction file at the Site office. All instructions received from the Project Manager relating to the Work shall be retained in the file.
- xvi. **PHOTOGRAPHS:** Besides submitting progress charts, reports, etc., the Contractor shall submit progress photographs as directed by Project Manager, every four weeks in triplicate along with negatives.
- xvii. The Contractor shall fully co-operate with all agencies concerned to fulfill this objective.

4. SITE:**4.1 Contractor to satisfy himself about site conditions:**

The Contractor represents that before tendering for the Work the Contractor has visited the Site and satisfied himself about the Site conditions for construction and for logistics and smooth flow of workmen and materials as well as permission from Authorities for this purpose. The Contractor has examined the Site and taken note of character of the soil and of the excavations, the correct dimensions of the Work, and facilities for obtaining any special articles called for in the Contract Documents. The Contractor has also made its own assessment and obtained all information on the Site constraints and on all matters that will affect the execution, continuation and progress, and completion of the Works. Any extra claims or extension of time made in consequence of any misunderstanding, incorrect information on any of these points or on the grounds of insufficient description or information shall not be entertained or allowed at any stage.

4.2 Access to site by the contractor:

The access to the Site will be shown immediately on award of the Contract to the Contractor and the Site shall be shared with other Vendors and Sub-Contractors as applicable. The Contractor shall upon being given such access commence the Work and diligently proceed with the execution of the Work in accordance with the Contract Documents. Access to the Site by the Contractor shall be merely a licence for carrying out the construction of the Work under the Contract, and the Contractor shall not by his being allowed such entry on the Site, acquire any right, lien or interest either in the Work carried out by him under the Contract or anything appurtenant or attached thereto or to any part of the Site, and his claim will only be in the nature of money found due and payable to him in accordance with the certificates issued by the Project Manager under the provisions contained herein. The Work shall be free from all liens, charges or claims of whatsoever nature from any party other than the BHEL. The BHEL shall have a lien over all work performed by the Architect, the Contractor, Sub-Contractors and Vendors and also for the materials and equipment brought on Site by them.

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4.3 Treasures, Antiquities found are property of BHEL:

All fossils, antiquities and other objects of interest or value, which may be found on the Site at the commencement or during the progress of the Work shall be the property of the BHEL. The Contractor shall carefully take out and preserve all such fossils, antiquities and objects and shall immediately deliver the same in their discovered state into the possession of the BHEL.

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4.4 Entry to site:

The Project Manager, at his discretion has the right to issue passes to control the admission of the Contractor, his agents, employees and work people to the Site of the Work or any part thereof. Passes shall be returned at any time on demand by the Project Manager.

5. NATURE OF CONTRACT:**5.1 ITEM RATE Contract:**

The Contract is neither a fixed lump sum contract nor a piece work contract, but is an item rate contract to carry out the finished Work according to the contract documents, drawings/ instructions issued by the Project Manager during the course of the contract and as per the description and at prices given in the Schedule of Rates/ Bill of Quantities and Technical Specifications.

5.2 CONTRACT PRICE

The Contract Price is the Total amount of cost of all items of finished work, as given in the Schedule of Rates/ Bill of Quantities attached with the Letter of Intent and as given in the contract documents. The quoted price shall include all taxes and duties (except GST) and shall remain firm during the entire contract period. GST shall be quoted separately in the bill of quantities and price schedule

The Contract Price includes payment for the supply of all labour (including payment to his Sub-Contractors), equipment, materials, plant and machinery, tools, transportation, framework, scaffolding, works, distribution of power and water and all services and activities constituting the Scope of Work under this tender and all applicable taxes including the Construction Workers Welfare Cess, GST, and any other statutory taxes and levies as applicable to the contractors/ workers etc., levies, royalties, fees, insurance premiums, contributions towards employees benefits including ESI and PF and funds. The BHEL shall not be responsible in any way whatsoever to pay for the same. The Contract Price shall also include the Contractor's establishment, infrastructure, overheads & profits and all other charges, and shall generally be inclusive of every cost and expense required by the Contract to be borne by the Contractor and necessary for the proper execution and completion of the Work under the Contract, in conformity with the Contract Documents and the best engineering and construction practices and to the satisfaction of BHEL.

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The items of work and/ or their quantities, as given in the Schedule of Rates/ Bill of Quantities are provisional and estimated, subject to change/ revision as required by the Project Manager. This being an item rate contract, the final contract price may be altered and will be based on actual quantities of work done and measured, including due to any change/ Variation orders/ extra items of work as ordered/ approved by the Project Manager, rates for which shall be approved in accordance with the procedure given in the contract.

No escalation in prices shall be allowed for any reason whatsoever and the prices given in the Schedule of Rates/ Bill of Quantities shall be deemed to be firm during the period of the project untill the completion of the project (Stipulated / extended).

6. TAXES, DUTIES ETC.:

- (i) No reimbursement on account of increase/ decrease in the rate of taxes, levies, duties etc. on input goods/ services/ work shall be made. Bidder has to make his own assessment of the impact of future variation if any, in rates/ duties/ levies etc. in his price bid.
- (ii) In case the Government imposes any new tax/ levy on the output services / work after the date of NIT, the same shall be reimbursed by BHEL at actuals. All necessary documents as required by BHEL shall have to be provided by the contractor. However, in the event of delay in work/ services execution solely attributable to the contractor the new taxes/ levies imposed during the delay period shall not be reimbursed to the contractor.
- (iii) In case any new tax / levy / duty etc. becomes applicable after the date of issuance of NIT by reasons of making , passing or promulgation of taxation laws in India by any other order, regulation or by-laws having force of law or interpretation of application of any existing law, the bidder / contractor must convey it's impact on his price duly substantiated by documentary evidence in support of the same .Such new tax / levy / duty beyond NIT issuance date will be reimbursed / adjusted suitably from the contract price as the case may be.
- (iv) To enable BHEL to avail GST Input tax credit, contractor shall submit GST compliant Tax invoice containing all the particulars as stipulated under Invoice Rules of GST Law. Such invoice shall be submitted within prescribed time limit in the name of BHEL, COE, Karkhiyaon, Varanasi (UP) and must contain the address and GSTIN of respective above mentioned office.
- (v) Payment shall be made to contractor only after submission of GST complaint Tax invoice as mentioned above and other relevant documents. However, to protect BHEL's interest for GST input tax credit, the contractor may submit bank guarantee of equivalent amount i.e. GST amount along with notional interest on GST credit for 02 months' period (i.e. presently rate

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of interest is 24% per annum i.e. 4% for 02 months) else GST amount plus 4% notional interest will be withheld from the bill.

- (vi) In case GST credit is delayed/denied to BHEL or subsequently recovered from BHEL due to non/delay in filing of GSTR-1 Return or delay in/non-payment of tax to Govt. by contractor or for any other reasons not attributable to BHEL, in such case any financial implication on BHEL on account of delay/loss/recovery from BHEL of such GST Credit along with interest levied/leviable on BHEL till the time GST credit is available to BHEL, shall be recovered from the contractor's running bill/ security deposit and/or adjusted against GST amount not paid as indicated under (v) above.
- (vii) Irrespective of refund of GST Credit and interest thereon to BHEL by GST portal upon subsequent declaration of such invoice by contractor in his GSTR-1 for any period after due date of such return and/or payment of GST thereon by contractor on GST portal, the notional interest for delayed period of GST credit (i.e. delay for the period when GST credit is actually allowed and the period when GST credit should have been allowed had contractor declared such invoice in his GSTR-1 and paid tax thereon in the relevant month as per GST law) shall be recovered from contractor.
- (viii) GSTIN of BHEL will be provided to the contractor within 30 days from the placement of work order.
- (ix) Any statutory changes as and when made applicable by the Government shall become applicable against documentary evidence. However, this will be mutually discussed and finalised at the time of any change occurs. However any increase in the duties and taxes in case of delays in the completion of work attributable to the contractor shall be to the contractor's account.
- (x) Payment to the contractor will be subjected to TDS as per rules in force from time to time. The Tax Deduction at Source (TDS) shall be done as per the provisions of Income Tax Act & GST, as amended from time to time and a certificate to this effect shall be provided to the contractor by BHEL.

7. NOTICES, FEES, BYELAWS, REGULATIONS, ETC.:

The Contractor shall comply with all applicable laws and Government Acts including the Byelaws or regulations of Central and / or Local Authorities relating to the Work in so far as labour, construction, fabrication and installation activities are concerned, and he shall obtain from the Central and / or Local Authorities all permissions and approvals required for the plying of trucks, construction machinery etc., and also for construction of temporary offices, labour camps, stores and other temporary structures in connection with the Work, and the Contractor shall give all notices and pay all fees and charges that are and that can be demanded by law thereunder. In

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the Contract Price for the Work, the Contractor shall allow for such compliance and work, and for the giving of all such notices, and shall include the payment of all such fees and charges.

8. LICENSE AND PERMITS:

The Contractor shall directly obtain all licenses and permits for the materials under Government control, and those required to be obtained by the Contractor for the execution of the Work. The Contract Price shall include all transportation charges and the other expenses that may be incurred in this connection.

9. ROYALTIES AND PATENT RIGHTS:

All royalties or other sums payable by the contractor in respect of the supply and use of any patented articles, processes or inventions for the carrying out of the Work as described by or referred to in the Contract Documents, shall be deemed to have been included in the Contract Price. The contractor shall keep the BHEL indemnified against all such demands as may arise on account of payment of royalties.

10. INSURANCE:

The successful contractor shall take out Contractors' All Risk (CAR) Insurance Policy and other necessary policies in the name of the contractor beneficiary. The original policies shall be deposited with the BHEL within 10 days of issue of LOI and acceptance by the contractor. The policies shall cover the clauses as under:

- 10.1 The Contractor shall at all times indemnify and keep indemnified the BHEL and its officers, servants, agents and any other guest or person against all third party claims, whatsoever, which may arise out of or in consequence of the construction & maintenance of works, (including but not limited to property loss or damage, personal accident, injury or death of/to property or person of any sub-contractor and/or the servants or agents of the contractor, any sub-Contractor(s) and/or the BHEL) and the contractor shall at his own cost and initiative at all times up to the successful conclusion of the defect liability period, maintain all insurable liabilities under this clause, including but not limited to third party insurance and liabilities under the Motor vehicles Act, workmen's Compensation Act, fatal Accident Act, Personal injuries Act and/or other industrial legislation from time to time in the BHEL, and such policy (ies) shall be of not lesser limit than the limits hereunder specified with reference to the matters hereunder specified, namely.

- a. **Workmen's compensation Insurance** – to the limit to which compensation may be payable under the laws of the Republic of India.

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- b. **Third Party Insurance including Cross Liability:** To cover for any damages to third party to the limit of not less than Rs.500000 /- (Rs. Five Lacs only) in each accident at each job site and to a limit of not less than Rs.2500000 (Rs. Twenty Five Lacs only) for all accidents at all job sites. The Policy shall be valid up to the end of the Defects Liability Period and shall include any damage to the properties and/or injury including death to the persons of the general public and anyone else deemed to be third party.

- 10.2 Provided that the limits specified above shall operate only as a specification of minimum limits for insurance purposes, but shall not in any way limit the contractor's liability to terms of this clause to the limit(s) specified.

Should the Contractor fail to take out and/or keep current insurance as provided for in the foregoing sub-clause, the BHEL shall be entitled (but without obligation to do so) to take out and/or keep current such insurance at the cost and expenses of the Contractor, and without prejudice to any rights or remedies of the BHEL in this behalf, to deduct the sum(s) incurred, from the dues of the contractor.

- 10.3 Period of policies: All Insurance covers mentioned above shall be kept alive during the completion period of contract and defects liability period.

- 10.4 Copies of said Insurance Policies shall be lodged with the BHEL, or BHEL's authorized representative prior to contractor's start of work on site.

10.5 **INJURY TO PERSONS AND PROPERTY**

- a. The Contractor shall be liable for and shall indemnify the BHEL against any liability, loss claim or proceedings whatsoever arising under any statute or at common law in respect of personal injury to or the death of any person whomsoever arising out of or in the course of or caused by carrying out of the works, unless due to any act or neglect of the BHEL or of any person for whom the BHEL is responsible.
- b. Except for such loss or damages as is at the risk of the BHEL (if any), Contractor shall be liable for and shall indemnify the BHEL against any expense, liability, loss, claim or proceedings in respect of any injury or damage whatsoever to any property real or personal in so far as such injury or damage arises out of or in the course of or by reason of the carrying out of the works and provided always that the same is due to any negligence, omission or default of the contractor, his servants or agents of any subcontractor, his servant or agent.

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10.6 Insurance against injury to persons and property

Without prejudice to his liability to indemnify the BHEL under these conditions, the contractor shall maintain and shall cause any subcontractor to maintain:

- a. Such insurance as are necessary to cover the liability of the Contractor or as the case may be of such subcontractor in respect of personal injuries or deaths arising out of or in the course of or caused by the carrying out of the work:
- b. Such insurances as may be specifically required in respect of injury or damage to property real or personal arising out of or in the course of or by reason of the carrying out of the work and caused by any negligence, omission or default of the contractor, his servants or agents or as the case may be of such subcontractor, his servants or agents.

10.7 The Contractor shall produce or cause any subcontractor to produce for inspection the relevant policy or policies of insurance together with the receipts in respect of premiums paid under such policy or policies as and when required so to do by BHEL provided always that as and when may be reasonably required by BHEL the production by either the contractor or any subcontractor of firm which shall have issued the policy or policies aforesaid shall be a good discharge of the contractors obligation to produce or to cause the production of the policy or policies and the receipts in respect of premium paid.

- a. The Contractor shall maintain in the joint names of the BHEL and contractor such insurance as may be required in respect of any expense, liability, loss, claim or proceedings which the BHEL may incur or sustain by reason of injury or damage to property real or personal arising out of or in the course of or by reason of the carrying out of the work and caused otherwise than by the negligence, omission or default of the contractor, his servants of any subcontractor, his servants or agents.
- b. Any such insurance as is referred to in the immediately preceding paragraph shall be placed with insurers to be approved by BHEL and the Contractor shall have to deposit with him the policy or policies and the receipts in respect of premium paid.

10.8 Should the Contractor or any subcontractor make default in insuring or in continuing to insure as provided in sub-clauses (1) and (2) of this condition the BHEL may himself insure against any risk with respect to which the default shall have occurred and may deduct a sum equivalent to the amount paid in respect of premium from any moneys due to or become due to the contractor.

10.9 Insurance of the works against fire etc.

- a. The Contractor shall in the joint names of the BHEL and Contractor insure against loss or damage by fire, storm, tempest, lighting, flood, earthquake, air craft or anything dropped there from, aerial objects, riot and civil commotion for the fully value thereof all work executed and all unfixed materials and goods intended for deliver to and placed or adjacent to the work, but

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excluding temporary building, plant, tools and equipment owned or hired by the Contractor or any subcontractor and shall keep such work materials and goods so insured until with insurers approved by the BHEL and the contractor shall deposit with the BHEL the policy or policies and receipts in respect of premiums paid and should the contractor make default in insuring or continuing to insure as aforesaid the BHEL may himself insure against any risk with respect of which the default shall have occurred and deduct a sum equivalent to the amount paid by him in respect of premium from any moneys due to or to become due to the Contractor.

- b. Provided always that if the Contractor shall independently of his obligations under this contract maintain a policy of insurance which covers (interim alia) the said work, materials and goods against the aforesaid contingencies to the full value thereof then the maintenance by the Contractor of such policy shall if the BHELs interest is endorsed thereon, be a discharge of the contractors obligation to insure in the joint names of the BHEL and contractor and the production by the contractor as and when may reasonably be required by the BHEL of a current certificate of insurance from the company or firm which shall have issued the aid policy shall be discharge of the contractors obligations to deposit with BHEL a policy or policies and the receipts in respect of premium paid.
- c. Upon settlement of any claim under the insurance aforesaid the Contractor with due diligence shall restore work damaged, replace or repair unfixed materials or goods which have been destroyed or injured, remove or dispose of any debris and proceed with the carrying out and completion of the work. All moneys received from such insurances shall be paid to the contractor by installments under certificates of BHEL issued at the period of interim certificates named in the appendix to these conditions. The contractor shall not be entitled to payment in respect of the restoration of work damaged, the replacement and repair of any unfixed materials or goods and the removal and disposal of debris other than the moneys received under the said insurances.

11. CONTRACTOR'S SITE ORGANIZATION AND RESOURCES:

11.1 Contractor's representative and supervisory staff:

The Contractor shall at his cost provide and ensure continued effective supervision of the Work with the help of the Contractor's Representative, assisted by team of qualified, experienced and competent engineers, supervisors and adequate staff, to the satisfaction of the Project Manager for the entire duration of the Work. The Contractor shall submit his proposed site organization chart for the approval of the Project Manager. The Contractor's Representative shall be on the Site at all times as the Work and the Project progresses and shall be responsible for carrying out the Work to the true meaning of the Drawings, Specifications, Conditions of Contract, Schedule of Rates, the other Contract Documents, and instructions and directions of the Project Manager. The instructions and directions given in writing to the Contractor's Representative or to any of his assistants at the Site by the Project Manager shall be deemed to have been given to the Contractor officially. Attention is called to the importance of the Contractor requesting written instruction from the Project Manager before undertaking any Work where the Project Manager's direction or instructions are required. Any such Work done in advance of such instructions will be liable to be

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removed at the Contractor's expense and will not be paid for unless specifically approved in writing by the Project Manager, as the case may be.

All key staff employed at the Site by the Contractor shall be considered essential to the performance of the Work and the Project Co-ordination Services, and all key staff shall be subject to the approval of the Project Manager. However such approval shall not relieve the Contractor of any of his Contractual obligations. No staff including the resident engineer and other technical supervisory staff shall be removed or transferred from the Work without the prior written permission of the Project Manager. The Project Manager shall, however, have the authority to order the removal from Site of any undesirable personnel. If key staff becomes unavailable for assignment to the Work or the Project Co-ordination Services for reasons beyond the Contractor's control, the Contractor shall immediately notify the Project Manager to evaluate the impact on the project. Prior to substitution or addition of any key staff, the Contractor shall obtain the Project Manager's written consent as to the acceptability of replacements or additions to such personnel. The Contractor shall at all times be fully responsible for the acts, omissions, defaults and neglect of all of his representatives, agents, servants, workmen and suppliers and those of his Sub-Contractors.

11.2 Man-power and plant and machinery:

The Contractor shall at his own cost provide and install all equipment, materials, plant/machines. Concrete Pumps, Cranes, and Material Hoists each of adequate capacity, will be required. Other equipments like (weigh batchers for design mixes), ladders, and scaffolding etc., necessary for the execution of the Work in conformity with the Contract Documents and to the satisfaction of the Project Manager will also be provided by the contractor at his own cost in adequate quantity. Also, all machines, tools, trucks, formwork material, man-power and everything else necessary for the proper and satisfactory execution and completion of the Work in accordance with the Contract Documents shall be provided by the Contractor at his own cost. The Contractor shall within two weeks of the award of Contract submit a complete list of his manpower, plant and machinery for the approval of the Project Manager, whose approval, however, shall not relieve the Contractor of any of his responsibilities, obligations and liabilities under the Contract. The Contractor shall augment his manpower, plant and machinery without extra cost to the BHEL whenever required or so directed by the Project Manager in order to conform to the approved construction programme for the achievement of milestones and Virtual Completion. (Ready mixed concrete) to be supplied from approved manufactures.

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11.3 Contractor store, site offices and other facilities:

Contractor shall inspect the site and make his own assessment towards the availability of space at site for his stores, yards, offices, steel & shuttering yards, cranes, material hoists and other facilities. A mutually determined area within the constraints of the Site will be allowed to the Contractor free of cost for the purpose of storing his tools, plant, materials, Site office, cement godown, canteen, plant & machinery etc. In case contractor is not able to accommodate his facilities within the site, or in the opinion of the Project Manager contractor's facilities are to be removed or relocated in the interest of the progress of work (contractor's and / or any other agency's / vendor's) the contractor shall make his own arrangements elsewhere outside the site at his own cost for the same. Water tank for the purpose of construction, Site offices, toilets, workshops and storage sheds etc. shall be built by the Contractor at the Contractor's cost. Water tank/s constructed for the purpose of construction should be of such dimensions as to provide storage for at least two days consumption. Site offices cum stores shall be of such dimensions to accommodate the Contractor's own office. A separate sanitary facility shall be provided and maintained for, Engineers and workers. The same shall be cleared after construction period. The Contractor shall remove all the temporary construction constructed by him at the Site for the purpose of completing the Work after the Project is completed. Costs of all such facilities including construction & removal shall be borne by the Contractor. Construction of labour hutments will be NOT allowed inside on the Site. Contractor has to make his own arrangement for space for labour hutment including transportation of labour to site. Nothing extra will be paid. The Contractor shall at his own cost make all arrangements. The Contractor shall at his own cost make all arrangements for space, lodging, transportation etc. for the labour. No person will be allowed to stay on Site except the security and watchman except during night construction when the Work is in progress. Furnished Air-conditioned accommodation of **700 sq. ft. carpet area with toilets which will be maintained by contractor till 3 months after virtual completion**, with insulated walls for Project Manager & his staff with conference room, toilets etc. as per design shall be provided. Nothing extra will be paid on this account.

11.4 Security:

The Contractor shall at his cost provide at all times adequate number of watchmen to guard the Site, materials and equipment, to the satisfaction of the Project Manager. The Contractor shall at all times be fully responsible for the security of all materials and equipment on the Site, whether his own or those of any Sub-Contractor. BHEL shall not be responsible for any loss due to theft, fire, accident or any other reasons, whatsoever.

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11.5 Telephone / Communication:

The contractor shall make his own arrangement for the telephones and mobile phones at site with information to the Project Manager. The Contractor shall provide his representative and key personnel with mobile phone for round the clock communication with Project Manager. Contractor shall also at his own cost ensure two way communication either by way of providing, maintaining and running the walkie-talkie or mobile phones of adequate range at site, between the Project Manager's team members and contractor's own key personnel (from Project In-charge to function/area In-charge level) deputed at site, with whom Project Manager would be required to interact on day to day basis.

11.6 Survey Equipment:

The Contractor shall keep & provide sufficient number of required survey equipment at site for his own use. The contractor will provide at his own cost for the sole use of the Project Manager survey equipment as required by the Project Manager.

11.7 Sanitary Convenience:

The Contractor shall at his expense provide and erect with prior permission and details to the Project Manager all necessary sanitary conveniences including septic tank and soak pits at the Site for the staff and all workmen of his own, his Sub-Contractors, the Project Manager & his staff. The sanitary conveniences shall be strategically located around the Site to provide ready access to all site operatives and employees. The Contractor shall maintain such convenience in a clean, hygienic, orderly condition and shall clean, disinfect and deodorize the ground after their removal, and meet all statutory requirements.

11.8 Scaffolding, staging, guard rails, barricades:

The Contractor shall at his cost provide steel scaffolding, staging, guard rails, barricades and safety barriers around all excavations, openings and at all edges, temporary stairs and other temporary measures required during construction. The supports for the scaffolding, staging guard rails, barricades and safety barriers and temporary stairs shall be strong, adequate for the particular situations, tied together with horizontal pieces and braced properly. The temporary access to the various parts of the building under construction shall be rigid and strong enough to avoid any chance of mishaps. The entire scaffolding arrangement together with the staging, guard rails, barricades and safety barriers, and temporary stairs shall be to the approval of the Project Manager whose approval however shall not relieve the Contractor of any of his responsibilities, obligations and liabilities for safety and for timely completion of the Work. The use of wooden scaffolding on the Site is strictly forbidden.

Traffic diversion / management during construction time shall be in scope of contractor & nothing extra shall be payable.

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11.9 Temporary Roads:

The Contractor shall at his cost construct and maintain temporary roads/access ways to suit Site requirements at locations mutually agreed with the Project Manager. Such roads/access ways will also be used by other Vendors working at the Site.

11.10 Safety Equipment & Personnel:

The Contractor shall provide sufficient helmets, safety boots/shoes, nets and protective clothing for use by the Project management team, his own staff and staff of its sub-contractors. The Contractor shall make available at all times when work is being undertaken, a vehicle suitable for the emergency evacuation of personnel from the site to a hospital staffed and equipped to receive injured personnel.

The contractor shall provide a fulltime, experienced and suitably qualified Safety Officer at site who shall be responsible for incorporation, implementation and enforcement of all safety measures and requirements for maintaining safe working conditions, safety of manpower and equipment, general safety and security of Site as per the various safety codes and stipulations mentioned in contract documents.

11.11 Temporary Lighting:

The Contractor shall make his own arrangement in respect of the provision of adequate lighting at all places where his workmen are engaged for carrying out the Work and also provide general lighting of site as a whole in a proper safe and satisfactory manner. Contractor shall ensure that all staircases, lobbies and basements are well lighted by providing at least one tube light at each landing of every staircase and also in each lift lobby plus adequate lighting in the working area as directed by the Project Manager. The Contractor shall provide general lighting in basement by installing at least one tube light per 100 sqm area at his own cost. Wiring shall be done in conformity with best practices and following all safety norms strictly.

11.12 Protection Of Environment:

The Contractor understands that the Site is free from pollutants at the time of access to the Site and commencement of the Work. The Contractor shall comply with all applicable environmental laws and regulations and shall ensure that the Site is and remains free from pollutants at the end of the Project. The Contractor shall ensure inter-alia, that neither the soil nor the ground water is polluted or contaminated by fuels or lubricants emitted by machinery operated on the Site or by other dangerous or poisonous substances which are or are deemed to be hazardous to the environment. Notwithstanding the above, the Contractor shall comply with all the directions and decisions of the Project Manager in this regard.

11.13 First Aid Equipment & Medical Facilities:

The Contractor shall establish a fully equipped and staffed (trained) first aid centre on the Site to deal with accidental injuries and workers health. Contractor shall ensure that a qualified & registered doctor is engaged to regularly visit the site for labour welfare. The Contractor shall provide such first aid and medical facility to at his own cost.

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The Contractor shall make necessary arrangements with a local hospital and with local doctors so that his sick or injured persons may receive prompt medical treatment with minimum delay at any hour of the day or night.

12 LABOUR REGULATIONS:

12.1 Regulations:

The Contractor shall be wholly and solely responsible for full compliance with the provisions under all labour laws and /or regulations such as Payment of Wages Act 1948, Employees Liability Act 1938, Workmen's Compensation Act 1923, Employees State Insurance Act 1948, Employees Provident Fund Act 1952, Industrial Disputes Act 1947, the Maternity Benefit Act 1961, the Contract Labour (Regulation and Abolition) Act 1970, Building and Other Construction Workers' Welfare Cess Act. 1996 the Factories Act 1948 or any modifications thereof and any other applicable Construction Workers Welfare Cess or any other law relating thereto and rules there under introduced from time to time. The Contractor shall assume liability and shall indemnify the BHEL from every expense, liability or payment by reason of the application of any labour law, act, rules or regulations existing or to be introduced at a future date during the term of the Contract. Insurance cover towards the above shall be effected by the Contractor as called for in the contract. In general, in respect of all labour directly or indirectly employed in the Work for the performance of Contractor's part of the Contract, the Contractor shall comply with all the rules framed by the Government authorities concerned from time to time for protection of the health and welfare of the workers. The Contractor shall at his own cost obtain a valid license for himself and the BHEL / Principal Employer under the Contract Labour (R & A) Act 1970 and the Contract labour (Regulation and Abolition) Central Rules 1971 and under any other applicable rules before the commencement of the Work and continue to have a valid licenses until the completion of the Work.

12.2 LABOUR WELFARE CESS

The contractor shall comply with all provisions of the BOCW Act and shall indemnify BHEL against all claims that may arise due to non-compliance of any provision of the said act by the contractor. BHEL shall deduct labour cess from the Running/ Final bills at applicable rates and deposit it in the account of UP Building and other construction workers welfare board in the office of Dy. Labour Commissioner, Varanasi. The project has already been registered under BOCW Act. The rates quoted by the bidder shall be inclusive of Labour welfare cess.

12.3 Payment of wages:

The Contractor shall pay to labour employed by him either directly or through Sub-Contractors wages not less than fair wages as defined in the relevant Central / Local Labour Regulations or as per the provisions of the Contract Labour (Regulation and Abolition) Act 1970 and the Contract Labour Regulation and Abolition of Central Rules 1971, wherever applicable. He shall also abide

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by the minimum wages and other regulations applicable to the labour engaged in the Work, as laid down by the concerned Central / local authorities.

In case the contractor fails to pay fare wages as required by the authorities then the BHEL shall be entitled to do so and receives such amounts including associated cost incurred by them in doing so from the contractor.

12.4 Model Rules:

The Contractor shall at his own expense comply with or cause to be complied with, Model Rules for labour welfare framed by Government or other local bodies from time to time for the protection of health and for making sanitary arrangements, Malaria control, etc. for workers employed directly or indirectly on the Work and in the workers hutment area. In case the Contractor fails to make arrangements as aforesaid, the BHEL shall be entitled to do so and recover the cost thereof from the Contractor.

12.5 Safety Codes:

In respect of all labour, directly or indirectly employed on the Work for the performance and execution of the Contractor's Work under the Contract, the Contractor shall at his own expense arrange for all the safety provisions as listed in (i) Safety codes of C.P.W.D. and Bureau of Indian Standards, (ii) The Electricity Act, (iii) The Mines Act, and Regulations, (iv) Regulations of employment & conditions of service Act 1996, Rules and Orders made there under and such other acts as applicable.

Precautions as stated in the safety clauses are of minimum necessity and shall not preclude the Contractor taking additional safety precautions as may be warranted for the particular type of work or situations. Also mere observance of these precautions shall not absolve the Contractor of his liability in case of loss or damage to property or injury to any person including but not limited to the Contractor's labour, the BHEL's, Architect's, or any member of the public or resulting in the death of any of these.

12.6 Safety Equipments:

Protective gear such as safety helmets, boots, belts, gloves, spectacles, nets, fire extinguishers etc. shall be provided by the Contractor at his own cost to all his manpower at the Site. The Contractor shall impose such requirements on all Sub-Contractors and Vendors also. It shall be the responsibility of the Contractor to ensure that such protective gear is worn at all times by all personnel working at the Site during the term of the Project. The Project Manager shall each have the right to stop any person not wearing such protective gear from working on the Site.

In case the Contractor fails to make arrangements and provide necessary facilities as aforesaid, the Project Manager shall be entitled (but not obliged) to do so and recover the costs thereof from the Contractor. The decision of the Project Manager in this regard shall be final and binding on the Contractor.

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12.7 Safety/Site Conditions:

- i. The Contractor shall take full responsibility for the adequacy, stability and safety of all Site operations and ensure that the methods of carrying out the Work and the Project by the Contractor including his workmen, employees, Sub-Contractors and Vendors meet all the necessary safety standards and requirements of the SHE Plan. In order to fulfil this obligation the Contractor shall appoint a permanent, full time and suitably qualified safety officer for the Site.
- ii. The Contractor shall institute and implement to the satisfaction of the Project Manager a construction safety programme, including:
 - a. Preparing a Site-specific written safety programme consistent with the SHE Plan, Indian law and best practices. As a minimum, the programme shall require applicable safety equipment for all workers, use of barriers and barricades around potentially dangerous areas, protection of workers working under elevated conditions, accident reporting, medical & first aid provisions, lighting, housekeeping, sanitation etc.
 - b. Weekly safety reviews and 'risk assessments' shall be carried out in conjunction with the Project Manager in order to identify potential safety hazards and to militate against them. Contractor shall be required to maintain proper records of these inspections along with the checklists.
 - c. The Contractor will be required to provide all personnel entering the Site a safety rules card with instructions on Do's and Don'ts and verbal explanation of the safety programme.
 - d. Requiring all Sub-Contractors and other workers under the responsibility of the Contractor (including the Vendors or later phases of the construction of the Project) to adhere to the written safety programme.

The Contractor has full responsibility for maintaining the Site in good and clean condition and removing all trash and debris on a daily basis to the satisfaction of the Project Manager. The Contractor is responsible for providing adequate sanitary facilities and maintaining them in a clean and healthy condition. If the Contractor fails to comply with the above the Project Manager will have the authority to get the same cleaned by an external agency and debit the expenses incurred on the same to the Contractor's account; but without being under any legal obligation to do so.

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If, by reason of any accident, or failure, or other event occurring to, in, or in connection with the Project, or any part thereof, either during the execution of the Work, or during the Defects Liability Period, any remedial or other work is, in the opinion of Project Manager urgently necessary for the implementation of the safety programme of the Project by the Contractor and the Contractor is unable or unwilling at once to do such work, the Project Manager shall be entitled to employ and pay other persons to carry out such work as the Project Manager may consider necessary. If the work or repair so done by the Project Manager is work which, in the opinion of the Project Manager, the Contractor is liable to do at its own cost, then all costs consequent thereon or incidental thereto shall be recoverable from the Contractor and may be deducted by the Project Manager from any of the Retention Money and any moneys due or to become due to the Contractor and the Project Manager shall notify the Contractor accordingly, provided that the Project Manager shall, as soon after the occurrence of any such emergency as may be reasonably practicable, notify the Contractor thereof.

The Contractor shall ensure that all operations by the Contractor, his workmen, employees, Sub-Contractors to complete the Project and the remedying of any defects therein shall, so far as compliance with the requirements of this Agreement permit, be carried on so as not to interfere unnecessarily or improperly with:

- The convenience of the public, or
- The access to, use and occupation of public or private roads, railways and footpaths to or of properties whether in the possession of BHEL or of any other person.
- The BHEL's operation and utilization of the facility at the Site; and
- The Work of Vendors.

If any hazardous or obnoxious materials (as defined by Indian law) are specified for use or are being used by Sub-Contractors or Vendors, the Contractor shall keep record of such material and forthwith give written notice to the Project Manager and shall ensure that the Sub-Contractors and Vendors, as applicable, use, store and dispose of such hazardous or obnoxious materials strictly in accordance with all applicable laws.

12.8 Additional Safety Regulations:

The Contractor shall continuously maintain adequate protection for the Work against fire and other hazards and shall protect the BHEL's property from damage or loss during the performance of this Contract. The Contractor also shall adequately protect property adjacent to the Work.

The Contractor shall take all necessary precautions for the safety of its employees, Subcontractors and the Vendors performing the Work and later phases of the Project and shall comply with all applicable safety laws and regulations to prevent accidents or injury to persons on, about, or adjacent to the Site.

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The Contractor shall be responsible for co-ordinating a safe working programme with the Project Manager. Such a programme shall include, and the Contractor shall be responsible for maintaining, the following safe working conditions and practices:

- i. All combustible material, food matter, garbage, scrap, and other debris generated during the performance of the Work shall be collected and removed from the Site on daily basis. Arrangements for scrap burning should be discussed with Project Manager.
- ii. An adequate number and type of fire extinguishers and sand buckets shall be provided at the Site for fire control and shall be kept/maintained in satisfactory and effective working condition, at all times.
- iii. Rescue operation team with availability of stretchers and transport vehicle. This team shall conduct mock drills at regular intervals. The report of which shall be submitted by the contractor to the Project Manager.
- iv. **FIRE PRECAUTIONS:** The Contractor shall take all precautions and preventive measures against fire hazards at the Site and shall assume full responsibility for the same.

12.9 Requirement of Fire Extinguishers

Each gas welding or burning, arc welding unit, tar pot, or open flame unit requires a fire extinguisher and sand buckets with it during operation.

12.10 Requirement of Equipment

The availability of fire blankets is recommended. Other equipment related conditions are as follows:

- The Contractor shall use only safe equipment in good condition. The Contractor shall not use or permit to be used the BHEL's equipment and the BHEL shall not use the Contractor's equipment without prior written permission of the other.
- When working in an occupied building or area, the Contractor must before commencement of work familiarize itself with the hazards of that area, such as the location of flammable substances and toxic fumes.
- Materials and equipment intended for installation in the Work as well as the BHEL's equipment and materials already in place are to be protected at all times from debris, weather, or any damage. The Contractor shall take all steps necessary to ensure the preservation condition of such equipment.
- The Contractor's materials, tools, and equipment shall be stored only in areas approved by the BHEL for this purpose.
- Site access and parking by the Contractor's personnel shall be at locations designated by the Project Manager. Only the Contractor's personnel necessary for the performance of the Work shall be permitted access to the Site. The Contractor and its employees and Sub-contractors shall adhere to all speed limits and traffic regulations at the Site.
- The Contractor and its employees and subcontractors shall strictly obey all "No Smoking" restrictions.

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- The Contractor shall not operate or use or manipulate utilities at the Site without the BHEL's prior written approval.
- No valves shall be turned off or on, or electrical disconnect switches operated except in an emergency. Any required utility "shut downs" will be scheduled and co-ordinate by the Project Manager.
- The Contractor shall make any requests for utility manipulation or "shut downs" in writing on least two (2) days' notice.

12.11 Safety with regard to site and housekeeping:

- The use of intoxicants or unlawful drugs at the Site, in any degree, shall be strictly prohibited. The Contractor shall rigorously enforce this regulation.
- When overhead work is in progress in or around an occupied area, signs to denote such work prominently displaying "Overhead Work" shall be used or the area shall be protected by barricade.
- Dusty work, such as concrete breaking or demolition, in or near occupied areas, shall proceed only after wetting down the area and taking steps necessary to prevent dust from penetrating occupied areas and creating a nuisance.
- Care shall be taken not to block any door, passageway, safety exit, firefighting equipment, or safety equipment with materials or equipment.
- Contractor shall maintain general cleanliness at site. All waste and debris shall be stored at designated place and disposed regularly.
- Materials must be piled, stacked, or stored in a neat and orderly manner. All stacking, whether inside or outside a building, shall be parallel to or at right angles to the building line or fence.
- When noisy operations of a prolonged nature are necessary in or near an occupied area, arrangements must be made with the Project Manager for scheduling to minimize any nuisance in the occupied area.

12.12 Non-compliance of Regulations

If the Project Manager notifies the Contractor of non-compliance with all or any of the foregoing regulations, the Contractor shall immediately, if so directed, or in any event not more than eighteen (18) hours after receipt of such notice, make all reasonable efforts to correct such non-compliance. If the Contractor fails to do so, the Project Manager may suspend all or any part of the Work. When the Contractor has undertaken satisfactory corrective action, Project Manager shall lift the suspension of the Work. The Contractor shall not claim any extension of time to complete the Work or additional fees due to any such work suspension.

12.13 Implementation of Safety Measures

Notwithstanding anything herein before contained, the Contractor shall be liable to ensure and implement all safety measures, whether or not statutorily prescribed, to safeguard, preserve and protect the life, health and welfare of every workman employed/deployed/engaged directly or indirectly by the Contractor on the Site and in relation to or connected with the Work and all Vendors employed in later phases of the Project in addition to installing, providing every prescribed safety and protective equipment, clothing etc., and the mere absence of any reference to or specification of a particular statute or rule or regulation in this Contract shall not

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absolve the Contractor of an obligation to comply with every such law, rule or regulation. The obligations stipulated in the contract shall not in any manner be deemed to limit or restrict any obligation or duty that any law, rule or regulation may otherwise impose upon the Contractor. The Contractor shall be liable for all consequences/liabilities arising out of his violating any of the aforesaid provisions, including fines, penalties, compensations, damages, prosecutions, proceedings, medical expenditure and costs, rehabilitation costs and all other expenses connected therewith.

12.14 Child Labour:

The Contractor shall not employ any labour less than 18 years of age on the job. If female labour is engaged, the Contractor shall make necessary provisions at his own expense for safeguarding and care of their children and keeping them clear of the Site. No children shall be permitted on the Site.

12.15 Crèches:

If women workers are employed on the Work, the Contractor shall provide at his expense two rooms of -reasonable dimensions plus toilet facilities for the use of their children under the age of six years. One room shall be used as a playroom and the other as the bedroom of the children. The rooms shall be built to reasonably good specifications in consultation with the Project Manager. The rooms shall be well lit and well ventilated.

The Contractor shall provide adequate number of toys and games in the playroom and sufficient number of cots and beddings in the bedroom. The rooms shall be maintained absolutely clean, employing sweepers.

The Contractor shall provide Dai (ayah) to look after the children in the crèche. The use of the rooms earmarked as crèches shall be restricted to children, their attendants and mothers of the children.

13. CONTRIBUTION TOWARDS EMPLOYEE BENEFITS, FUNDS ETC.:

The Contractor shall include in the Contract Price all expenses necessary to meet his obligations for making contributions toward employee benefits funds (Such as provident fund, ESI benefits, old age pension and/or any other benefits/compensation legally payable) in compliance with all the statutory regulations and requirements. All records in this connection shall be properly maintained by the Contractor and produced for scrutiny by the concerned authorities and BHEL whenever called for.

13.1 Employees' State Insurance Scheme (ESI)

The Contractor shall be liable to pay his contribution and Employee's contribution to the State Insurance Scheme in respect of all labour/ employees employed by him or for the execution of the contract in accordance with the provision of "The Employee's State Insurance Act, 1948" as amended from time to time, as applicable during the contract period.

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13.2 Employees Provident Fund (EPF)

The Contractor shall obtain prescribed recommendations from the Regional Provident Funds Commissioner under the Employees' Provident Fund and Misc. Provisions Act, 1952 and shall cause provident fund contribution from all eligible employees and Contractor's contribution to be deposited regularly with the prescribed authority and in token of which shall submit every month necessary receipts/ documentary evidence as may be required by the Project Manager. The contractor shall also provide its P.F. registration number/ certificate to Project Manager.

In case the contractor fails to comply with above provisions as required by the authorities then the Project Manager shall be entitled to do so and recover such amounts including the associated costs incurred by them in doing so, from the contractor.

The Contractor must fully satisfy himself as to these points and allow coverage for the same in the rates while giving his tender. Nothing extra shall be paid on these accounts.

14. SETTING OUT AND SITE SURVEYS:

The Contractor shall establish, maintain and assume responsibility for all bench marks and grid lines, and all other levels, lines, dimensions and grades that are necessary for the execution of the Work, in conformity with the Contract Documents. The Contractor shall establish his relation to the permanent benchmarks and boundary lines established at the Site. The Contractor shall verify and co-relate all the survey data available at the Site before commencing the Work and shall immediately report in writing any errors or inconsistencies to the Project Manager. Commencement of Work by the Contractor shall be regarded as his acceptance of the correctness of all survey and setting out data available at the Site and no claims shall be entertained or allowed in respect of any errors or discrepancies found at a later date. If at any time error in this regard appears during his progress of the Work, the Contractor shall at his own expense rectify such error to the satisfaction of the Project Manager

The approval by the Project Manager of the setting out by the Contractor shall not relieve the Contractor of any of the responsibilities, obligations, and liabilities under the Contract.

The Contractor shall be entirely and exclusively responsible for the horizontal, vertical and other alignment for all levels and dimensions and for the correctness of every part of the Work, and he shall rectify effectively any errors or imperfections therein. All such rectifications shall be carried out by the Contractor at his own cost and to the instructions and satisfaction of the Project Manager

The Contractor shall employ qualified surveyors to carry out all the surveys and setting out works.

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15. DRAWINGS, SPECIFICATIONS, INTERPRETATIONS ETC.:

For guidance of the bidder, **Architectural and Structural drawings are enclosed with these Tender Documents**. These drawings are broadly indicative of the work to be carried out. These drawings are not the 'Construction Drawings' and details indicated there in are for guidance only and are liable to be modified by the Project Manager during course of actual construction. No claim what so ever shall be admissible on account of changes that may be introduced later by the Project Manager.

The Project Manager shall provide three copies of working drawings to the Contractor as the Work progresses. The timing of the provision of drawings shall be mutually agreed between the Contractor and Project Manager in conformity with the construction programme and with due regard for the need to order and specify materials and equipment to the Site. **Additional copies of construction status drawings will be supplied on payment at actual cost basis.**

In general, the Drawings shall indicate the dimensions, positions and type of construction, the Specifications shall stipulate the quality and the methods and performance criteria, and the Schedule of Rates shall indicate the rates for each item of work. However, the above Contract Documents being complementary, what is called for by any one shall be binding as if called for by all. **Wherever there is a discrepancy between drawings and specifications, the drawings shall be followed. In interpreting the specifications, the following order of decreasing importance shall be followed:**

Drawings

BOQ

Technical Specifications

Matters not contained in the specifications and in case of any ambiguities in written specifications of the contract, the works shall be executed as per relevant BIS codes and CPWD specifications in that order of preference. If such codes have not been framed, the decision of the BHEL shall be final.

Any work indicated on the Drawings and not mentioned in the Specifications or vice versa, shall be deemed as though fully set forth in each. Work not specifically detailed, called for, marked or specified shall be the same as similar parts that are detailed, marked or specified.

From time to time during the progress of the Work, the Contractor will be issued with revisions of Drawings and written instructions by the Project Manager in connection with and necessary for the proper execution and completion of the Work. All such revisions of Drawings and written instructions shall be part of the Contract Documents and the Contractor shall be bound to carry out

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the work that is shown and detailed on all such Drawings and shall be bound to follow and comply with all such instructions.

The Project Manager will issue all Drawings and their subsequent revisions via listing on transmittals/ Register to the Contractor. The Contractor shall maintain a Drawing register listing all Drawings and their latest revisions. All superseded Drawings shall be so stamped and withdrawn from circulation at the Site and returned to the Project Manager. It shall be the responsibility of the Contractor to ascertain and ensure that all the Work is carried out in accordance with the latest revisions of the Drawings issued to him. Should the Contractor fail to do this, all the rectifications and remedial work that may be required to conform to the latest revisions of the Drawings shall be at the Contractor's expense.

Wherever it is mentioned in the Conditions of Contract, Specifications, and other Contract Documents that the Contractor shall perform certain work or provide certain facilities, it is understood that the Contractor shall do so at his own cost, unless otherwise provided in the Documents.

No deviations shall be made by the Contractor, in the execution of the Work from the Drawings, Specifications, and other Contract Documents. Only the Project Manager shall issue interpretations and clarifications.

The Contractor shall immediately in writing bring any errors or inconsistencies in the Drawings and Specifications to the attention of the Project Manager for interpretation or correction before proceeding with the affected portion of the Work, and no claims or losses alleged to have been caused by such discrepancies shall be entertained or allowed at any stage. Local conditions, which may affect the Work, shall likewise be brought to the Project Manager's attention at once. If at any time it is discovered that work, which has been done or is being done is not in accordance with the approved Drawings and Specifications, the Contractor shall correct the work immediately. Correction of such work shall be at the expense of the Contractor and shall not form a basis for any claims for payment or extension of time. The Contractor shall carry out all the rectification work only after obtaining approval for the same from the Project Manager

No scaling of any Drawing shall be done to obtain the dimensions. Figured dimensions on the Drawings shall be used for carrying out the Work. Drawings with large-scale details shall take precedence over small scale Drawings. Where any Drawings and details have not been provided but are necessary for the execution of the Work, it shall be the responsibility of the Contractor to seek these drawings and details in writing from the Project Manager at least four weeks prior to the latest date by which the Contractor needs these drawings and details to suit the programmed execution of the Work. No extension of time shall be allowed for any delays caused due to the Contractor's failure to seek such details.

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Drawings, Schedule of Rates, Specifications, and other Contract Documents, and all copies thereof furnished by the Project Manager shall become the BHEL's property. They shall not be used on any other work and shall be returned to the BHEL at his request or at the completion of the Contract.

16. WATER AND ELECTRICITY:**16.1 WATER SUPPLY**

Contractor has to make his own arrangement for water supply from outside the site premises and BHEL shall not be responsible for the same. Contractor to submit an affidavit in this regard.

16.2 POWER SUPPLY

The electricity required for execution Work shall be arranged by the Contractor from the authorities and / or generators at his own cost. Contractor shall be responsible for all distribution points as may be required for the Work. The contractor is also required to install at his own cost, a standby generator of required capacity, which shall conform to Pollution Control Norms, including distributions and connections and in the event of non-availability of power so that there is no delay in progress of Work as per execution schedule submitted by him and approved by BHEL (all the generators shall be approved as per latest CPCB guideline & Indian Electricity Act). The Contractor shall also share electricity from his Generators and electric connection with other Contractors, Sub-contractors, Vendors & BHEL etc. and share proportionate cost with them at tariff prevalent in the market as per State Electricity Board. The point of supply shall be at Generator / Electric supply Board. The cost of energy meter shall be borne by the respective allied contractors. Contractor shall ensure adequate capacity of generators to support such load sharing with other vendors

It shall be the responsibility of the contractor to provide and maintain the complete installation on the load side of the supply with due regard to safety and proper circuit protection requirement at site. All cabling, equipment, installations etc. shall comply in all respects with the latest statutory requirements and safety provisions i.e. as per the central/state electricity acts and rules etc. The contractor will ensure that his equipment and electrical wiring etc., are installed modified, maintained by a licensed electrical/supervisor. A test certificate is to be produced to the Project Manager for this approval, before power is made available. Non adherence of safety code shall render the contractor to be penalized a deemed fit by the Project Manager.

The BHEL is not liable for any loss or damage to the contractor's equipment as a result of variation in voltage or frequency or interruption in power supply or other loss to the contractor arising there from.

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The contractor shall ensure at his cost that all electric lines and equipment and all installations are approved by the State Electricity Inspector.

All statutory Fees & miscellaneous expenses and costs for electric power and Water connection for construction purposes shall be borne by the Contractor.

17. ASSIGNMENT AND SUB-LETTING:

The Contractor shall not assign/Sublet any part of this Contract to any other agency without the approval of the Project Manager. The Contractor may, however, sub-contract any part of the Work with the prior written consent of the Project Manager. Any permission to sub-contract parts of the Work shall not relieve the Contractor from any of his responsibilities, obligations, and liabilities under this Contract.

18. SUB-CONTRACTORS:

As soon as practicable, but at **least four weeks** before awarding any Sub-Contract, the Contractor shall submit to the Project Manager in writing the names of the Sub-Contractors along with their profiles and work experience proposed for any part of the Work, for the approval of the Project Manager. The Contractor shall employ such Sub-Contractors only after he has received confirmation in writing of such approval from the Project Manager. Such approval, however, shall not relieve the Contractor of any of his responsibilities, obligations and liabilities under the Contract. The Contractor shall be responsible for the acts, defaults and neglect of all Sub-Contractors and their agents, servants and workmen. The Contractor shall not employ any Sub-Contractor to whom the Project Manager, objects and/or does not approve.

19. SEPARATE CONTRACTS:

The BHEL reserves the right to let other contracts in connection with the Project. The Contractor shall afford other contractors reasonable opportunity for their access to the Site, for the storage of their materials, and for the execution of their work, or if specified give assistance to such contractors for such purposes as are specified. The Contractor shall properly connect and co-ordinate his Work with that of the other contractors that may be employed or engaged by the BHEL and shall co-ordinate, communication among the Project Manager, Architect, the Contractor, its Sub-Contractors and the Vendors and provide the facilities and oversee construction schedule, construction co-ordination and Site Safety for the Project. If any part of the Contractor's Work depends for proper execution or results upon the work of any other contractor, the Contractor shall inspect and promptly report in writing to the Project Manager any defects in such work that render it unsuitable for such proper execution and results. The Contractor's failure to so inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for receiving the work of the Contractor.

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20. CO-ORDINATION OF WORK:

At the commencement of the Work, and from time to time, the Contractor shall co-operate with other contractors, Sub-Contractors, persons engaged on separate contracts in connection with the Project, Vendors, the Project Manager, and the Architect for the purpose of the co-ordination and execution of various parts / phases of the Project. The Contractor shall determine and ascertain from the Vendors and persons engaged on separate contracts, in connection with the Project, the extent of all chasings, cutting and forming of all openings, holes, details of all inserts, sleeves, etc. that are required to accommodate the various services.

The Contractor shall determine and ascertain the routes of all services and positions of all floor and wall openings, outlets, traps, the details of all inserts, equipment and services and shall carry out the construction and making good of all "builder's work" in accordance with and as shown, described and/or measured in the drawings, Specifications, and other Contract Documents. Also, the Contractor shall ensure that all required services, inserts, sleeves, embedment etc. are in place/position before he proceeds with his work. Should the Contractor fail to comply with these requirements and the consequence of such failure necessitates the breaking, re-doing and making good of any work, then the cost of all such breaking, re-doing and making good of any work shall be to the account of the Contractor and shall be borne by him. No breaking and cutting of completed work shall be done unless specifically authorised in writing by the Project Manager. No work shall be done over broken or patched work without first ascertaining that the broken surface is adequately prepared and reinforced to receive and hold further work, as determined by the Project Manager.

In order to ensure proper co-ordination is being undertaken, weekly meetings, chaired by the Project Manager, will be held with the various contractors, at which co-ordination will be discussed and minutes of actions proposed circulated.

21. USE OF CONTRACTOR'S FACILITY BY OTHERS:

Contractor shall allow the use of his access ways, temporary staging, lighting, and sources of temporary power and water, by other Contractors, Sub-contractors and Vendors etc., where necessary for their legitimate work, without let or hindrance, but in a coordinated manner. Should there be conflict, then direction of the Project Manager shall be final and all parties shall be bound by it for consumption of water/ Electricity the charges will be payable by other contractors/subcontractors and vendor at specify rate to be agreed mutually with the approval of the Project Manager.

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22. OVERTIME WORK:

- 22.1 If it is necessary for the Contractor or any Sub-Contractor to work on other than working days or outside the normal working hours in order to keep up to the time schedule and meet the Construction Programme, the Contractor shall obtain the prior approval of the Project Manager in writing, whose approval shall not be unreasonably withheld. The additional cost of wages and any other costs incurred as- a result of overtime or any shift work shall be borne by the Contractor.
- 22.2 Where work is being carried out in or around an operating plant / office or occupied building /premises and is liable to cause disturbance or interruption in working of the Plant / Office or inconvenience to the occupants of the premises, the Contractor shall work only at specified places and times as mutually arranged between the Contractor and the Project Manager so as not to cause any disturbance. Due to this the Contractor may be required to work during off-hours, Sundays and holidays. The Contractor shall not be entitled for any extra payment for doing work in the manner described above.

23. MATERIALS, WORKMANSHIP, STORAGE, INSPECTIONS ETC.:**23.1(A) BHEL Supplied Material: -**

This item be treated as null & void. There will be no BHEL supplied material.

23.1(B) Contractor Supplied material: -

- 23.1.1 All the materials shall be procured by the contractor. Basic rates for selected materials and fixtures in the tender are provided to enable the contractor to quote the item rates accordingly. Quoted rate to include labour, basic cost of material, cost of accessories, taxes, payment to suppliers, transportation, handling, storage, safety, wastage, accounting and reconciliation and to provide Form 'C' & '38' and any other documents/formalities for purchase of materials, cost of electricity, water, GST as & when applicable and contractor's overheads and profits etc.
- 23.1.2 In case the Contractor fails / refuses to procure and provide any material, the Project Manager in the interest of the work may resort to procure and provide such materials at the risk and cost of the Contractor. Under such circumstances a penal recovery @ 15% of the respective item rates shall be imposed on the Contractor and recovered from his bills / any outstanding payments.
- 23.1.3 The materials shall be fully accounted for by the Contractor as required hereinafter. In accounting for the materials, allowances against each item, will be made to cover all wastages and losses that may have been incurred in the process of handling, storing, cutting, fabrication, fixing and installing. The contractor shall submit statement of account and reconciliation of material lying in Contractor's stores along with each Running Account Bill and consolidated statement of reconciliation along with Final Bill.

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23.1.4 The Contractor shall, at all times when requested, satisfy the Project Manager by the production of records or books or submissions of returns that the materials are being used for the purpose for which they are procured and the Contractor shall at all times keep the records updated to enable the Project Manager to apply such checks as he may desire to impose. The Contractor shall, at all times, permit the Project Manager to inspect his godown. The Contractor shall not, without prior written permission of the Project Manager, utilise or dispose of the materials for any purpose other than intended in the Contract.

23.2 Materials and workmanship:

The Contractor shall be responsible for the establishment of a full and comprehensive quality control system for the Work. The system shall include, but not be limited to, the means of controlling the testing and receipt of materials, the inspection of the Work, the filing and ordering of drawings and correspondence and the duties and responsibilities of staff members.

All materials and equipment to be incorporated in the Work shall be new. The materials, equipment, and workmanship shall be of the best quality of the specified type, in conformity with Contract Documents and the best engineering and construction practices, and to the complete satisfaction of the Project Manager. This requirement shall be strictly enforced at all times and stages of the Work and no request for change whatsoever shall be entertained on the grounds of anything to the contrary being the prevailing practice. **The Contractor shall immediately remove from the Work any materials, equipment and/or workmanship which, in the opinion of the Project Manager, are defective or unsuitable or not in conformity with the Contract Documents and best engineering and construction practices, and the Contractor shall replace such rejected materials, equipment and/or workmanship with proper, specified, required and approved materials, equipment and/or workmanship, all at his own cost within a period of seven (7) days from the date of issuance of such notice.**

The Contractor shall, whenever required to do so by the Project Manager, immediately submit satisfactory evidence and necessary test results as to the kind and quality of the materials and equipment.

23.2 Special Makes or Brands:

Where special makes or brands are called for, they are mentioned as a standard. Others of equivalent quality may be used provided that Project Manager considers the substituted materials as being equivalent to the brand specified, and prior approval for the use of such substituted materials is obtained in writing from the Project Manager. **Unless substitutions are approved by the Project Manager in writing in advance, no deviations from the Specifications and other Contract Documents shall be permitted, the Contractor shall indicate and submit written evidence of those materials or equipment called for in the Specifications and other Contract Documents that are not obtainable for incorporation in the Work within the time limit of the Contract. Failure to indicate this in writing within one month of the signing of the Contract will be deemed sufficient**

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cause for denial of any request for an extension of time and /or additional cost because of such circumstances.

Alternative equivalent brands if suggested by the Contractor during construction may be considered if approved brand is not available in market, provided the suggested brand fully meets the requirements and is acceptable to the Project Manager. The contractor has to furnish the rate analysis of all such items and get its prior approval from Project Manager before execution.

23.3 Proper scheduling and delivery of materials:

All materials and equipment shall be scheduled and delivered so as to ensure a speedy and uninterrupted progress of the Work, and the same shall be properly stored. Within fifteen days of signing of the Contract, the Contractor shall submit the material procurement schedule for approval of Project Manager for all materials to be procured by the Contractor.

23.4 List of Materials:

Within fifteen days of the award of the Contract, the Contractor shall submit for the approval of the Project Manager a complete list of all materials and equipment the Contractor and his Sub-Contractors propose to use in the Work, of definite brands or makes, which differ in any respect from those specified, or the particular brand where more than one is specified as standard. The Contractor shall also list materials and the items not specifically mentioned in the Contract Documents but which are reasonably inferred and are necessary for the proper execution and completion of the Work.

23.5 Storage of materials and equipment at site

The Contractor shall, at his own cost, provide adequate storage sheds and yards at the Site, at locations pre-approved by the Project Manager, for all materials and equipment that are to be incorporated in the Work. This shall be for all the materials and equipment, supplied by the Contractor or any Sub-Contractor. In addition to being watertight and weatherproof, the storage facilities shall be of such a manner that all the materials and equipment are adequately protected in every way from any deterioration or contamination or damage whatsoever, to the complete satisfaction of the Project Manager. The method of storing of all the materials and equipment shall be in conformity with the Specifications and/or to the directions and instructions of the Project Manager. At no time shall any material or equipment be stored in open or in contact with the ground. Should any of the materials or equipment deteriorate or be contaminated or damaged in any way due to improper storage or for any other reason then such materials and equipment shall not be incorporated in the Work and shall be removed forthwith from the Site and the replacement of all such materials and equipment shall be entirely at the cost and expense of the Contractor. The Contractor shall be responsible for also providing, at his own cost, proper and adequate security for all the materials and equipment stored at the Site so as to prevent any theft, pilferage etc., and the

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Contractor shall be responsible and liable for all the matters in connection with such security or the lack thereof. Where, after permission has been sought and obtained from the Project Manager, any material or equipment is kept on any portion of the structure, this shall be done in such a manner as to prevent any overloading whatsoever of the structure, to the complete satisfaction of the Project Manager. The cost associated with any damage to any portion of the structure in this respect shall be to the account of the Contractor and shall be borne by him.

Should delays be caused on account of removal and replacement of any materials or equipment or on account of any lack of security, the Contractor shall not be entitled to any extension of time or increase in the Contract Price.

Wherever applicable the storage of materials shall be in accordance with the relevant Indian Standard Specifications.

Cement storage capacity of the Contractor shall be of minimum 1500 bags to store substantial quantity of cement, keeping in view the tight schedule of the Work. Sand and aggregates shall be stored over hard concrete base or paved brick platforms. Reinforcement bars shall be stored diameter-wise over raised sleepers and protected from rain in suitable manner as approved by the Project Manager. Similarly, structural steel sections shall also be stored in the yard in a proper orderly manner.

23.6 Right Type of Workmen, Plant and Machinery, Jigs, Tools, etc.:

The Contractor shall employ the right type of workmen, plant and machinery, jigs, tools etc. to fabricate and/or install all materials and equipment. They shall be fabricated and/or installed without any damage and in accordance with the manufacturer's instructions and manuals, and to the satisfaction of the Project Manager.

23.7 Inspection:

All materials, equipment, and workmanship shall be subject to inspection, examination and testing by the Project Manager at all times and stages during construction, manufacture and/or installation, and they shall have the right to reject and order the removal and replacement of any defective material, equipment and / or workmanship or require its correction and rectification. The Contractor shall not proceed with any operation or sequence or trade of the Work until the previous operation or sequence or trade has been inspected and approved by the Project Manager. No embedded items or any other work shall be covered up unless these have been inspected and approved by the Project Manager. The onus shall be on the Contractor to get such inspections carried out and obtain such approvals. Should the Contractor fail to comply with these requirements, then all additional or redoing of work necessitated as a consequence thereof shall be at the Contractor's cost and expense. No inspection or approval shall relieve the Contractor of any of his responsibilities,

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obligations and liabilities under the Contract. No defective workmanship shall be repaired or patched up in any way without inspection and direction of the Project Manager.

Rejected workmanship shall be immediately corrected and rectified and rejected materials and equipment shall be removed and replaced with proper, specified and required materials and equipment, by the Contractor to the approval and satisfaction of the Project Manager. The cost of all such correction and rectification and such removal and replacement shall be to the account of the Contractor and shall be borne by him, and also, the Contractor shall be responsible for all delays in this regard. The Contractor shall promptly segregate and remove the rejected materials and equipment from the Site and shall not reuse them in the Work. If the Contractor fails to proceed at once with the correction and rectification of rejected workmanship and/or the removal and replacement of rejected materials and equipment, the Project Manager shall have the right to employ other persons / agencies to correct and rectify such workmanship and/or remove and replace such materials and equipment, and recover the cost thereof from the Contractor, or the Project Manager may terminate the right of the Contractor to proceed further with the Work.

The Contractor shall furnish promptly and without any charge, all facilities, access, labour, materials, plant and tools required and necessary for enabling the Project Manager, to carry out inspections and tests in a safe and convenient manner. The Contractor shall ascertain and ensure that the facilities and access provided for the carrying out of all inspections are completely safe in every respect and the Contractor shall be fully responsible and liable for all matters in connection with such safety.

23.8 Testing:

All the tests on materials, equipment, and workmanship that shall be necessary in connection with the execution of the Work, as decided by the Project Manager and as called for in the Contract Documents, shall be carried out at the cost of the Contractor at the place of work or of manufacture or fabrication or at the Site or at an approved testing laboratory or at all or any such places. The Contractor shall provide all assistance, instruments, machines, labour and materials as are required for the examining, measuring and testing as described above, which shall be got calibrated from approved laboratory at the specified frequency to ensure accuracy of results, the testing and all expenses connected with the tests as described above shall be borne by the Contractor.

23.9 Certificates:

The Contractor shall furnish, at his own cost, test certificates, calibration certificates for the various materials and equipment as called for by the Project Manager. Such test certificates should be for the particular consignment/lot/piece as decided by the Project Manager. The details in respect of the test and calibration certificates shall be as decided by the Project Manager for the relevant items.

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24. SAMPLES, SHOP DRAWINGS:

After the award of the Contract, the Contractor shall furnish for the approval of the Project Manager, all samples of materials and shop drawings called for in Contract Documents or required by the Project Manager. The samples and shop drawings shall be delivered as directed by the Project Manager. The Contractor shall construct prototypes of works as laid down in the Contract Documents or as instructed by the Project Manager, such prototypes or samples, of works, after approval by the Project Manager shall serve as the standards to be achieved in the final construction. No extra payment shall be due to the Contractor for submission of material sample and preparation of shop drawings and prototypes. A schedule giving dates of the submission of samples and shop drawings shall be included in the time schedule. Samples / materials approved by the Project Manager, shall be kept at Site under safe custody of Contractor and on completion of the Work handed over to the Project Manager.

25. CONSTRUCTION PROGRAMME, SCHEDULES AND PROGRESS REPORTS:**25.1 Construction Programme:**

- i. Every contractor should furnish along with his tender an overall construction programme utilizing a known CPM software package like Microsoft Project, latest version. The construction programme shall clearly show all the sequential activities of work required to be carried out from the commencement of the Work up to the Virtual Completion.
- ii. The Tenderers proposed Construction programme be submitted along with the tender defining various mile stones of floor levels.
- iii. Every, or sooner if required by the Project Manager, the approved programme charts shall be reviewed in relation to the actual progress of the Work, and shall be updated as necessary. If at any time it appears to the Project Manager that the actual progress of the Work does not conform to the approved programme, the Contractor shall produce, at its expense and without reimbursement therefor, a revised programme showing the modifications to the approved programme and the additional input of resources by the Contractor necessary to ensure completion of the Work within the time stipulated for completion.
- iv. The submission to and approval by the Project Manager of such programmes or the furnishing of such particulars shall not relieve the Contractor of any of his responsibilities, obligations and liabilities under the Contract.

25.2 Construction Schedules:

Along with the construction programme, the Contractor shall also submit the following monthly schedules in the prescribed format:

- i. Manpower Schedule.
- ii. Cash-flow Schedule.
- iii. Plant and Equipment Schedule
- iv. Materials Schedule (including status and mobilisation programme)
- v. Material samples Schedule
- vi. Shop drawings Schedule (including status and delivery)

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25.3 Daily site reports:

The Contractor shall throughout the contract period, submit daily site reports on an approved / prescribed proforma to the Project Manager. The reports will include, but not be limited to:

- i. Record of the Site progress
- ii. Number of employees on the Site
- iii. Number of men employed on individual trades
- iv. Plant and machinery at site (including an indication as to whether the plant is working or standing)
- v. Notification of accidents, if any
- vi. Events influencing the progress of the Work

25.4 The records should include all staff employed by the Contractor as Sub-contractors.

25.5 Site Register:

The Contractor shall maintain a site register that records the name and time of arrival and departure, at Site, of any visitors.

25.6 Progress Reports:

At the end of each month the Contractor shall submit a Weekly progress report in a prescribed / agreed format with the Project Manager. The reports shall include sets of progress photographs taken from pre-determined locations, which illustrate the progression of the Work.

25.7 Employee Records

The records should include all staff employed by the Contractor and Subcontractors.

25.8 Meetings:

The designated site incharge from contractor's side will attend and participate in the weekly progress review meetings, schedule review meetings and any other meetings convened by Project Manager where their presence is required, as determined by Project Manager. The designated site safety incharge of contractor shall attend all safety meetings conducted at job site and also participate in Weekly progress meetings, as required by Project Manager.

26. BUREAU OF INDIAN STANDARDS:

26.1 A reference made to any Indian Standards Specifications in the Contract Documents shall imply reference to the latest version of that Standard, including such revisions/amendments as may be issued, during the currency of the Contract, by the Bureau of Indian Standards and the corresponding clause/s therein shall hold valid in place of those referred to. The Contractor shall keep copies at the Site of all latest publications of relevant BIS Codes and Indian Standards

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Specifications applicable to the Work at the Site and as listed in the Specifications for quick referencing.

26.2 Amendments to BIS codes announced after finalization of the Contract shall be followed.

27. TOLERANCES:

27.1 The Contractor shall exercise every care to ensure that all structural members are plumb and true to line, level and dimensions called for on the Drawings, for the purposes of structural requirements as well as in order to receive finishes, equipment and similar items. The details of the finishing items are based upon allowing tolerances as per the most stringent requirements laid down in the Contract Documents/Indian Standard Specifications/Best Trade practices and the limits of tolerances shall be in strict conformity with such Documents and Standards. Any variations beyond such limits shall require, in accordance with the directions and to the approval of the Project Manager, rectifications in the structural members and/or wall openings or the remaking or replacing of the finishing elements and / or equipment, fabricated to fit into the openings or spaces shown on the Drawings. All such rectifications or remaking or replacing of work, shall immediately be carried out by the Contractor at his own cost and expense, and he shall be responsible for all delays in this regard. All such costs and expenses shall be recovered from the Contractor and shall be deducted by the BHEL from any money that may be payable or that may become payable to the Contractor.

27.2 In case of separate Contracts the Contractor or Sub-Contractor whose work does not conform to the dimensions and limits of tolerances specified in the Contract Documents and/or the Indian Standard Specifications shall be liable for all costs and expenses incurred for rectifications and/or replacements of any other Contractor's and/or Sub-Contractor's work required, in accordance with the directions of the Project Manager, for the proper installation of the finishing elements and/or equipment, and/or for structural purposes. The Project Manager's decision in this respect shall be final and binding on the Contractors and Sub-Contractors, and all such costs and expenses shall be recovered from the pertinent Contractors and Sub-Contractors and shall be deducted by the BHEL from any money that may be payable or that may become payable under the Contract to such pertinent Contractors and Sub-Contractors for and on behalf of the Contractor.

28. PROTECTIONS AND CLEANING OF WORKS AND CLEARING OF SITE:

28.1 Protection of works:

The Contractor shall take full responsibility for the proper care and protection of the Work from commencement of work until completion and handing over of the Work to the Project Manager at no additional cost. The Contractor shall protect and preserve the Work in every way from any damage, fire or accident, including by providing temporary roofs, boxing or other construction as required by the Project Manager. This protection shall be provided for all property on the Site as

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well as adjacent to the Site. The Contractor shall adequately protect, to the satisfaction of the Project Manager, all the items of finishing work to prevent any chipping, cracking, breaking of edges or any damage of any kind whatsoever and to prevent such work from getting marked or stained or dirty. Should the Contractor fail to protect the Work or any part thereof and should any damage be caused to the same, the Contractor shall be responsible for all replacement and rectification, as directed by the Project Manager, and all costs and expenses in connection with such replacement and rectification shall be to the account of the Contractor and shall be borne by him.

- 28.2 The Contractor shall in connection with the Work provide and maintain at his own cost all lights, security guards, fencing and anything else necessary for the protection of the Work and for the safety of the public and everyone associated with the Work, all to the approval and satisfaction of the Project Manager.
- 28.3 All operations necessary for the execution of the Work shall be carried out so as not to interfere with the convenience of the public, or with the traffic, or the access to, use and occupation of public or private roads and footpaths or of properties whether in the possession of the BHEL or of any other person. The Contractor shall indemnify BHEL in respect of all claims, proceedings, damages, costs, charges, and expenses whatsoever arising out of or in relation to any such matters.
- 28.4 **CLEANING OF WORKS AND CLEARING OF SITE: The Contractor shall maintain the Site, adjoining areas within 20 meters all around site and all Work thereon in neat, clean and tidy-conditions at all times.** The Contractor shall remove all rubbish and debris from the Site and adjoining areas on daily basis and as directed by the Project Manager. Suitable steel skips shall be provided at strategic locations around the Site to receive waste and packaging materials.
- 28.5 Just prior to the Virtual Completion of the Work, or whenever so directed by the Project Manager, the Contractor shall carry out all the work necessary to ensure that the Site & 20 meter area all around site is clear and the Work are clean in every respect, the surplus materials, debris, sheds and all other temporary structures are removed from the Site, all plant and machinery of the Contractor are removed from site, the areas under floors are cleared of rubbish, the gutters and drains are cleared, the doors and sashes are eased, the locks and fastenings are oiled, all electrical, plumbing and other services are tested and commissioned, the keys are clearly labelled and handed to the Project Manager, so that at the time of Virtual Completion the whole Site and the Work are left fit for immediate occupation and use, to the approval and satisfaction of the Project Manager.
- 28.6 Should the Contractor fail to comply with the cleaning requirements, whether progressively or before completion, or fail to clear the Site and 20 meter area all around site as directed and required, then the Project Manager, after giving due notice in writing to the Contractor, shall have the right to employ other persons or agencies to carry out the cleaning and/or clearing work and all costs incurred on such work shall be recovered from the Contractor and shall be deducted by the BHEL from any money that may be payable or that may become payable to the Contractor.

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29. METHOD OF MEASUREMENT: - WORKS TO BE MEASURED JOINTLY

29.1 The Project Manager shall, except as otherwise stated, ascertain and determine by measurement **carried out jointly with the contractor's agent or authorized representative**, the value of work done in accordance with the contract. He shall, when he requires any part or parts of the works to be measured, give notice to the Contractor's authorized agent or representative who shall forthwith attend or send a qualified agent to make measurements of the work done in the presence of the Project Manager or his representative and shall furnish all particulars required by the Project Manager for his approval. Should the Contractor not attend or neglect or omit to send such agent or to furnish all particulars required by the Project Manager, the measurements made by the Project Manager or approved by him shall be taken to be the correct measurements of the work. Any measurements made by contractor or the Project manager and approved by the Project manager, if found to be incorrect at a later stage will be corrected subsequently and the contractor shall fully cooperate in doing so with the Project manager.

29.2 For the purpose of measuring such permanent work as is to be measured by record drawings, the Contractor's representative shall prepare record drawings month by month of such work done or as and when called upon to do so by the Project Manager in writing and submit the same to the Project Manager for his approval. Should the Contractor neglect or omit to prepare and submit such record drawings, the Project Manager will have the same prepared himself and they shall be taken to be correct.

29.3 Method of Measurement

Where works have to be measured for any purpose, whatsoever, it shall be in accordance with IS-1200 unless, otherwise, specifically indicated in the contract.

30. COVERING UP:

The Contractor shall give at least 24 hours clear notice in writing to the Project Manager before covering up any of the Work in foundations or any other such areas in order that inspection of the Work may be carried out for maintaining proper quality control. In the event of the Contractor failing to provide such notice he shall, at his own expense, uncover such Work as required to allow the inspection to be taken and thereafter shall reinstate the Work to the satisfaction of the Project Manager.

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31. Withholding of payments:

The Project Manager may withhold payment or, on account of subsequently discovered evidence, nullify the whole or a part of any payment certificate to such extent as may be necessary to protect the BHEL from loss on account of including but not limited to the following:

- i. Defective work not remedied by the Contractor.
- ii. Failure of the Contractor to make payments properly and regularly to his own workers, to his Sub-Contractors, to his suppliers.
- iii. Damage by the Contractor to the work of other Contractors, Sub-Contractors or Vendors.
- iv. A reasonable doubt that the Contract cannot be completed for the balance unpaid amount.
- v. A reasonable doubt that the Contractor intends to leave work items incomplete.
- vi. Failure of the Contractor to execute the Work in conformity with the Contract Documents.
- vii. Failure of the Contractor to meet or keep-up with the approved Construction Programme.
- viii. Failure of the Contractor to comply with and fulfill all contractual obligations and liabilities stipulated in the Contract Documents.

32. Payment to sub-contractor / vendor :

The final payment of the contractor shall be made subject to submitting an indemnity bond on Rs. 100/- stamp papers stated as under:

“We undertake that payment against subject work order have been made in full to all sub-contractors, vendors. In case any claim is lodged by our sub-contractor, vendor, we shall bear the same and cost thereof and shall not hold BHEL or any of its employee responsible”.

33. RECTIFICATION OF IMPROPER WORK NOTICED

If it shall appear to the Project Manager during the progress of the Work that any work has been executed with unsound, imperfect or unskilful workmanship or with materials of any inferior description or that any materials or articles provided by the Contractor for the execution of the Work are unsound or of a quality inferior to that contracted for or otherwise not in accordance with the Contract, the Contractor shall, on demand in writing from the Project Manager specifying the work, materials or articles complained of, notwithstanding that the same may have been passed and certified, forthwith rectify or remove and reconstruct the work so specified in whole, or in part as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own proper charge and cost and in the event of his failing to do so within a period so specified by the Project Manager in his demand aforesaid, the Project Manager may rectify or remove and re-execute the work or remove and replace with others, the materials or articles complained of as the case may be at the risk and expense in all respects of the Contractor, and deduct the expenses from the Retention Money or any sums that may be due at any time thereafter may become due to the Contractor or from his performance bond.

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34. CHANGE ORDERS / VARIATIONS/ EXTRA ITEMS OF WORK

- 34.1 The BHEL / Project Manager reserves the right to alter the Scope of Work and consequently the Contract Price shall be suitably adjusted for such changes by reference to the rates in the Schedule of Rate. All change orders shall be issued by the Project Manager and the onus shall be on the Contractor to obtain such prior written consent of the Project Manager.
- 34.2 If the rates for the extra, additional, altered or substituted items of work are not specifically provided in the Schedule of Rates then such rates shall be derived by interpretation /interpolation from the rates that are specified for a similar class of work in the Contract. The Project Manager's interpretation as to what is a similar class of work and his decision on the method in which the rate is to be derived shall be final and binding on the Contractor.
- 34.3 If the rates for altered, additional, or substituted work cannot be determined in the manner specified in sub-clause 34.1 & 34.2 above, the rate for such items will be worked out on the basis of sanctioned schedule of rates or standard analysis of rates of latest versions of DSR.
- 34.4 If the rates for the extra, additional, altered or substituted items of work cannot be determined in the manner specified above, then the rates for such work shall be determined on the basis of actual /theoretical consumption of materials, and actual /theoretical use of labour, as detailed below; consideration of actual or theoretical consumption shall be at sole discretion of the Project Manager.
- i. Cost of materials actually used by the Contractor and /or by theoretical analysis of consumption of materials at work, at no more than prevailing market rates, actually incorporated in the Work.
 - ii. Cost of labour actually used at the Site and /or by theoretical analysis of labour utilization on the Work at prevailing rates of labour.
 - iii. **15%** of the costs in respect of (i) and (ii) above, towards Contractor's establishment, water & electricity charges, tool & plants, all other costs, overhead & profit plus applicable taxes.
 - iv. For this purpose, the Contractor shall submit to the Project Manager detailed analysis of the rate proposed by the Contractor supported by relevant vouchers along with the estimated quantity of work item involved.
- 34.5 If the Contractor and the Project Manager cannot agree on a rate as determined in accordance with this sub-clause, then the Project Manager may order and direct the work to be carried out by such other persons or agencies as it may think fit, and such other persons or agencies shall not, in any manner be prevented or obstructed in their work or from entering upon the Work by the Contractor for the purpose of carrying out such work. The Contractor shall not be entitled to any payment whatsoever in connection with such work carried out by such other persons or agencies.

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Before any extra work is undertaken by the Contractor, he shall ensure that he has received from the Project Manager a specific Change Order on a mutually agreed proforma, signed and approved by the Project Manager. No additional payments shall be made to the Contractor without prior agreement and receipt of the necessary signed Change Order. Each Change Order shall clearly state the value of the additional work agreed to and signed for by the Project Manager.

The Contractor shall at monthly intervals submit to the Project Manager an account giving particulars, as full and detailed as possible, of additional work ordered in writing by the Project Manager and which the Contractor has executed during the preceding month. In case any Change Order instructed by the Project Manager causes a delay in the completion of the Work causing the Contractor to overrun the time fixed for completion of the Work, the contractor shall notify the Project Manager in writing about such expected delay, before /issuance of such change order by the Project Manager. If necessary and if requested by the contractor within 3 days of the receipt of the change order in writing, the Project Manager shall organize with due dispatch, a joint review on the question of expected delay, to be held and had amongst the Contractor & BHEL and the issue of such expected delay would be immediately resolved through such joint review to facilitate extension of time for completion of the Work.

35. DEDUCTIONS FOR WORK NOT DONE AS PER SPECIFICATIONS:

- 35.1 If the Project Manager deems it inexpedient to get corrected or rectified any work of the Contractor which is defective or damaged or of substandard quality or is generally not in accordance with the Contract Documents, then an equitable and appropriate deduction shall be made thereof from the Contract Price, and the Project Manager's decision in this respect shall be final and binding on the Contractor.
- 35.2 Furthermore if, by reason of any accident, or failure, or other event occurring to, in or in connection with the Work, or any part thereof, either during the execution of the Work or during the Defects Liability Period, any remedial or other work or repair shall, in the opinion of the Project Manager, be urgently necessary for the safety of the Work, or any part thereof, and the Contractor is unable or unwilling to immediately and at once do such work or repair, the Project Manager may employ and pay other persons or agencies to carry out such work or repair as the Project Manager may consider necessary. If the work or repair so done by other persons or agencies is work which, in the opinion of the Project Manager, the Contractor was liable to do at his own expense under the Contract, then all expenses incurred by the BHEL in connection with such work or repair shall be recovered from the Contractor and shall be deducted by the BHEL from any money that may be payable or that may become payable to the Contractor or from the Contractor's performance bond.

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- 35.3 The defective or uncorrected work of the Contractor at any stage (during or after completion of work) may adversely affect or damage the work of other Vendors. Contractor shall at his own cost immediately rectify, correct or replace both his defective work as well as the work of the other Vendors so damaged, with in the time period stipulated by the Project Manager, so as not to effect the progress and quality of other Vendor's work. In case the Contractor fails to do the necessary corrections to the satisfaction of Project Manager or unduly delays the correction work, then the Project Manager shall be at liberty to get the correction work done and if the correction work is not possible, then any extra work necessary to cover the defect or damage, done through same / any other Vendor at Contractor's cost.

Actual costs including any incidentals thereof incurred by the BHEL on such corrections / extra works shall be recovered from the payments or any amounts due to the Contractor.

36. TIME FOR COMPLETION:

36.1 Time as the essence of the contract:

The time allowed for carrying out the Work as entered in the tender shall be strictly observed by the Contractor and shall be deemed to be of the essence of the Contract. The Work shall proceed with due diligence until Final Completion. The Contractor shall prepare a Construction Programme with time schedule keeping in view the completion period stipulated for specific portions of the Work and also the overall completion time and submit the same for the approval of the Project Manager. The Contractor shall comply with the time schedule as approved by the Project Manager. In the event of the Contractor failing to comply with the overall and individual milestones contained in the time schedules, he shall be liable to pay liquidated damages as provided for in this Contract.

36.2 Causes of delay for which claims for extension of time may be considered;

The Contractor shall be entitled to claim for extension of time, subject to the Conditions herein, should he be delayed or impeded in the execution of the Work by reason of the following:

- i. Force Majeure as defined in the contract.
- ii. Delay in the receipt of 'construction status' drawings from the Architect provided that, in the opinion of the Project Manager, the Contractor has made every effort and endeavor to minimize the effect of such delays.
- iii. Any change orders directed by the Project Manager, which in the opinion of the Project Manager entail the requirement of additional time for completion of the Work.

- 36.3 **Extension of Time** - In respect of conditions mentioned above, the Contractor shall submit in writing to the Project Manager his intention to claim for an extension of time within seven (7) working days of any of the above mentioned reasons or events causing a delay. Any claim of extension of time in respect of item (iii) shall be notified by the Contractor before such change order is actually issued. The Contractor shall thereafter detail and submit his claim for the extension of time within

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fourteen (14) working days of such delay having occurred. If the Contractor does not comply with both these conditions for each and every delay caused by any of the above-mentioned reasons or events, then he shall not be entitled to any extension of time.

- 36.4 **Claim of Extension of Time** - The Project Manager shall study and verify the particulars of the claim for extension of time submitted by the Contractor and shall then reject or amend or accept the claim. He will extend the time by notifying the Contractor in writing for completion of the Work by such period as he shall think adequate with the prior approval and the time for completion of the Work so extended shall for all purposes of the Contract be deemed the time specified for completion of the Work. The decision of the Project Manager in this regard shall be final and binding on the Contractor. No extension of time shall be granted separately for any concurrent or parallel activities, and only a delay, caused by any of the above-mentioned reasons or events, in a critical activity, which has a direct effect on the overall completion of the Work, shall form a basis for granting extension of time.
- 36.5 **Deletion or changes in the scope of work** - Should any deletions or changes in the scope of the Work reduce the time required to complete the Work under the Contract, then the time savings accruing from such deletions may be considered by the Project Manager in offsetting the durations awarded for an extension of time.
37. **NO FINANCIAL OR OTHER COMPENSATION FOR DELAYS:**
The Contractor shall not be entitled to any compensation for any loss suffered by him on account of delays in commencing or in executing or in completing the Work, whatever might be the cause of the delay.
38. **SUFFICIENCY OF TENDER:**
The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the Works and of the rates and prices stated in the priced bill of quantities and the schedule of rates and prices, if any. The tender rates and prices shall cover all his obligations under the Contract and all matters and things necessary, for the proper completion and maintenance of the Work.
39. **PROPRIETY & OCCUPATION OF EXECUTED WORK:**
All executed work, whether in part or in whole shall be the exclusive property of the BHEL. The Contractor or any of his Sub-Contractors or their employees or workmen or servants or agents shall not be entitled to the use of any such work except for the purpose of carrying out subsequent work that is required to be carried out under the Contract or to complete the Project. The BHEL shall have the right to occupy and take over the Work or any part thereof at any time during the progress of the Work or upon their completion, irrespective of any pending claims or disputes that the Contractor may have against the BHEL. Such occupation shall not relieve the Contractor of any of its obligations under the Contract.

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40. INDEMNITY:

40.1 The Contractor shall indemnify, defend and hold and keep indemnified, the BHEL, including their employees, officers, representatives, servants, agents, suppliers, vendors and any other persons claiming through or under them from and against all actions, suits, claims costs, liabilities and demands brought or made against the BHEL in respect of:

- i) any matter or thing done or omitted to be done by the Contractor or any of his Sub-Contractor(s) or their employees, workmen, representatives, agents, servants or suppliers in the execution of or in connection with the Work; or
- ii) any matter or thing done or omitted to be done by the Contractor or any of his Sub-Contractor's about performance under this Contract; or
- iii) against any loss or damage to the BHEL in consequence of any action or suit being brought against the Contractor or any of his Sub-Contractor(s) or their employees, workmen, representatives, agents, servants or suppliers for anything done or omitted to be done in execution of the Work and the Project Coordination Services under this Contract; including but not limited to a) meeting the Project milestones, b) non-compliance with the applicable laws and regulations of the government and local authorities, c) not obtaining the relevant licenses and permits, d) infringing any patents rights specifically regarding use, storage and disposal of hazardous materials. The obligations of the Contractor under this clause shall survive the termination or expiry of this Contract.

40.2 The Contractor shall ensure that the Sub-Contractors indemnify, defend and hold, and keep indemnified the BHEL, including their employees, officers, representatives, servants, agents, suppliers, vendors and any other persons claiming through or under them harmless from all actions, suits, claims, costs, fines, judgements and liabilities in respect of:

- a) any matter or thing done or omitted to be done by the Sub-Contractors or their employees, workmen, representatives, agents, servants and suppliers in execution of or in connection with the Work; or
- b) any matter or thing done or omitted to be done by the Sub-Contractors or their employees, workmen, representatives, agents, servants and suppliers arising out of or in any way alleged to be in connection with Sub-Contractors' performance under this Contract; including but not limited to a) not meeting the Project milestones, b) non-compliance with the applicable laws and regulations of the government and local authorities, c) not obtaining the relevant licenses and permits, d) infringing any patents rights and specifically regarding the storage, use or disposal by the Sub-Contractors of hazardous materials in, on or under the Site or at any location whatsoever in connection with the Project in any way.

The Sub-Contractors' responsibility under this indemnification shall also include any and all hazardous materials introduced to the Site by their agents, representatives, employees, workmen, servants and suppliers. The obligations of Sub-Contractors under this clause survive the termination or expiry of this Contract.

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41. RECTIFICATION OF WORK BEFORE VIRTUAL COMPLETION OF WORKS:

- 41.1 The Project Manager shall conduct an extensive inspection just prior to the Virtual Completion of the Work and shall prepare a list of materials, equipment, and workmanship which are defective or damaged or of substandard quality or improperly executed or generally unacceptable due to not being in conformity with the requirements stipulated in the Contract Documents. The Contractor to the satisfaction of the Project Manager shall promptly remove, replace, re-execute, rectify and make good, to conform to the requirements stipulated in the Contract Documents, all such materials, equipment, and/or workmanship included or itemized in the said list and the Contractor shall bear and pay for all expenses in connection therewith and consequent thereon and incidental thereto, including the cost for all remedial work on the work of other contractors destroyed or damaged by such removal, replacement, re-execution, rectification and making good. If the Contractor fails to remove, replace, re-execute, rectify and make good the rejected materials, equipment, and/or workmanship within a reasonable time, fixed by written notice, the BHEL may employ and pay other persons or agencies to carry out such removal, replacement, re-execution, rectification and making good and all expenses incurred in connection therewith, including all damages, losses and expenses consequent thereon and incidental thereto shall be recovered from the Contractor and shall be deducted by the BHEL from any money that may be payable or that may become payable to the Contractor. It is clarified that all materials shall be procured by the Contractor at his own cost for construction of work.

42. VIRTUAL COMPLETION OF WORKS:

- 42.1 The Works shall be considered as Virtually Complete only upon fulfillment of the procedure laid down in contract, and only after the Work has been completed in every respect in conformity with the Contract Documents and after all the systems and services have been tested and commissioned, and after the Site has been cleared and the Work cleaned in accordance with contract and when the Project Manager has certified in writing that the Work is Virtually Complete. **The Defects Liability Period shall commence from the date of such Certificate of Virtual Completion.**
- 42.1 Should, before Virtual Completion, the BHEL decide to occupy any portion of the Work or use any part of any equipment, the same shall not constitute an acceptance of any part of the Work or of any equipment, unless so stated in writing by the Project Manager.
- 42.2 **Prior to the issue of the Virtual Completion Certificate, the Contractor shall submit and hand-over to the BHEL the keys to all locks, all operation and maintenance manuals for systems and services, material reconciliation statements, warranties, as built drawings, any spares called for in the Contract, and everything else necessary for the proper use and maintenance of the Work complete with all systems and services.**

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42.3 GUARANTEES

The Contractor understands and agrees that the BHEL is expressly relying and will continue to rely on the skill and judgment of the Contractor in executing the Work and remedying any defects in the Work. The Contract represents and warrants that:

- i. The Contractor shall perform the Work in a timely manner, in strict accordance with the Contract Documents, and consistent with generally accepted professional, construction and construction-supervision practices and standards provided by an experienced and competent professional contractor and construction supervisor rendered under the same or similar circumstances.
- ii. The Contractor is and will be responsible to the BHEL for the acts and omissions of all Sub-Contractors and their respective employees, agents and invitees and all the persons performing any of the Work.

Besides the guarantees required and specified elsewhere in the Contract Documents, the Contractor shall in general guarantee all work executed by the Contractor and the Sub-Contractors for Defects Liability Period from the date of issue of the Virtual Completion Certificate. Those parts of the Work or equipment or installations, for which extended guarantee periods are stipulated elsewhere in the Contract Documents, shall be guaranteed for such periods that are so stipulated. The duration of the Defects Liability Period, unless specified otherwise, shall be the extent of length of such guarantee periods.

The Contractor represents, warrants and guarantees to the BHEL, inter alias that:

- i. The construction of the Project shall be approved and capable of use, operation, performance and maintenance for accomplishing the purpose for which it has been built and acquired.
- ii. The Work shall comply with the Specifications, Drawings, and other Contract Documents.
- iii. The Work shall, for Defect Liability Period from the date of issue of the Virtual Completion Certificate, be free from all defects and the Project shall be of structural soundness, durability, ease of maintenance, weather tightness etc.
- iv. The materials, workmanship, fabrication and construction shall be of the specified and agreed quality and all materials shall be new.
- v. The Work performed for the BHEL shall be free from all liens, charges, claims of whatsoever nature from any party other than the BHEL.

Where, during such guarantee periods as mentioned above, any material or equipment or workmanship or generally any item of work fails to comply or perform in conformity with the requirements stipulated in the Contract Documents or in accordance with the criteria and provisions of the guarantee, the Contractor shall be responsible for and shall bear and pay all costs and expenses for replacing and/or rectifying and making good such materials, equipment, workmanship, and items of work and, in addition, the Contractor shall be also responsible for and shall bear and

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pay all costs and expenses in connection with any damages and/or losses suffered as a consequence of such failure.

All guarantees required under the Contract shall be in the format approved by the Project Manager and submitted to the Project Manager by the Contractor when requesting certification of the final bill.

43 DEFECTS LIABILITY:

The Defect Liability Period shall be applicable as mentioned in the Contract.

44.1 Maintenance by contractor during defects liability period:

All defective items of work and defects noticed and brought to the attention of the Contractor during the Defects Liability Period shall be promptly and expeditiously attended to and replaced and/or rectified and made good by the Contractor at his own cost, to the complete satisfaction of the BHEL.

44.2 Replacement and/or rectification and making good by contractors of all defective materials, equipment and/or workmanship during defects liability period:

The Contractor shall replace and/or rectify and make good, at his own cost, and to the satisfaction of the BHEL, all defective items of work and defects arising, in the opinion of the Project Manager, from materials, equipment, and/or workmanship not performing or being in accordance with the Drawings or Specifications or the instructions of the Project Manager or other Contract Documents or the best engineering and construction practices, and which may appear or come to notice within Defects Liability Period after Virtual Completion of the Work. **Any item, material or matter repaired or replaced shall receive a new Defects Liability Period of like duration beginning from the date of the repaired or replaced item, material or matter is returned for use to the BHEL, provided that the aggregate guarantee period shall not exceed 24 months.** The Contractor shall be also liable for all costs associated with damages and/or losses which are a consequence of such defective items of work and defects, and such costs shall be recouped by Project Manager from the Contractor and shall be recovered from the Retention Money held and/or from the Contractor's final bill (if the final bill has not been certified and paid for at the time), or the same would otherwise be recovered from the Contractor.

It is clarified that all materials shall be procured by the contractor at his own cost for carrying out correction work. No charges shall be paid on this account.

On failure of the contractor to rectify, correct or replace the defective works or on undue delay on part of the contractor for the same, the Project Manager shall be at liberty to undertake the correction works by itself or through any Vendor at the Contractor's cost. All such costs including any incidentals thereof incurred by the Project Manager shall be recovered from the Contractor's payments or from any amounts due to the Contractor.

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Taking over of the works prior to completion of the Defects Liability Period by the Project Manager, shall not discharge the contractor of his responsibilities for the balance Defects Liability Period and the Defects Liability Period shall remain in force till completion of Defects Liability Period as mentioned in the contract.

On removal of all the defects, handing over to the Project Manager and successful completion of the Defects Liability Period by the Contractor, the Project Manager shall take over and issue the Final Completion Certificate to the contractor and the Defects Liability Period shall be deemed to be complete.

44.3 FINAL COMPLETION OF THE WORK:

The Work shall be considered as finally complete at the end of the Defects Liability Period subject to the Contractor having replaced and/or rectified and made good all the defective items of work and defects and hand over the building in accordance with clause above, to the satisfaction of the Project Manager, and provided that the Contractor has performed all his obligations and fulfilled all his liabilities under the Contract, and when the Project Manager has certified in writing that the work is finally complete.

44 INTELLECTUAL PROPERTY RIGHTS:

44.1 It is hereby acknowledged and agreed that the BHEL has commissioned the Work in connection with the Project and accordingly BHELship of all intellectual property rights, including but not limited to property rights in the design and in all Drawings, Specifications and documents prepared by the Architects, the Contractor and any Sub-Contractors or Vendors belongs and shall be assigned solely to the BHEL who shall be entitled to deal with the designs, Drawings, Specifications and documents in whole or in part, in any manner in the BHEL's sole discretion, directly or through the Project Manager. The Contractor hereby disclaims any right whatsoever on these intellectual property rights in which cases the BHEL shall be duly informed in that regard. This intellectual property right entitlement shall extend to any maintenance, repair and renewal, reinstatement and enlargement of the Project. The Contractor shall ensure that any provisions of this type necessary to protect the intellectual property rights of the BHEL are included in all its contracts with Sub-Contractors.

44.2 All communications, whether written or oral, including but not limited to this Contract, its Annexures, Drawings, data sheets, Specifications, bills of material, sketches, calculations, designs and all other materials shall be treated as confidential and shall be the exclusive property of the BHEL unless otherwise agreed in writing and must be given to the BHEL upon request, but in any event all such materials shall be delivered to the BHEL upon termination/expiry of this Contract.

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- 44.3 The Contractor agrees that it and its employees, agents, Sub-Contractors and consultants shall not (without the prior written consent of the BHEL) during the term of this Contract or thereafter, disclose, make commercial or other use of, give or sell to any person, firm or corporation, any information received directly or indirectly from the BHEL or acquired or developed in the course of the Work, Project or this Contract, including by way of example only, ideas, inventions, methods, designs, formulae, systems, improvements, prices, discounts, business affairs, trade secrets, products, product specifications, manufacturing processes, data and know-how and technical information of any kind whatsoever unless such information has been publicly disclosed by authorized officials of the BHEL. The Contractor agrees that prior to assigning any employee or agent or hiring any Sub -Contractor or consultant to work on this Project, such employee, agent, Sub-Contractor or consultant shall be required to execute a document containing in substance and form, a confidentiality provision similar to this provision.
- 44.4 The Contractor shall not, without the Project Manager's prior consent:
- i. Take any photographs or videos of the Project (or any part thereof) for use otherwise than in connection with carrying out and completion of the Project;
 - ii. Write for publication, or cause, information or comment or pictures about the Project;
 - iii. Supply to any third person such as actual and prospective clients, contractors, publishers, other interested parties and the like, the designs and any articles or information relating to the Project; and
 - iv. Give interviews to the press including television, radio print and the like regarding the Project or the Contractor's involvement in the Work.
- 44.5 Notwithstanding the foregoing, this provision shall not limit the obligation of the Contractor to take photographs and/or videos on a regular basis for the purpose of providing the progress reports required by this Contract.
- 44.6 The Contractor, Sub-Contractors and their respective employees, representatives, agents, servants, workmen and suppliers shall not, during or after the termination/expiry of this Contract, disclose any information pertaining to this Contract or the Project to any person without the prior written consent of the BHEL except when called upon to do so by a valid and lawful direction or order of a statutory or Government authority or an order of a court of law or where any of the parties require production of this document and related information for establishing their respective legal rights.

45 GOVERNING LAW:

The governing law of the Contract shall be Indian law.

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46 STANDARDS OF CONDUCT:

47.1 The Contractor, in performing its obligations under this Contract, shall establish and maintain appropriate business standards, procedures and control, including those necessary to avoid any real or apparent impropriety or adverse impact on the interests of the BHEL. The BHEL will in no event reimburse the Contractor for any costs incurred for purposes inconsistent with such policies.

47.2 Compliance with Laws, Rules and Regulations:
Contractor represents, warrants, certificates and covenants that in connection with performance under this contract that:

- i. It shall, and the Work to be provided hereunder shall, comply with all applicable Local, National, and Central Laws, rules and regulations, including but not limited to those governing building constructions, environmental, safety of persons and property, ESI, workmen compensation, PF and applicable industrial/labour laws, and land development laws, rules and regulations.
- ii. No services provided hereunder will be produced using forced, indentured or convict labour or using the labour of persons in violation of the minimum working age law in the country where the Work are rendered;
- iii. It shall comply with all laws regarding improper or illegal payments, gifts or gratuities; and Contractor agrees not to pay, promise to pay or authorize the payment of any money or anything of value, directly or indirectly, to any person or entity for the purpose of illegally or improperly inducing a decision or obtaining or retaining business or any advantage in connection with this Contract;
- iv. It has not paid or provided and shall not pay, any gratuity for the benefit of any agent, representative or employee of the BHEL other than in accordance with the BHEL's applicable policies; and
- v. It has not, and shall not, engage in any sharing or exchange of prices, costs or other competitive information or take any other collusive conduct with any third party supplier or bidder in connection with the preparation or submission of any bid or proposal to the BHEL or the negotiation of this Contract.
- vi. It will also comply with all rules and regulations of the BHEL which may be in effect at the Facility site regarding employment, passes, badges, smoking, fire prevention, safety and conduct or property. On behalf of the BHEL, Contractor shall request and monitor that such is observed by any Contractor, subcontractors, vendors and each of their employees.

46.1 WARRANTY AS TO DOCUMENTS SUBMITTED TO BHEL; AUDIT:

The Contractor represents that all Documents, including invoice, vouchers, and financials to settlements, billings and other reports submitted or to be submitted by the Contractor to the BHEL

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in support of an application payment are true, correct, complete and accurate in all respects. Upon request of the BHEL, the Contractor agrees to cooperate fully with the BHEL in the conduct of a billing and technical audit by an independent agency of the billings by the Contractor for the Work.

The Contractor accepts that the contract / work shall be subject to the technical audit by an independent technical auditor appointed by the BHEL to audit the quality and quantities of the works done by the contractor, and agrees to render all necessary assistance to such agencies / professionals, whose reports / assessments shall be final and binding. Contractor shall fulfill the requirements as per the auditor's assessments at his own cost with in the time stipulated by the Project Manager.

47 CHANGES IN CONTRACTOR'S CONSTITUTION:

- 47.1 Where the contractor is a Partnership, prior approval in writing shall be obtained from the Project Manager before any change is made in the Constitution of the partnership.
- 47.2 Where the Contractor is an individual or a Hindu Undivided Family business, such written approval from the Project Manager shall likewise be obtained before Contractor enters into any partnership agreement in which the partnership would have the right to carry out the work previously to be undertaken by the Contractor.
- 47.3 If such written prior approval is not obtained by the Contractor, the contract shall be deemed to have been assigned in the contravention of contract and same action taken and consequences ensue, as provided for in the Contract.

48 GROUNDS FOR WITHHOLDING PAYMENTS:

The BHEL may withhold the whole or part of any compensation due to the Contractor to the extent necessary to protect the BHEL from any loss on account of any breach of Contractor's obligations under the Contract. When the cause for withholding is rectified, such amounts then due and owing shall be paid or credited to the Contractor.

49 ACCOUNTS AND AUDIT:

The Contractor agrees to maintain true and accurate financial statements and books of accounts, recording all income and expenditure in relation to the Project ("Books of Accounts"). The Books of Accounts shall, at all times, be maintained at the Site or at the office of the Contractor. The Contractor agrees that the BHEL, shall have the right to conduct (or cause to be conducted) an independent audit of the Books of Accounts at any time during the subsistence of the Contract. **Additionally, the Contractor agrees that the Books of Accounts shall be maintained for 36 months subsequent to the expiry/termination of the Contract.**

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50 CONTRACT SIGNING:**50.1 LETTER OF INTENT/ WORK ORDER**

After scrutiny, negotiations and discussions, the BHEL shall issue a Letter of Intent to a selected contractor out of the tenderers, intimating to him the intent/ decision of the BHEL to award the work contract to him.

50.2 CONTRACT AGREEMENT

The successful Tenderer shall enter into agreement with the BHEL on non-judicial stamp paper of appropriate value as per 'Articles of Agreement' enclosed in the tender document with such modifications as may be necessary, within 10 days of intimation. Expenses for the agreement including cost of stamp papers etc. shall be borne by the contractor. In case of delay, the Earnest Money Deposit (EMD) may be forfeited and the Tender cancelled or the contract enforced as per terms of the Tender and the Tenderer shall thus be bound even though the formal agreement has not been executed and signed by the Tender.

51 APPROVAL BY STATUTORY BODIES:

The Project Manager will handle commencement Certificate, No Objection Certificate and Occupation Certificate if applicable for the permanent building works under this Contract.

The contractor shall be responsible for providing required notices to authorities and to obtain and retain with him at his own cost all other approvals from the statutory bodies pertaining to works under this tender and temporary structures to be constructed at site, labour, ESI, PF, Tax Deptts. etc. and any other approval required to facilitate performance of Contractor's work under the Contract till completion.

Refusal by statutory authorities to issue completion / occupation certificate or any other approvals due to the Contractor's failure to construct the building in accordance with the sanctioned plans and/or specifications shall render the Contractor liable for damages and in addition, render him liable to obtain such certificates at his cost.

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52 PROJECT MANAGER/ ARCHITECT'S INSTRUCTIONS:

52.1 Project Manager may, at his absolute discretion and from time to time, issue further drawings and/ or verbal/ written instructions, details, directions, & explanations, which are hereafter collectively referred to "Project Manager's Instructions" in regard to:

- a) Variation or modification of the design, quality or quantity of works or the addition or omission or substitution of any work.
- b) Any discrepancy in the drawings or between the Schedule of Quantities and/or drawings and/or Specifications.
- c) Removal from the site of any materials brought therein by Contractor and the substitution of any other material therefore.
- d) Removal and/or re-execution of any work executed by Contractor.
- e) Dismissal from the works of any persons employed therein.
- f) Opening up for inspection of any work covered up.
- g) Amending and making good of any defects.

52.2 Contractor shall forthwith comply with and duly execute any work comprised in such "Project Manager's Instructions" provided always that verbal instructions, directions and explanations given to contractor or his representative upon the works by Project Manager shall, if involving a variation, be confirmed in writing by the contractor from the Project Manager within seven days.

52.3 The Contractor shall maintain a Site instruction file at the Site office. All instructions received from the Project Manager relating to the Work shall be retained in the file.

53 DRAWINGS

Drawings forming part of the Contract are listed in **Annexure-B**. Further supplementary Drawings furnished by the Project Manager from time to time shall also be deemed to form part of the Contract.

53.1 WORKING DRAWINGS

Three copies of Working Architectural/ Structural drawings marked 'Good for Construction' and duly signed by the Architect / Consultants shall be issued by the Project Manager from time to time during the contract period, based on which the contractor shall prepare 'Shop drawings', 'Bar Bending Schedules', etc. as required for approval of the Project Manager and proceed with construction work. Working drawings are diagrammatic but shall be followed as closely as actual

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construction permits. Any deviations made shall be in conformity with the direction of the Project Manager and with the prior approval of the Project Manager.

- i. Architectural drawings shall take precedence over Structural drawings, which in turn shall take precedence over services drawings in regard to all dimensions.
- ii. The Contractor shall verify all dimensions at the Site and bring to the notice of the Project Manager discrepancies if any, the Project Manager's decision in this respect shall be final.

53.2 REFERENCE DRAWINGS:

The Contractor shall maintain on site one set of all Drawings issued to him for reference.

53.3 SHOP DRAWINGS:

The Contractor shall prepare and submit, during the currency of the project, to the Project Manager four (4) hard copies and one soft copy of all shop drawings for approval of the BHEL.

Shop drawings shall be submitted generally for the following:

- i. Construction and installation details for shuttering and formworks
 - ii. Structural Steelwork, especially joint details.
 - iii. For specific areas requiring detailing as called for by the Project Manager.
 - iv. Manufacturer's and/or Contractor's fabrication drawings for equipment supplied by Contractor.
- a) Shop drawings shall be submitted for approval sufficiently in advance of planned delivery and installation of any materials to allow Architect/Consultant ample time for scrutiny. No claims for extension of time shall be entertained because of any delay in the work due to his failure to produce shop drawings at the right time, in accordance with the approved programme.
- b) **Manufacturer's drawings, catalogues, pamphlets, equipment characteristics data, performance charts and other documents submitted for approval shall be in four sets.** Each item in each set shall be properly labeled, indicating the specific services for which material or equipment is to be used, giving reference to the governing section and clause number and clearly identifying in ink the items and the operating characteristics. Data of general nature shall not be accepted.
- c) Samples of all finishing materials like Tiles (vitrified and ceramic), Indian marble & granite, paints, door shutters, door locks & other hardware etc. other than materials so specified shall be submitted to the Project Manager prior to procurement. These will be submitted in triplicate for approval and retention by Project Manager and shall be kept in their site office for reference and verification till the completion of the Project.

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- d) Approval of shop drawings shall not be considered as a guarantee of measurements or of building dimensions. Where drawings are approved, said approval does not mean that the drawings supersede the contract requirements, nor does it in any way relieve the contractor of the responsibility or requirement to furnish material and perform work as required by the contractor.
- e) Where the contractor proposes to use an item of equipment, other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundation, piping, wiring or any other part of the mechanical, electrical or architectural layouts; he shall inform the Project Manager well in advance and no delays resulting from such re-design shall be admissible. He shall also submit all related information as may be required for such redesign to the Project Manager.
- f) Where the work of the contractor has to be installed in close proximity to, or will interfere with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. If so directed by the Project Manager, the contractor shall prepare composite working drawings and sections at a suitable scale not less than 1:50, clearly showing how his work is to be installed in relation to the work of other trades. If the Contractor installs his work before coordinating with other trades, or so as to cause any interference with work of other trades, he shall make all the necessary changes without extra cost to the BHEL.
- g) Within four weeks of approval of all the relevant shop drawings, the contractor shall submit four copies of a comprehensive variation in quantity statement, and itemized price list of recommended (by manufacturers) imported and local spare parts and tools covering all equipment and materials in this contract.

53.4 **COMPLETION/ AS BUILT DRAWINGS**

- a. Contractor shall maintain adequate records of all changes to the works and shall issue the same from time to time as required by the Project Manager. Contractor shall prepare accurate and complete "As built drawings" of the work as constructed. Such drawings shall include all concealed construction, field changes, and other details not indicated in initial contract drawings.
- b. On completion of the Work, the Contractor shall submit one (1) Reproducible/ soft copy and two (2) Prints of the site produced drawings and marked "AS BUILT" drawings verified and approved by the Architect to the Project Manager. These drawings shall include and show all the changes / deviations made from the working drawings during the course of construction and also the other details as called for by the Project Manager.

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During the execution of the Works a set of drawings shall be retained in the Contractor's Site Offices for the exclusive purpose of recording changes made to the Work as the construction proceeds. The drawings shall be prepared on computer through AutoCAD Software and provided to the Project Manager on CD.

- c. Final payment to contractor shall depend in part upon receipt and approval of all necessary "As built drawings".
- d. Contractor is deemed to have included for the cost of production of "As built drawings" in his Tender.

54 COMMENCEMENT OF WORK / PERIOD OF COMPLETION

The Contractor shall commence mobilization for the works immediately after receipt of the Letter of Intent and Instructions to mobilise from the Project Manager. **The mobilization shall be completed within 15 days thereafter and works shall commence soon after mobilization.** Time is the essence of this contract. **All works as per this Contract shall be completed within one (1) year from the date commencing after the end of the mobilization period.**

Target dates for completion of construction for specified areas as mentioned in this tender document must be strictly adhered to. Contractor shall work out a detailed programme of Construction, adhering to the target dates, and submit it to Project Manager for approval, within two weeks from the date of letter of intent.

As work is to be executed in an expeditious manner, Contractor shall furnish to Project Manager Progress reports once in a month detailing stages of work completed, work in progress and work to be taken up, as also the consumption and stock figures relating to the various items of materials. He shall also furnish to Project Manager the details of his procurement action in respect of all materials.

For timely completion of work, Contractor, if required by the Project Manager, shall work in two or three shifts without any extra payment. The normal working hours will be 8.30 A.M. to 5.30 P.M. However, if contractor wishes to work extra hours for completing the work schedule, he shall obtain permission from Project Manager for working extra hours.

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55 QUALITY ASSURANCE AND CONTROL PROGRAMME:

The Contractor shall establish an effective quality control system at the Site and implement the same through an independent team consisting of the Contractor's Representative and qualified and experienced engineers and technical personnel to enforce quality control on all items of the Work and the Project at all stages.

56 REPORTS & CHECKLISTS BY CONTRACTOR:

Within 15 days of award of contract the contractor shall submit the draft formats for various reports and Checklists for the approval of the Project Manager. During progress of the Work the Contractor shall prepare and submit to the Project Manager various checklists, for having checked various Works at different stages of progress and reports as per the approved formats and at specified frequency.

The Contractor shall file daily category-wise labour return. The report shall indicate scheduled requirement against actual strength.

The Contractor shall prepare weekly reports of planned and actual progress of the Work and the subsequent week's scheduled Work. These will also include material procurement status.

These reports shall be submitted to Project Manager and shall be reviewed in weekly co-ordination meeting.

The Contractor shall submit monthly progress report along with monthly bills.

Further progress charts and schedules shall be prepared by the Contractor as directed by the Project Manager.

Contractor shall submit a safety procedure manual or Company policy on safety. Complying with the SHE Plan and outlining its implementation by the Contractor and including:

- i. Quality Assurance and Control System (Sample format).
- ii. Realistic construction programme/schedule.

Contractor shall maintain and make available all the records pertaining to reports, returns and checklist to the Project Manager during audits (internal as well as external) and make necessary corrections, additions and actions based upon the findings / observations of the audits.

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57 INSPECTION AND TESTING OF MATERIALS:

- 57.1 The Contractor shall, if so required, produce manufacturers' test certificates for any particular batch of materials supplied by him. The tests carried out shall be as per relevant Indian Standards and shall be carried out at Government approved test facility specified by the Project Manager.
- 57.2 For checking setting out and testing materials at the Site the Contractor shall provide the following minimum testing equipment:
- i. One theodolite & tripod capable of reading to 20 seconds
 - ii. One level with horizontal circle and tripod.
 - iii. Two metric levelling staffs not less than 3.5mtr high.
 - iv. One 100 metre rust less steel band, one 30 metre rust less steel tape & two 30 metre linen tapes.
 - v. An adequate number of ranging rods drop arrows, wooden setting-out pegs, etc.
 - vi. Weighing machines
 - vii. Spirit levels, plumb bobs
 - viii. Micro meters
 - ix. Thermometers
 - x. Hydraulic testing machines
 - xi. Smoke test machines
 - xii. Moisture meters
 - xiii. Complete sets of sieves
 - xiv. Oven.
 - xv. Compression Testing Machine for concrete and bricks
 - xvi. Slump testing apparatus.
 - xvii. Sieve sets for testing of fine and coarse aggregate balance
 - xviii. Cube moulds – Minimum 12 nos.
 - xix. Balance

All such equipment shall be calibrated at specified frequency for accuracy at a Testing Facility approved by the Project Manager and calibration certificates will be submitted to the Project Manager.

The Contractor shall get other tests carried out at his own cost at approved laboratory as per the directions of the Project Manager.

58 TESTING OF INSTALLATIONS:

All water retaining structures and the basement shall be tested as specified for the waterproof qualities, in the presence of the Project Manager. The Contractor shall also perform all such tests as may be necessary and required by the Project Manager to ensure quality of the executed works and by local authorities to meet Municipal and other bye-laws, regulations in force. The Contractor shall provide all labour, equipment, and materials etc., required for the performance of the tests.

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59 DRILLING, CUTTING ETC.:

All cutting and drilling of walls or other elements of the building for the proper entry/installation of inserts, boxes, equipment, etc. shall be carried out using electrically operated tools only. **Manual drilling, cutting, chiseling, etc. shall not be permitted. No structural member shall be cut or chased without the written permission of the Project Manager.** Cutting and drilling of structural members shall be carried out using vibration free diamond wire sawing and diamond drilling only with prior permission from the Project Manager. The costs for procurement and using such equipment are deemed to be included in the Contract and no extra costs will be paid.

60 DEWATERING AND FLOODING CONTROL

The Contractor is deemed to have allowed for any and all temporary dewatering, during the execution of his Work. Such work shall include but not necessarily be limited to the safe disposal of the resulting water; removal, replacement and/or recompaction of the water logged soils/surfaces; backfilling plugging of all temporary sumps, ditches, temporary materials and devices.

Contractor shall be deemed to have allowed for all costs associated with removal of flood waters and any associated sludge debris etc. from the basement level or any other part of the building so effected in the event of flooding due to heavy rains during his construction activities and after basement, superstructure work is completed until such time as Contractor has completed and handed over all his works under the Contract.

61 OTHER SITE FACILITIES**61.1 Accommodation/Transportation**

The contractor shall make his own arrangement for living accommodation of staff, labour, local conveyance etc. at his own cost. No living accommodation shall be permitted for staff and labour within the site.

61.2 Limitations of space & facilities to be provided

Due to the constructed and sensitive nature of the site, the following limitations are imposed:

- a. Contractor shall be deemed, should he so elect to have allowed for all costs and time associated with the manufacture of pre-cast concrete/ reinforcement steel at an off-site location, its transportation to site and placement at final location.

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- b. Should the contractor elect to manufacture said pre-cast units on site, the site location, if available for said manufacture and storage shall have the prior approval of the Project Manager.
- c. Contractor is advised that on-site parking, other than legitimate construction traffic for loading/unloading purposes in the designated areas shall be limited and must have the Project Manager's prior approval.
- d. Contractor shall immediately remove any illegally parked on site any company or private vehicles when required by Project Manager.

61.3 Project Managers Office

- a. The Contractor shall supply, erect and satisfactorily maintain in good repair until final completion of the Project, at no additional cost, where directed within the site, office accommodation including water supply, plumbing, sanitary, electrical fittings/ fixtures, air conditioners (for all rooms) for the Project Manager and his staff. This accommodation shall be well lighted and ventilated and provided with the following facilities.
 - i. Free water, stabilised power and lighting as required for the duration of the Project.
 - ii. Sanitation facilities for the duration of the Project.
 - iii. Janitorial and Housekeeping of PM office on daily basis.
- b. The building will be maintained by the contractor during the contract period. The cost of this construction/ maintenance of this building shall be borne by the contractor.
- c. The accommodation will be demolished when directed.

61.4 Sign Boards

The contractor is not entitled to do any publicity on account of the project. Contractor shall not put any hoarding, publish any advertisement, put any banner or circulate any pamphlet or adopt any other publicity method save and except with prior written approval of the Project Manager.

A Sign Board of overall size approximately 2.5m x 2.0m may be made and displayed by the Contractor at his own cost at the Site at some approved place. The drawing of the Name Board shall be got approved from the Project Manager. The contents of the board shall be as follows:-

- i. Name of the Project.
- ii. Name of the Owner/Owners.
- iii. Project Manager/ Architect / Consultants with their addresses.
- iv. Contracting Agency.
- v. Other Contracting Agencies.

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Care should be taken to see that the height of letters especially for the Architects should not be more than 2" to abide by the code of professional conduct prescribed by the Indian Institute of Architects. The colour, texture etc., of the board shall be as per the Architect's instructions.

61.5 Barricading / Safety Precautions

- a. The contractor shall provide around all excavations, of whatsoever nature, temporary barricades and/or fencing including warning signs, signals, notices and lights as appropriate to the particular situation, and of sufficiency and strength suitable for said situation. Same shall be maintained continuously until the particular potential hazards are no longer there. In like manner same shall be maintained at, but not necessarily be limited to, such works as demolition, dismantling, erection etc.
- b. **The Contractor shall also provide around the site boundary temporary barricading with 6mtr.** High CGI sheets using steel sections not more than 3 M apart including lockable security steel gate and leaving the barricading until completion of work. The barricading shall be painted as per the instructions of the Project Manager.
- c. Site Boundary wall existing at site shall be maintained by the Contractor at his own cost till completion of the Project.
- d. Contractor is deemed to have allowed for all direct or associated costs arising thereof, when tendering for the work.

61.6 Watching and Guarding

- a. The Contractor shall provide and maintain at his own expense, all lighting, guards, fencing, warning notices, and watching wherever and whenever necessary to ensure the safe and effective execution of the works, or as required by the Project Manager, and to ensure the safety of all persons employed on the work in whatever capacity, all visitors to the works, and members of the General Public within or adjacent to the works.
- b. Any instruction/ requirement of the Project Manager with regard to safety shall not relieve Contractor of his absolute responsibility under this or any other relevant contract condition.
- c. The Contractor shall be held entirely responsible for the security of the site and the protection of the works at all times inclusive of non-working hours, during the contract period. He shall be deemed to have included for all costs associated therewith.

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61.7 Maintenance of roads, pathways, traffic control

Contractor shall be entirely responsible for maintaining public roads and private entrance road to the site. These areas shall be free from any materials of whatever nature being delivered to or removed from the site and kept in a generally clean and safe condition. With this in mind, Contractor shall ensure adequate traffic control at the entrance and at progress points of the site – both temporary and permanent and ensure no parking on public roads, pavements or adjacent land.

61.8 Protection/ Preservation of Trees

Contractor shall take all measures necessary to ensure the protection and preservation of existing trees within / outside the boundary of the site. Contractor shall be responsible of any damage / casualty to the trees happening as a result of his working at site and for any action, claim, penalty or expenses imposed by the forest / any other department. No claim / payment shall be payable to the contractor on this account.

61.9 Common facilities

- a. The contractor is required to provide the following common facilities at site free of cost.
 - i. General cleaning
 - ii. Security
 - iii. General lighting
 - iv. General hygiene
- b. These facilities shall be of general nature and all specific requirements of the contractor shall be fulfilled by himself, and he shall be responsible for the same. Contractor shall not be entitled to demand any specific facility from the BHEL as a right.

64 RATE ONLY ITEMS, NON-TENDERED/ EXTRA ITEMS AND QUANTITIES EXCEEDING THE TENDERED QUANTITIES:

The contractor shall immediately and before procurement and execution of the work obtain a written approval of the variation order from the Project Manager for the rate only item, non-tendered /extra items and quantities exceeding the tendered quantities. No payments will be entertained without the Project Manager's written approval of the change / variation order. The onus shall be on the Contractor to obtain such prior written variation order from the Project Manager.

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65 LABOUR WAGES

The Contractor shall have no claim whatsoever, if on account of any rules and regulations or otherwise, he is required to pay wages in excess of fair wages called for under the contract.

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(Signature with Name, Designation and Date)

ANNEXURE-A

FORMAT FOR DECLARATION OF CURRENT WORKS

(Declaration disclosing all works for which the contractor has already entered into contract)

NAME OF TENDERER: _____

S. NO.	NAME OF WORK & LOCATION	NAME OF CLIENT’S CONTACT PERSON / TELE. NO.	DATE OF AWARD / PROPOSED COMPLETION	VALUE OF THE WORK	VALUE OF WORK THAT REMAINS TO BE EXECUTED	ANY DISPUTES PENDING

Certified that the above information is true to the best of my/our knowledge.

PLACE:
DATE:

SIGNATURE OF THE TENDERER
WITH SEAL AND ADDRESS

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(Signature with Name, Designation and Date)

ANNEXURE-B

LIST OF TENDER DRAWINGS

S.NO	SHEET TITLES	DRAWING NO.

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Project Milestone Chart - (To be filled by the Contractor and submitted along with his tender for both the Stages of works as mentioned in the NIT)

S.NO.	MAJOR MILESTONES	DATES
1.	D- Day	Date of LOI / Work Order
2.	Start of Construction	D + 15 days

BIDDER

(Signature with Name, Designation and Date)



BHARAT HEAVY ELECTRICALS LIMITED
Centre of Excellence (CoE), Karkhiyaon, Varanasi

Name Of Work:
Construction of Propulsion Manufacturing Block
Foundation and Miscellaneous Enabling Works at
BHEL CoE, Karkhiyaon, Varanasi

Tender Enquiry No. : COE/VNS/CVL/2023/001

VOLUME-1D

GENERAL CONDITIONS OF CONTRACT (GCC)

BIDDER
(Signature with Name, Designation and Date)

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CHAPTER – 1

1. GENERAL INSTRUCTION TO TENDERERS

1.1. DESPATCH INSTRUCTION

- (i) The General Conditions of Contract form part of the Tender specifications. **All pages of the tender documents shall be duly signed, stamped and submitted along with the offer in token of complete acceptance thereof. (For E-Tender, bidders shall use electronic Signature viz Digital Signature Certificate while uploading on the e-procurement portal.** The information furnished shall be complete by itself. The tenderer is required to furnish all the details and other documents as required in the following pages.
- (ii) Tenderers are advised to study all the tender documents carefully. Any submission of tender by the tenderer shall be deemed to have been done after careful study and examination of the tender documents and with the full understanding of the implications thereof. Should the tenderers have any doubt about the meaning of any portion of the Tender Specification or find discrepancies or omissions in the drawings or the tender documents issued are incomplete or shall require clarification on any of the technical aspect, the scope of work etc., he shall at once, contact the authority inviting the tender well in time (so as not to affect last date of submission) for clarification before the submission of the tender. Tenderer's request for clarifications shall be with reference to Sections and Clause numbers given in the tender documents. The specifications and terms and conditions shall be deemed to have been accepted by the tenderer in his offer. Non-compliance with any of the requirements and instructions of the tender enquiry may result in the rejection of the tender.
- (iii) Integrity pact (IP) shall be applicable for all tenders / contracts if indicated in NIT. This integrity pact shall be issued as part of the Tender documents and shall be submitted by the bidder along with Techno-commercial bid duly filled, signed and stamped by the authorized signatory who signs the bid. Only those vendors / bidders who have entered into such an IP with BHEL shall be considered qualified to participate in the bidding. Entering into this pact shall be a preliminary qualification.

1.2. SUBMISSION OF TENDERS

- 1.2.1 The tenderers must submit their tenders to Officer inviting tender as per instructions in the NIT.
- 1.2.2 Tenders submitted by post (i.e. by 'REGISTERED POST / by COURIER') shall be sent with due allowance for any postal/courier delays. BHEL takes no responsibility for delay, loss or non-receipt of tenders sent by post/courier. **The tenders received after the specified time of their submission are treated as 'Late Tenders' and shall not be considered under any circumstances.** Offers received by Email shall be considered as per terms of NIT. E-Tenders shall be submitted through E-

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Procurement portal as per instruction in NIT. Tenderers to upload offers well in advance in order to avoid last minute congestion in e-procurement website. However, after submission of the tender, the tenderer can re-submit revised tender but before due date and time of submission of tender as notified.

- 1.2.3 Tenders shall be opened by Officer of BHEL at the time and date as specified in the NIT, in the presence of such of those tenderers or their authorized representatives who would like to be present (In case of Manual Tenders). BHEL reserves the right to go ahead with opening of the Tender even in case of no representative is present on the specified date and time. For e-tenders, bidders may mark their presence online through provisions available in e-procurement portal.
- 1.2.4 Tenderers whose bids are found techno commercially qualified shall be informed about the date and time of opening of the Price Bids and such Tenderers may depute their representatives to witness the opening of the price bids (In case of Manual Tenders). BHEL's decision in this regard shall be final and binding.
- 1.2.5 Before submission of Offer, the tenderers are advised to inspect the site of work and the environments and be well acquainted with the actual working and other prevalent conditions, facilities available, position of material and labour, means of transport and access to Site, accommodation etc. No claim will be entertained later on the grounds of lack of knowledge of any of these conditions.
- 1.2.6 The tenderer may get aware about weather conditions, contingencies & other circumstances which may influence or affect their tender prices. Invariable of inspection by the tenderer, the tenderer shall be considered deemed acquainted with all site conditions such as rain patterns, hazardous conditions, soil patterns, local factors etc. Tenderer to have satisfied himself in all respect before quoting his rates and no claim will be entertained later on the grounds of lack of knowledge of any of these conditions.

1.3. LANGUAGE

- 1.3.1 The tenderer shall quote the rates in English language and international numerals. These rates shall be entered in figures as well as in words. Tenderers are requested to refer the clauses of NIT/ Vol-2 "Price Bid" for more details. For the purpose of the tenders, the metric system of units shall be used.
- 1.3.2 All entries in the tender shall either be typed or written legibly in ink. Erasing and over-writing is not permitted and may render such tenders liable for rejection. All cancellations and insertions shall be duly attested by the tenderer.

1.4. PRICE DISCREPANCY

- 1.4.1 **Price Bid Opening:** During opening of price bids (submitted through conventional method or through E-Procurement system), if there is any difference between the amount in figures and in words, the amount quoted by the bidder in words shall be taken as correct.

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- 1.4.2 **Reverse Auction:** In case of Reverse Auction, the successful bidder shall undertake to execute the work as per overall price offered by him during the Reverse Auction process. (Guidelines as available on www.bhel.com on “**supplier registration page**”).

1.5. QUALIFICATION OF TENDERERS

- (i) Only tenderers who have previous experience in the work of the nature and description detailed in the Notice Inviting Tender and/or tender specification are expected to quote for this work duly detailing their experience along with offer.
- (ii) Offers from tenderers who do not have proven and established experience in the field shall not be considered.
- (iii) The offers of the bidders who are on the banned/ hold list and also the offer of the bidders, who engage the services of the banned/ hold firms, shall be rejected. The list of **banned/ hold firms** is available on BHEL web site www.bhel.com. (Refer clause 23.0 of NIT).
- (iv) Offers from tenderers who do not comply with the latest guidelines of Ministry/Commissions of Govt. of India shall not be considered.

1.6. EVALUATION OF BIDS

- (i) Technical Bids submitted by the tenderer will be opened first and evaluated for fulfilling the Pre- Qualification criteria and other conditions in NIT/Tender documents, based on documentary evidences submitted along with the offer.
- (ii) In case the same qualifying experience is claimed by more than one agency, then:
 - (a) The agency who has executed the work as per documentary evidence submitted shall only be qualified. Scope of qualifying work should be totally with the agency who has executed and in case it is only labour and consumables without T&P, then the credentials of execution is assigned to the first agency and not to the agency who has executed only as labour supply contractor. Further, BHEL reserves the right to ask for any other proof for the said job.
 - (b) However, if the same is on account of subletting part of scope by one agency to another agency in a project of BHEL, experience of both the agencies may be considered for the sublet portion of the work provided subletting has been done with the approval of BHEL.
- (iii) In case the qualifying experience is claimed by private organizations (sub-agency) based on ‘Work Order’ and ‘Experience Certificates’ from a non-BHEL organization (main agency), then it shall be the responsibility of sub-agency to submit (in addition to the experience certificate from main agency) relevant certificate regarding qualifying experience from the end Customer or the Turnkey-Contractor (if any) who

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has awarded the work to main agency, as a proof for having executed subject qualifying work. BHEL reserves the right to ask for any other proof for the said job.

- (iv) Assessing Bidder's Capacity for executing the current tender shall be as per Notice Inviting Tender.
- (v) Price Bids of shortlisted bidders shall only be opened either through the conventional/electronic price bid opening with/without Reverse Auction, at the discretion of BHEL. Unless specified otherwise in the tender, the L1 bidder amongst all the shortlisted bidders shall be considered for award on the basis of their quoted "GRAND TOTAL" price in the price bid. However, the L1 bidder shall have no claim on the award & BHEL reserves the right to award the tender at its sole discretion.
- (vi) Price Bids of unqualified bidders shall not be opened. Reasons for rejection shall be intimated in due course after issue of LOI/LOA to successful bidder either through system generated e-mail or through letter/e-mail.
- (vii) Bidders are advised to also refer to clause no 2.9.4 regarding evaluation of their performance in ongoing projects for the current tender.

1.7. DATA TO BE ENCLOSED

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

(i) INCOME TAX PERMANENT ACCOUNT NUMBER

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

(ii) ORGANIZATION CHART

The organization chart of the tenderer's organization, including the names, addresses and contact information of the Directors/Partners shall be furnished along with the offer.

(iii) POWER OF ATTORNEY

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

(iv) IN CASE OF INDIVIDUAL TENDERER

His/ her full name, address, PAN and place & nature of business.

(v) IN CASE OF PARTNERSHIP FIRM

The names of all the partners and their addresses, a copy of the partnership deed/instrument of partnership duly certified by the Notary Public shall be enclosed.

(vi) IN CASE OF COMPANIES

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

1.8. AUTHORIZATION AND ATTESTATION

Tenders shall be signed by a person duly authorized/empowered to do so, for which a Power of Attorney is to be submitted along with the tender offer. For company, a Power of Attorney (as per format in Volume-I D) shall be submitted.

1.9. EARNEST MONEY DEPOSIT

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

- (i) EMD shall be furnished before tender opening / along with the offer in full as per the amount indicated in the NIT.
- (ii) The EMD is to be paid only in the following forms:
 - (a) Cash deposit as permissible under the extant Income Tax Act (before tender opening).
 - (b) Electronic Fund Transfer credited in BHEL account (before tender opening).
 - (c) Banker's cheque / Pay order / Demand draft, in favour of 'Bharat Heavy Electricals Limited' and payable at Varanasi.
 - (d) Fixed Deposit Receipt (FDR) issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL) (along with offer). The Fixed Deposit in such cases shall be valid for at least six months from the due date of tender submission.

In case EMD amount is more than Rs. Two Lakhs, Tenderer has the option to submit Rs. Two lakhs in the forms described above in clause no. 1.9.1. (ii) (a) to (d) and the remaining amount over and above Rs. Two Lakhs in the form of Bank Guarantee from Scheduled Bank (along with the Offer). The Bank Guarantee in such cases shall be valid for at least six months from the due date of tender submission. The Bank Guarantee format for EMD shall be in the prescribed formats.

- (iii) No other form of EMD remittance shall be acceptable to BHEL.

1.9.2 EMD by the Tenderer will be forfeited as per NIT conditions, if:

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(Signature with Name, Designation and Date)

- (i) 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.
- (ii) The Contractor fails to deposit the required Security deposit or commence the work within the period as per LOI/ LOA/ Contract.
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.

1.9.3 EMD shall not carry any interest.

1.9.4 EMD given by all unsuccessful tenderers shall be refunded normally within fifteen days of award of work.

1.9.5 Cash portion of EMD of successful tenderer will be retained as part of Security Deposit. EMD submitted in the form of Bank Guarantee/ FDR shall be retained by BHEL until the receipt of required of the Security Deposit.

1.10. SECURITY DEPOSIT (10 % of Contract Value)

1.10.1 Upon acceptance of Tender, the successful Tenderer should deposit the required amount of Security Deposit towards fulfilment of any obligations in terms of the provisions of the contract. The total amount of Security Deposit will be 10% of the contract value.

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

Note: In case of small value contracts not exceeding Rs. 20 lakhs, work can be started before the required Security Deposit is collected. However, payment can be released only after collection/ recovery of initial 50% Security Deposit.

1.10.3 The balance amount to make up the required Security Deposit of 10% of the contract value may be accepted in the following forms.

- (i) Cash (as permissible under the extant Income Tax Act).
- (ii) Local cheques of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favour of BHEL.
- (iii) Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL).
- (iv) Bank Guarantee from Scheduled Banks/ Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format for Security Deposit shall be in the prescribed formats.

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

Note: (1) BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith.

(2) In case of delay in submission of security deposit, enhanced security deposit which would include interest (Repo rate +4%) for the delayed period, shall be submitted by the bidder.

1.10.4 The Security Deposit shall not carry any interest.

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

- (i) The enhanced part of the Security Deposit shall be immediately deposited by the Contractor or adjusted against payments due to the Contractor.
- (ii) Contract value for the purpose of operating the increased value of Security Deposit due to Quantity Variation, shall be exclusive of Price Variation Clause, Over Run Compensation and Extra works done on manday rates.
- (iii) The recoveries made from running bills (cash deduction towards balance SD amount) can be released against submission of equivalent Bank Guarantee in acceptable form, but only once, before completion of work, with the approval of competent authority of BHEL.

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

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

1.11. RETURN OF SECURITY DEPOSIT

Security Deposit shall be released to the contractor upon fulfillment of contractual obligations as per terms of the contract including completion of Guarantee Period after deducting all expenses / other amounts due to BHEL under the contract / other contracts entered into with them by BHEL.

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1.12. BANK GUARANTEES

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

- (i) Bank Guarantees shall be from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. Bank Guarantees issued by Co-Operative Banks/ Financial Institutions shall not be accepted.
- (ii) The Bank Guarantees shall be as per prescribed formats.
- (iii) It is the responsibility of the bidder to get the Bank Guarantees revalidated/extended for the required period as per the advice of BHEL Site Engineer / Construction Manager. BHEL shall not be liable for issue of any reminders regarding expiry of the Bank Guarantees.
- (iv) In case extension/further extensions of any Bank Guarantees are not required, the bidders shall ensure that the same is explicitly endorsed by the Construction Manager/ Project Director and submitted to the CoE, Karkhiyaon issuing the LOI/LOA.
- (v) In case the Bank Guarantees are not extended before the expiry date, BHEL reserves the right to invoke the same by informing the concerned Bank in writing, without any advance notice/communication to the concerned bidder.
- (vi) Bidders to note that any corrections to Bank Guarantees shall be done by the issuing Bank, only through an amendment in an appropriate non judicial stamp paper.
- (vii) The Original Bank Guarantee shall be submitted to Subcontracting Department of BHEL CoE Karkhiyaon.

1.13. VALIDITY OF OFFER

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

1.14. EXECUTION OF CONTRACT AGREEMENT

The successful tenderer's responsibility under this contract commences from the date of issue of the Letter of Intent/ Award by Bharat Heavy Electricals Limited.

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

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duly authorized/empowered by the tenderer. The expenses for preparation of agreement document shall be borne by BHEL

1.15. REJECTION OF TENDER AND OTHER CONDITIONS

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

- (a) To reject any or all of the tenders.
- (b) To split up the work amongst two or more tenderers as per NIT.
- (c) To award the work in part if specified in NIT.
- (d) In case of either of the contingencies stated in (b) and (c) above, the time for completion as stipulated in the tender shall be applicable.

1.15.2 Conditional tenders, unsolicited tenders, tenders which are incomplete or not in the form specified or defective or have been materially altered or not in accordance with the tender conditions, specifications etc. are liable to be rejected.

1.15.3 Tenders are liable to be rejected in case of unsatisfactory performance of the tenderer with BHEL or tenderer under suspension (hold/banning) by any Unit/ Region / Division of BHEL or tenderers who do not comply with the latest guidelines of Ministry/Commissions of Govt of India.

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

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

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

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

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

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- 1.15.9 The successful tenderer (Contractor) should not sub-contract any portion of work detailed in the tender specification undertaken by him without prior written permission of BHEL's Construction Manager/ Site In-Charge. BHEL, at its discretion, may consider the written request from the Contractor and permit subletting of part scope. However, the Contractor is solely responsible to BHEL for the work awarded to him.
- 1.15.10 The Tender submitted by a techno commercially qualified tenderer shall become the property of BHEL who shall be under no obligation to return the same to the bidder. However unopened price bids and late tenders shall be returned to the bidders, in case of Conventional/ Paper bid.
- 1.15.11 Unsolicited discount received after the due date and time of Bid Submission shall not be considered for evaluation. However, if the party who has submitted the unsolicited discount/rebate becomes the L-1 party, then the awarded price i.e. contract value shall be worked out after considering the discount so offered.
- 1.15.12 BHEL shall not be liable for any expenses incurred by the bidder in the preparation of the tender irrespective of whether the tender is accepted or not.

1.16. INTIMATION OF CHANGE OF NAME/RE-CONSTITUTION OF THE ORGANIZATION

In the event of the organization (Proprietorship/Partnership/Company) undergoing any change of name or reconstitution, prior intimation of the same shall be given to BHEL. Upon such changes coming into effect, the same is to be intimated to BHEL immediately with supporting documents as applicable.

Further, the new entity has to intimate BHEL in writing that they will honor all the earlier commitments in respect of the subject contract

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CHAPTER – 2

2 DEFINITION

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

- (i) BHEL shall mean **Bharat Heavy Electricals Limited**, a company registered under Indian Companies Act 1956, with its Registered Office at BHEL HOUSE, SIRI FORT, NEW DELHI – 110049, or CoE Karkhiyaon or its Authorized Officers or its Site Engineers or other employees authorized to deal with any matters with which these persons are concerned on its behalf.
- (ii) “EXECUTIVE DIRECTOR” or “GENERAL MANAGER (In- charge)” or “GENERAL MANAGER” or “PROJECT DIRECTOR” shall mean the Officer in Administrative charge of CoE, Karkhiyaon.
- (iii) “COMPETENT AUTHORITY” shall mean BHEL Officers who are empowered to act on behalf of BHEL.
- (iv) “ENGINEER” or “ENGINEER IN CHARGE” shall mean an Officer of BHEL as may be duly appointed and authorized by BHEL to act as “Engineer” on his behalf for the purpose of the Contract, to perform the duty set forth in this General Conditions of Contract and other Contract documents. The term also includes ‘CONSTRUCTION MANAGER’ or ‘SITE INCHARGE’ or “PROJECT DIRECTOR” as well as Officers at Site or at the Headquarters of CoE, Karkhiyaon.
- (v) “SITE” shall mean the places or place at which the plants/equipments are to be erected and services are to be performed as per the specification of this Tender.
- (vi) “ARCHITECT OF BHEL” shall mean the project consultant with whom BHEL has entered into a contract for provision of design services.
- (vii) “CONTRACTOR” shall mean the successful Bidder/Tenderer who is awarded the Contract and shall include the Contractor’s successors, heirs, executors, administrators and permitted assigns.
- (viii) “CONTRACT” or “CONTRACT DOCUMENT” shall mean and include the Agreement of Work Order, the accepted appendices of Rates, Schedules, Quantities if any, Offer submitted by contractor including acceptance to General Conditions of Contract, Special Conditions of Contract, Instructions to the Tenderers, Drawings, Technical Specifications, the Special Specifications if any, the Tender documents, subsequent amendments /corrigendum to Tender mutually agreed upon and the Letter of Intent/Award/Acceptance issued by BHEL. Any conditions or terms stipulated by the contractor in the tender documents or subsequent letters shall not form part of the

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contract unless, specifically accepted in writing by BHEL in the Letter of Intent/Award and incorporated in the agreement or amendment thereof.

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

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- (xix) "HEADING" – The heading in these General Conditions are solely for the purpose of facilitating reference and shall not be deemed to be part thereof or be taken as instructions thereof or of the contract.
- (xx) "MONTH" shall mean calendar month unless otherwise specified in the Tender.
- (xxi) 'Day' or 'Days' unless herein otherwise expressly defined shall mean calendar day or days of twenty-four (24) hours each. A Week shall mean continuous period of seven (7) days.
- (xxii) "COMMISSIONING" shall mean the synchronization testing and achieving functional operation of the Equipment with associated system after all initial adjustments, trials, cleaning, re-assembly required at site if any, have been completed and Equipment with associated system is ready for taking into service.
- (xxiii) "WRITING" shall include any manuscript type written or hand written or printed statement or electronically transmitted messages, under the signature or seal or transmittal of BHEL.
- (xxiv) "TEMPORARY WORK" shall mean all temporary works for every kind required in or for the execution, completion, maintenance of the work.
- (xxv) 'CONTRACT PRICE' or 'CONTRACT VALUE' shall mean the sum mentioned in the LOI/LOA/Contract Agreement subject to such additions thereto or deductions there from as may be made under provisions hereinafter contained.
- (xxvi) 'EXECUTED CONTRACT VALUE' shall mean actual value of works executed by the contractor and certified by BHEL. This value shall not include PVC, ORC, Extra Works and Taxes.
- (xxvii) "COMMENCEMENT DATE" or "START DATE" shall mean the commencement/start of work at Site as per terms defined in the Tender.
- (xxviii) "SHORT CLOSING" or "FORE CLOSING" of Contract shall mean the premature closing of Contract, for reasons not attributable to the contractor and mutually agreed between BHEL and the contractor.
- (xxix) "TERMINATION" of Contract shall mean the pre mature closing of contract due to reasons as mentioned in the contract.
- (xxx) "DE MOBILIZATION" shall mean the temporary winding up of Site establishment by Contractor leading to suspension of works temporarily for reasons not attributable to the contractor.
- (xxxi) "RE MOBILIZATION" shall mean the resumption of work with all resources required for the work after demobilization.

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2.2 LAW GOVERNING THE CONTRACT AND COURT JURISDICTION

The contract shall be governed by the Law for the time being in force in the Republic of India. Subject to clause 2.21.1.1 of this contract, the Civil Court having original Civil Jurisdiction at Varanasi (UP), shall alone have exclusive jurisdiction in regard to all matters in respect of the Contract.

2.3 ISSUE OF NOTICE**2.3.1 Service of notice on Contractor**

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

2.3.2 Service of notice on BHEL

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

2.4 USE OF LAND

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

2.5 COMMENCEMENT OF WORK

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

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

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

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2.6 MEASUREMENT OF WORK AND MODE OF PAYMENT

- 2.6.1** All payments due to the contractors shall be made by e mode only, unless otherwise found operationally difficult for reasons to be recorded in writing.
- 2.6.2** For progress running bill payments: - The Contractor shall present detailed measurement sheets in triplicate, duly indicating all relevant details based on technical documents and connected drawings for work done during the month/period under various categories in line with terms of payment as per contract. The basis of arriving at the quantities, weights shall be relevant documents and drawings released by BHEL. These measurement sheets shall be prepared jointly with BHEL Engineers and signed by both the parties.
- 2.6.3** These measurement sheets will be checked by BHEL Engineer and quantities and percentage eligible for payment under various groups shall be decided by BHEL Engineer. The abstract of quantities and percentage so arrived at based on the terms of payment shall be entered in Measurement Book and signed by both the parties. Measurements to be submitted in BHEL format of Works Account Manual (WAM).
- 2.6.4** Based on the above quantities, contractor shall prepare the bills, along with statutory documents, in prescribed format and work out the financial value. These will be entered in Measurement Book and signed by both the parties. Payment shall be made by BHEL after effecting the recoveries due from the contractor.
- 2.6.5** All recoveries due from the contractor for the month/period shall be effected in full from the corresponding running bills unless specific approval from the competent authorities is obtained to the contrary.
- 2.6.6** Measurement shall be restricted to that portion of work for which it is required to ascertain the financial liability of BHEL under this contract.
- 2.6.7** The measurement shall be taken jointly by persons duly authorized on the part of BHEL and by the Contractor.
- 2.6.8** The Contractor shall bear the expenditure involved if any, in making the measurements and testing of materials to be used/ used in the work. The contractor shall, without extra charges, provide all the assistance with appliances and other things necessary for measurement.
- 2.6.9** If at any time due to any reason whatsoever, it becomes necessary to re-measure the work done in full or in part, the expenses towards such re measurements shall be borne by the contractor unless such re measurements are warranted solely for reasons not attributable to contractor.
- 2.6.10** Passing of bills covered by such measurements does not amount to acceptance of the completion of the work measured. Any left out work has to be completed, if pointed out at a later date by BHEL.

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

2.7 RIGHTS OF BHEL

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

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

In case of inadequate manpower deployed by the contractor, BHEL reserves the right to deploy additional manpower through any other agency for expediting activities in the interest of the project. Supplied manpower shall be put on job by the contractor and payments and other statutory compliances related to manpower shall be the contractor's responsibility. In case of contractor's failure to fulfill his obligations in respect of such manpower, BHEL reserves the right to take necessary action as per contract conditions.

2.7.2 Breach of Contract, Remedies and Termination

2.7.2.1 BHEL shall terminate the contract after due notice of a period of 14 days' any of the following cases, which if not rectified/ improved within the time period mentioned in the notice, then, 'Breach of Contract' will be considered to have been established:

- (i) Contractor's poor progress of the work vis-à-vis execution timeline as stipulated in the Contract, backlog attributable to contractor including unexecuted portion of work does not appear to be executable within balance available period considering its performance of execution.
- (ii) Withdrawal from or abandonment of the work by contractor before completion of the work as per contract.
- (iii) Non-completion of work by the Contractor within scheduled completion period as per Contract or as extended from time to time, for the reasons attributable to the contractor.

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- (iv) Repeated failure of contractor in deploying the required resources, to comply the statutory requirements etc. even after given by BHEL is writing.
- (v) Strike or Lockout declared is not settled within a period of one month.
- (vi) Termination of Contract on account of any other reason (s) attributable to Contractor.
- (vii) Assignment, transfer, subletting of Contract without BHEL's written permission.
- (viii) Non-compliance to any contractual condition or any other default attributable to Contractor.

2.7.2.2 Remedies in case of Breach of Contract is established

In case 'Breach of Contract' is established, Security Deposit shall be encashed/ forfeited. This is without prejudice to BHEL's right to levy of liquidated damages, debarment etc. which shall be applied as per the provisions of the contract. Sequence of recovery to be made in case of breach of contract is established, is as below:

- (a) In case the value of Security Deposit & Retention Amount, available for the Contract, is less than 10% of the Contract Value, the balance amount shall be recovered from dues available in the form of Bills payable to contractor, BGs against the same contract etc.
- (b) Demand notice for deposit of balance recovery amount shall be sent to contractor, if funds are insufficient to effect complete recovery against dues indicated in (a) above.
- (c) If contractor fails to deposit the balance amount to be recovered within the period as prescribed in demand notice, following action shall be taken for balance recovery:
 - (i) Dues payable to contractor against other contracts with CoE Karkhiyaon shall be considered for recovery.
 - (ii) If recovery cannot be made out of dues payable to the contractor as above, balance amount to be recovered, shall be informed to other Regions/Units of BHEL for making recovery from the Unpaid Bills/Running Bills/SD/BGs/Final Bills of contractor.
 - (iii) In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.

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Note:

1) In addition to above, levy of liquidated damages, debarment, termination, short-closure etc. shall be applied as per provisions of the contract.

2) If tendering is done for the balance work, the failed defaulted contractor (including all the members/partners in case of JV/ partnership firm) shall not be eligible for either executing the balance work or to participate in the tender(s) for executing the balance work.

2.7.3 To terminate the contract or to restrict the quantum of work and pay for the portion of work executed, as per mutual agreement.

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

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

2.7.6 BHEL may permit or direct contractor to demobilize and remobilize at a future date as intimated by BHEL in case of following situations for reasons other than Force majeure conditions and not attributable to contractor:

(i) Suspension of work(s) at a Project either by BHEL.

or

(ii) Where work comes to a complete halt or reaches a stage wherein worthwhile works cannot be executed and there is no possibility of commencement of work for a period of not less than three months

In such cases, charges towards demobilization and remobilization shall be as decided by BHEL after successful remobilization by contractor at site, and decision of BHEL shall be final and binding on the contractor. After remobilization, all conditions as per contract shall become applicable. In case Contractor does not remobilize with adequate resources or does not start the work within the period as intimated, then BHEL reserves the right to terminate the contract and effect remedied under Clause 2.7.2.2. Duration of the contract/time extension shall be revised suitably. In case of any conflict, BHEL decision in this regard shall be final and binding on the contractor.

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

(a) The balance works (including but not limited to Trial Operation, PG Test etc.) are minor vis a vis the scope of work envisaged as per the contract.

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- (b) There has been no significant work in past 6 months OR no significant work is expected in next 6 months (e.g. in projects where work has stopped due to reasons beyond the control of BHEL).
- (c) The balance works cannot be done within a reasonable period of time as they are dependent on unit shut down or on other facilities of BHEL or any other such reasons not attributable to the contractor.

At the point of requesting for short closure, contractor shall establish that he has completed all works possible of completion and he is not able to proceed with the balance works due to constraints beyond his control. In such a case, the estimated value of the unexecuted portion of work (or estimated value of services to be provided for carrying out milestone/stage payments like Trial Operation/PG Test etc.) as decided by BHEL, shall however be reduced from the final contract value.

Note: The Contractor shall not be eligible for any compensation on account of Quantity Variation arising out of short-closure of contract as per clause no. 2.7.8 (b) above.

2.7.8 LIQUIDATED DAMAGES/PENALTY

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 alone, (ii) Force majeure conditions, and (iii) BHEL, shall be worked out. 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 solely attributable to contractor and recoverable from the dues payable to the contractor.

If the contractor fails to maintain the required progress of work which results in delay in the completion of the work as per the contractual completion period, BHEL shall have the right to impose Liquidated Damage/Penalty at the rate of 0.5% of the contract value, per week of delay or part thereof subject to a maximum of 10% of the contract value. For this purpose, the period for which LD is applicable shall be worked out based on portion of time extension granted solely attributable to contractor at the end of the contract. Contract Value for this purpose, shall be the final executed value exclusive of ORC, Extra Works executed on Manday rate basis, Supplementary/ Additional Items and PVC.

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

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

- 2.8.1 As far as possible, Unskilled Workers shall be engaged from the local areas in which the work is being executed.
- 2.8.2 The contractor at all times during the continuance of this contract shall, in all his dealings with local labour for the time being employed on or in connection with the work, have due regard to all local festivals and religious and other customs.
- 2.8.3 The contractor shall comply with all applicable State and Central Laws, Statutory Rules, Regulations, Notifications etc. such as Payment of Wages Act, Minimum Wages Act, Workmen Compensation Act, Employer's Liability Act, Industrial Disputes Act, Employers Provident Act, Employees State Insurance Scheme, Contract Labour (Regulation and Abolition) Act, 1970, Payment of Bonus & Gratuity Act, Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996, The Building and Other Construction Workers' Welfare Cess Act 1996 and other Acts, Rules, and Regulations for labour/workers as applicable and as may be enacted by the State Government and Central Govt. during the tenure of the Contract and having force or jurisdiction at Site. The Contractor shall also comply with provisions of and give all such notices to the local Governing Body, Police and other relevant Authorities as may be required by the Law.
- 2.8.4 The Contractor shall obtain independent License under the Contract Labour (Regulations and Abolition) Act, 1970 for engaging contract labour as required from the concerned Authorities based on the certificate (Form- V or as applicable) issued by the Principal Employer/BHEL.
- 2.8.5 The contractor shall pay and bear all taxes, fees, license charges, Cess, duties, deposits, tolls, royalties, commission or other charges which may be leviable on account of his operations in executing the contract.
- 2.8.6 While BHEL would pay the inspection fees and Registration fees of Boiler/Electrical Inspectorate, all other arrangements for site visits periodically by the Inspectorate to site, Inspection certificate etc. will have to be made by contractor. However, BHEL will not make any payment to the Inspectorate in connection with contractor's Welders/Electricians qualification tests etc.
- 2.8.7 Contractor shall be responsible for provision of Health and Sanitary arrangements (more particularly described in Contract Labour Regulation & Abolition Act), Safety precautions etc. as may be required for safe and satisfactory execution of contract.

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- 2.8.8 The contractor shall be responsible for proper accommodation including adequate medical facilities for personnel employed by him.
- 2.8.9 The contractor shall be responsible for the proper behavior and observance of all regulations by the staff employed by him.
- 2.8.10 The contractor shall ensure that no damage is caused to any person/property of other parties working at site. If any such damage is caused, it is responsibility of the contractor to make good the losses or compensate for the same.
- 2.8.11 All the properties/equipments/components of BHEL/their Client loaned with or without deposit to the contractor in connection with the contract shall remain properties of BHEL/their Client.
- 2.8.12 The contractor shall use such properties for the purpose of execution of this contract. All such properties/equipments/components shall be deemed to be in good condition when received by the contractor unless he notifies within 48 hours to the contrary. The contractor shall return them in good condition as and when required by BHEL/their Client. In case of non-return, loss, damage, repairs etc. the cost thereof as may be fixed by BHEL Engineer will be recovered from the contractor.
- 2.8.13 In case the contractor is required to undertake any work outside the scope of this contract, the rates payable shall be those mutually agreed upon if the item rates are not mentioned in existing contract.
- 2.8.14 Any delay in completion of works/or non-achievement of periodical targets due to the reasons attributable to the contractor, the same may have to be compensated by the contractor either by increasing manpower and resources or by working extra hours and/or by working more than one shift. All these are to be carried out by the contractor at no extra cost.
- 2.8.15 The contractor shall arrange, coordinate his work in such a manner as to cause no hindrance to other agencies working in the same premises.
- 2.8.16 All safety rules and codes applied by the BHEL/Statutory Authorities at site shall be observed by the contractor without exception. The contractor shall be responsible for the safety of the equipment/material and works to be performed by him and shall maintain all light, fencing guards, slings etc. or other protection necessary for the purpose. Contractor shall also take such additional precautions as may be indicated from time to time by the Engineer with a view to prevent pilferage, accidents, fire hazards. Due precautions shall be taken against fire hazards and atmospheric conditions. Suitable number of Clerical staff, watch and ward, store keepers to take care of equipment/materials and construction tools and tackles shall be posted at site by the contractor till the completion of work under this contract.

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

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

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

Contractor shall create awareness amongst their workforce by helping & encouraging in opening bank accounts and to encourage them to adopt digital mode of transactions. While releasing wages/ salary to their workers/ supervisors/ staff, Contractor shall comply with the GOI's guidelines for maximizing such transactions through Non-Cash / digital means.

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

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

- 2.8.20 The contractor shall take all reasonable care to protect the materials and work till such time the plant/equipment has been taken over by BHEL.

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

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

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

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

2.8.25 For all works having contract value of Rs. 5,00,000/- or above, BHEL shall recover the amount of compensation paid to victim(s) by BHEL towards loss of life/ permanent disability due to an accident which is attributable to the negligence of contractor, agency or firm or any of its employees as detailed below.

(a) Victim: Any person who suffers permanent disablement or dies in an accident as defined below.

(b) Accident: Any death or permanent disability resulting solely and directly from any unintended and unforeseen injurious occurrence caused during the manufacturing/ operation and works incidental thereto at BHEL factories/ offices and precincts thereof, project execution, erection and commissioning, services, repairs and maintenance, trouble shooting, serving, overhaul, renovation and retrofitting, trial operation, performance guarantee testing undertaken by the company or during any works/ during working at BHEL Units/ Offices/ townships and premises/ Project Sites.

(c) Compensation in respect of each of the victims:

(i) In the event of death or permanent disability resulting from Loss of both limbs:
Rs. 10,00,000/- (Rs. Ten Lakh).

(ii) In the event of other permanent disability: Rs.7,00,000/- (Rs. Seven Lakh)

(d) Permanent Disablement: A disablement that is classified as a permanent total disablement under the proviso to section 2 (I) of the Employee's Compensation Act, 1923.

2.8.26 Contractor shall be fully responsible for their T&Ps and other material mobilized at site. In any case, BHEL shall not be liable for any damage/loss/misuse of any item(s) belong to the contractor.

2.9 EXECUTION PLAN, PROGRESS MONITORING, MONTHLY REVIEW AND PERFORMANCE EVALUATION

2.9.1 A tentative plan/ programme for completion of the contractual scope of work as per the time schedule given in the contract shall be made jointly by BHEL and Contractor, before commencement of work. The above programme shall be supported by month wise deployment of resources viz Manpower, T&P, Consumables, etc. Progress will be reviewed periodically (Daily/Weekly/Monthly) vis-à-vis this jointly agreed programme.

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Subsequently, every month, quarterly rolling plan will be made by BHEL based on budgeted targets.

Monthly plan in F-14 format shall be drawn from this Quarterly plan. Monthly plan shall necessarily include activities required for achieving targets/ milestones unless inputs/ fronts are not available. While planning and arriving on asking rate all available inputs shall be taken into consideration.

Vendor will be required to execute the monthly plan in that month in addition to make full efforts to minimize the cumulative shortfall attributable to him up to the month.

BHEL may require monthly work plan up to one and half times of average monthly value and demand matching manpower. Where, Average Monthly Value = Total Contract Value (as per latest revision) / Period of Contract (in months) provided, this requirement is reflected in the rolling quarterly plan two months in advance.

If the Contractor refuses to sign the F-14 format, those F-14 formats requiring Contractor's signature shall be deemed to have been signed and accepted by the Contractor, if communicated to the Contractor through email or any other mode as stated in clause 2.3.1.

The Contractor shall submit periodical progress reports (Daily/Weekly/Monthly) and other reports/information including manpower, consumables, T&P mobilization etc. as desired by BHEL.

- 2.9.2 Monthly progress review between BHEL and Contractor shall be based on the agreed programme as above, availability of inputs/fronts etc., and constraints if any, as per prescribed formats (i.e. Form F-14). Manpower, T&P and consumable reports as per prescribed formats shall be submitted by contractor every month. Release of RA Bills shall be contingent upon certification by BHEL Site Engineer of the availability of the above prescribed formats duly filled in and signed.
- 2.9.3 The burden of proof that the causes leading to any shortfall is not due to any reasons attributable to the contractor is on the contractor himself. The monthly progress review shall record shortfalls attributable to (i) Contractor, (ii) Force Majeure Conditions, and (iii) BHEL
- 2.9.4 Performance of the Contractor shall be assessed as per prescribed formats by BHEL. BHEL reserves the right to revise the evaluation formats during the course of execution of the works.

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2.10 TIME OF COMPLETION

- 2.10.1 The time schedule shall be as prescribed in the Contract. The time for completion shall be reckoned from the date of commencement of work at Site as certified by BHEL Engineers.
- 2.10.2 Time being the essence of the contract, the entire work shall be completed by the contractor within the time schedule or within such extended periods of time as may be allowed by BHEL under clause 2.11.

2.11 EXTENSION OF TIME FOR COMPLETION

- 2.11.1 If the completion of work as detailed in the scope of work gets delayed beyond the contract period, the contractor shall request for an extension of the contract and BHEL at its discretion may extend the Contract.
- 2.11.2 Based on the F-14 formats, the works balance at the end of original contract period less the backlog attributable to the contractor shall be quantified, and the number of months of 'Time extension' required for completion of the same shall be jointly worked out. Within this period of 'Time extension', the contractor is bound to complete the portion of backlog attributable to the contractor. Any further 'Time extension' or 'Time extensions' at the end of the previous extension shall be worked out similarly.
- 2.11.3 However, if any 'Time extension' is granted to the contractor to facilitate continuation of work and completion of contract, due to backlog attributable to the contractor alone, then it shall be without prejudice to the rights of BHEL to impose penalty/LD for the delays attributable to the contractor, in addition to any other actions BHEL may wish to take under clause 2.7.2 of GCC i.e. "Breach of Contract, Remedies and Termination".
- 2.11.4 Planning, progress monitoring, monthly review and performance monitoring shall be carried out as per Clause 2.9 of GCC.

2.12 OVERRUN COMPENSATION – Not Applicable.**2.13 INTEREST FREE/ INTEREST BEARING RECOVERABLE ADVANCES****2.13.1 Mobilization Advance****(a) Interest Free Mobilization Advance**

Interest free mobilization advance payment may be provided secured through Bank Guarantee/s and shall be limited to a maximum of 5% of the contract value at the sole discretion of BHEL. This advance amount will be recovered

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from contractor within a time period not later than 50% of the original contract period and it will not be linked with progress of work.

The Bank Guarantee shall be for 110% of the value of advance so as to enable recovery of not only principal but also the interest portion, if so required. Such BGs shall remain effective until the advance payment has been fully repaid, but the amount thereof shall be progressively reduced by the amount repaid by the contractor, as indicated in the interim payment certificates.

Interest Free Mobilization Advance shall be disbursed in instalments as below:

- (i) Submission of BG for seeking advance (1%)
- (ii) Installation of Batching Plant of required capacity (1%)
- (iii) Operation of Site Office and Cement Storage Shed (1%)
- (iv) Mobilization of required T&P including Transit Mixers, Excavators, JCBs, Dumpers, Hydra Cranes, Welding Machines etc. (2%)

(b) Interest Bearing Mobilization Advance

In exceptional circumstances, mobilisation advance payment over & above interest free advance mentioned at (a) above shall be interest bearing and secured through Bank Guarantee/s and shall be limited to a maximum of 5% of the contract value.

2.13.2 **Additional Interim Advance:** Not applicable.

2.13.3 The unadjusted amount of secured advances paid to the contractor as mentioned in 2.13.1 & 2.13.2 above shall not exceed 10% of the total contract value at any point of time. Recovery of advances shall be made from the running bills progressively such that the amount paid along with the interest is fully recovered by the time the Contractor reaches 90% billing of total value of works to be executed.

2.13.4 The aforesaid advances limited to 10 (ten) per cent shall be payable in not less than two installments with any of the installment not exceeding 60% of the total eligible advance. Contractor shall submit utilization certificate for the mobilization advances. Subsequent instalments shall be released after receipt of satisfactory utilization certificate from the contractor for the earlier instalment.

2.13.5 The Bank Guarantee towards above mentioned mobilization advances shall be for 110% of the value of advance so as to enable recovery of not only principal but also the interest portion, if so required. Part 'Bank Guarantees' (BGs) against the mobilization advance shall be submitted by the Contractor in as many numbers as the proposed recovery instalments.

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- 2.13.6 Such BGs shall remain effective until the advance payment has been fully repaid, but the amount thereof shall be progressively reduced by the amount repaid by the Contractor, as indicated in the interim payment certificates.
- 2.13.7 Payment and recovery of mobilization advances shall be at the sole discretion of BHEL and shall not be a subject matter of arbitration.
- 2.13.8 The rate of interest applicable for the above advances shall be the repo rate on the date of release of advance plus 4%, and such rate will remain fixed till the total advance amount is recovered.
- 2.13.9 Unadjusted amount of advances paid shall not exceed 5% of the total contract value at any point of time. Recovery of advances shall be made from the Running Bills progressively such that the advance amounts paid along with the interest is fully recovered by the time the contractor's billing reaches 90% of contract value.
- 2.13.10 Recovery rate per month shall be the sum of:
(i) Not less than 10% of Running Bill amount
(ii) Simple interest up to the date of RA Bill on the outstanding Principle amount/amounts
- 2.13.11 Contractor to submit Bank Guarantee as per prescribed formats for each of the advance and shall be valid for at least one year or the recovery duration whichever is earlier. In case the recovery of dues does not get completed within the aforesaid BG period, the contractor shall renew the BG or submit fresh BG for the outstanding amount, valid for at least one year or the remaining recovery duration whichever is earlier.
- 2.13.12 **Secured Advance against Material brought to Site:**
(a) Secured advance on the security of following materials (which are not combustible, fragile or perishable in nature) brought to the site but not yet incorporated in the works will be made up to 75 (seventy-five) per cent of invoice value, or the 75 (seventy-five) per cent of the corresponding value of the materials determined on the basis of BOQ rates, whichever is less, subject to the condition that their quantities are not excessive and shall be used within a period of 90 (ninety) days and subject to other stipulations in the contract:

(i) TMT Reinforcement Steel
(ii) Cement
(iii) Concrete
(iv) Sand
(v) Any other material as decided by engineer

(b) The advance will be recovered from each succeeding running bill (periodic/ interim payment) to the extent materials for which advance has been previously paid have been incorporated into the works.

At any point of time, the unadjusted secured payments against material brought to site shall not be more than 5% of the contract value.

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

2.14 QUANTITY VARIATION

2.14.1 Variation in Final Executed Contract Value

The quantities given in the contract are tentative and may change to any extent (both in plus side and minus side). No compensation becomes payable in case the variation of the final executed contract value is within the limits of Minus (-) 30% of awarded contract value. Also, no compensation becomes payable in case the contract gets partially executed/ short closed/ terminated/ work withdrawn under Rights of BHEL mentioned in Clause 2.7 of GCC.

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

- (i) In case the finally executed contract value reduces below the lower limit of awarded Contract Value due to quantity variation specified above, the Contractor will be eligible for compensation @ 15% of the difference between the lower limit of the awarded contract value and the actual executed contract value.
- (ii) In case the finally executed contract value increases above the awarded Contract Value due to quantity variation, the Contractor is not eligible for any compensation.

2.14.2 Variation in Individual Quantities of BOQ Item(s)

The quantities given in the contract are tentative and may change to any extent (both in plus side and minus side). No compensation becomes payable in case the variation of the quantity of individual BOQ item(s).

BHEL, however, retains the right to arrange the excess quantity through any other source for expediting activities in the interest of the Project.

BHEL reserves the right to add or delete items of scope of work depending upon the final requirement. For such addition or deletion the Contract value shall be adjusted based on the quoted unit price. Such variation is not expected to be more than +30% of the contract value. However, the quantities in the BOQ are tentative which may vary or deviate upto any limit provided the contract value is limited to +30%. The price quoted by the Contractor shall be valid for such variation. Variation beyond the above limit shall be settled on mutually agreed rates.

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2.15 EXTRA WORKS

- 2.15.1 All rectifications/modifications, revamping and reworks required for any reasons not due to the fault of the contractor, or needed due to any change in deviation from drawings and design of equipments, operation/maintenance requirements, mismatching or due to damages in transit, storage and erection/commissioning and other allied works which are not very specifically indicated in the drawings, but are found essential for satisfactory completion of the work, will be considered as extra works.
- 2.15.2 Extra works arising on account of the contractor's fault, irrespective of time consumed in rectification of the damage/loss, will have to be carried out by the contractor free of cost. Under such circumstances, any material and consumable required for this purpose will also have to be arranged by the contractor at his cost.
- 2.15.3 All the extra work should be carried out by a separately identifiable gang, without affecting routine activities. Daily log sheets in the pro-forma prescribed by BHEL should be maintained and shall be signed by the contractor's representative and BHEL engineer. No claim for extra work will be considered/entertained in the absence of the said supporting documents i.e. daily log sheets. Signing of log sheets by BHEL engineer does not necessarily mean the acceptance of such works as extra works.
- 2.15.4 BHEL retains the right to award or not to award any of the major repair/rework/modification/rectification/fabrication works to the contractor, at their discretion without assigning any reason for the same.
- 2.15.5 After eligibility of extra works is established and finally accepted by BHEL engineer/designer, payment will be released on competent authority's approval at the following rate.

Man-Hour Rate For Eligible Extra Works: Single composite average labour man-hour rate, including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals, consumables for carrying out any major rework/repairs/rectification/modification/fabrication as certified by site as may arise during the course of erection, testing, commissioning or extra works arising out of transit, storage and erection damages, payment, if found due will be at Rs 139/- per man hour.

- 2.15.6 The above composite labour man hour rate towards extra works shall remain firm and not subject to any variation during execution of the work. PVC will not be applicable for extra works. Rate revision, Over Run Charges/compensation etc. will not be applicable due to on extra works.
- 2.15.7 **Extra Works for Civil Packages** shall be regulated as follows:
- (i) Rates for Extra Works arising due to (1) non availability of BOQ (Rate Schedule), OR (2) change in Specifications of materials/works (3)

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rectification/modification/dismantling & re-erecting etc. due to no fault of Contractor, shall be in the order of the following:

- (a) Item rates are to be derived from similar nature of items in the BOQ (Rate Schedule) with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities.
 - (b) As per latest edition of CPWD-DSR with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities OR Notification issued by the office of CPWD for 'Cost Index' in that Region where the project is being executed with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities, whichever is less.
 - (c) Item rates are to be worked out on the basis of market rates prevailing on the date of execution mutually agreed between BHEL and Contractor.
- (ii) PVC and ORC will not be applicable for (i) above.

2.16 SUPPLEMENTARY ITEMS

2.16.1 For Non-Civil Works

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

- (i) Based on percentage breakup/rates indicated for similar/nearby items.
- (ii) In case (i) above does not exist, then BHEL/site may derive the percentage breakup/rates to suit the type of work.

2.16.2 For Civil Works

- (i) Rates for Supplementary Works/Additional Works arising out due to additions/alterations in the original scope of works as per contract subject to certification of BHEL Engineer shall be worked out as under:
 - (a) Item rates which are available in existing BOQ (Rate Schedule) shall be operated with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities.
 - (b) Items of works which are not available in existing BOQ shall be operated as an 'Extra Works' and rate shall be derived as per clause no 2.15.7
- (ii) Execution of Supplementary Works/Additional Works through the Contractor shall be at the sole discretion of BHEL, and shall be considered as part of executed contract value for the purpose of Quantity Variation as per clause 2.14.

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- (iii) BHEL Engineer's decision regarding fixing the rate as above is final and binding on the contractor.
- (iv) PVC and ORC will not be applicable for (i) above.

2.17 PRICE VARIATION COMPENSATION

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

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

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

Sl. No.	Category	Index/ Average Minimum Wage	Percentage Component ('K')				
			Civil Packages (See Note A/B/C)			Mechanical Packages	Electrical , C&I Material Management / Handling and other labour oriented packages
			A	B	C		
(i)	Labour (All Categories)	'Monthly All-India Average Consumer Price Index Numbers For Industrial Workers' published by Labour Bureau, Ministry of Labour and Employment, Govt. of India. (50% weightage out of component 'K') (website: labourbureau.nic.in) Arithmetical average of minimum wages of Unskilled, Semi-skilled, Skilled and Highly skilled workers as applicable at project site location (50% weightage out of component 'K')	40	25	30	65	80
(ii)	High Speed Diesel Oil	Name of Commodity: HSD Commodity Code: 1202000005 (See Note E)	5	3	5	5	5
(iii)	Welding Rod	Name of Commodity: Manufacture of Basic Metals Commodity Code: 1314000000 (See Note E)	-	-	-	15	-
(iv)	Cement	Name of Commodity: Ordinary Portland Cement Commodity Code: 1313050003 (See Note E)	-	20	30	-	-
(v)	Steel (Structural and Reinforcement Steel)	Name of Commodity: Mild Steel: Long Products Commodity Code: 1314040000 (See Note E)	-	25	-	-	-

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Sl. No.	Category	Index/ Average Minimum Wage	Percentage Component ('K')				
			Civil Packages (See Note A/B/C)			Mechanical Packages	Electrical, C&I Material Management / Handling and other labour oriented packages
			A	B	C		
(vi)	All Other Materials (Other than Cement & Steel)	Name of Commodity: All Commodities Commodity Code:1000000000 (See Note E)	40	12	20	-	-

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

2.17.3 Blank.

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

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

Where,

- P = Amount to be paid/recovered due to variation in the Index for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials
- K = Percentage COMPONENT ('K') applicable for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials
- R = Value of work done for the billing month (Excluding Taxes and Duties if payable extra)
- X_N = Revised Index for Labour, Revised Average Minimum Wages for Labour, Revised Index for High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials for the billing month under consideration
- X_o = Index for Labour, Average Minimum Wages for Labour, Index for High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials as on the Base date

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- 2.17.5 PVC shall not be payable for the ORC amount, Supplementary/Additional Items, Extra works. However, PVC will be payable for items executed under quantity variation of BOQ items under originally awarded contract.
- 2.17.6 Base date shall be calendar month of the 'last date of submission of Tender'.
- 2.17.7 The contractor shall furnish necessary monthly bulletins in support of the requisite indices from the relevant websites along with his Bills.
- 2.17.8 The contractor will be required to raise the bills for price variation payments on a monthly basis along with the running bills irrespective of the fact whether any increase/decrease in the index for relevant categories has taken place or not. In case there is delay in publication of bulletins (final figure), the provisional values as published can be considered for payments and arrears shall be paid/recovered on getting the final values.
- 2.17.9 PVC shall be applicable for the entire original contract period plus the extended period, i.e. for the complete execution period, as follows:

For PVC computation of the n^{th} month:

Let the cumulative delay attributable to the Contractor is D_n in the n^{th} month as per Form-14.

Considering R_n as the billing value for the n^{th} month, PVC for the n^{th} month shall be calculated as follows:

- (a) PVC for the portion of R_n for an amount of $D_{(n-1)}$ shall be payable as per indices for the $(n-1)^{\text{th}}$ month.
- (b) PVC for the balance portion of R_n shall be payable as per indices for the n^{th} month

In case $D_{(n-1)}$ is greater than R_n , then entire R_n shall be payable as per indices for the $(n-1)^{\text{th}}$ month and the balance portion of $D_{(n-1)}$ shall be adjusted from $R_{(n+1)}$ of the $(n+1)^{\text{th}}$ month and will be payable as per indices for the $(n-1)^{\text{th}}$ month. The above process shall be continued for subsequent month(s) also till full $D_{(n-1)}$ is consumed.

- (i) For milestones mentioned in the contract, PVC shall be applicable as per average of the indices from the month of base date till the month of execution of milestone.
- (ii) PVC shall not be applicable for time extension provided for the delays solely attributable to the contractor. No PVC is payable during the period of Provisional Time Extension till grant of final time extension. Applicability of PVC will be decided at the time of grant of final time extension.

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

Note: Work Planning in F-14 format to be meticulously done as per Clause 2.9 of this GCC.

2.18 INSURANCE

- 2.18.1 BHEL shall arrange for insuring the materials/properties of BHEL covering the risks during transit, storage, erection and commissioning.
- 2.18.2 It is the sole responsibility of the contractor to insure his materials, equipment, workmen etc. against accidents and injury while at work and to pay compensation, if any, to workmen as per Workmen's compensation Act. The work will be carried out in a protected area and all the rules and regulations of BHEL/Statutory Authorities in the area of project which are in force from time to time will have to be followed by the contractor.
- 2.18.3 If due to negligence and or non-observation of safety and other precautions by the contractors, any accident/injury occurs to the property / manpower belong to third party, the contractor shall have to pay necessary compensation and other expense, if so decided by the appropriate authorities.
- 2.18.4 The contractor will take necessary precautions and due care to protect the material, while in his custody from any damage/ loss due to theft or otherwise till the same is taken over by BHEL. For lodging / processing of insurance claim, the contractor will submit necessary documents. BHEL will recover the loss including the deductible franchise from the contractor, in case the damage / loss is due to carelessness / negligence on the part of the contractor. In case of any theft of material under contractor's custody, matter shall be reported to Police by the contractor immediately and copy of FIR and subsequently police investigation report shall be submitted to BHEL for taking up with insurance. However, this will not relieve the contractor of his contractual obligation for the material in his custody.

2.19 STRIKES & LOCKOUT

- 2.19.1 The contractor will be fully responsible for all disputes and other issues connected with his labour. In the event of the contractor's labour resorting to strike or the Contractor resorting to lockout and if the strike or lockout declared is not settled within a period of one month, it may be considered as 'Breach of Contract' under Clause 2.7 and the remedies under Clause 2.7.2.2 may be executed, at the discretion of BHEL.

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

2.20 FORCE MAJEURE

- 2.20. "Force Majeure" shall mean circumstance which is: a) beyond a party's control, b) The party could not reasonably have provided against before entering into the contract, c) Having arisen, such party could not reasonably have avoided or overcome, and d) Is not substantially attributable to the other party. Such circumstances include but not limited to
- (i) Exceptionally adverse climatic conditions at the site which are unforeseeable having regard to climate data available or published in the country for the geographical location of the site.
 - (ii) War, hostilities (whether war be declared or not), invasion, act of foreign enemies.
 - (iii) Rebellion, terrorism, revolution, insurrection, military or usurped power, or civil war.
 - (iv) Riot, commotion or disorder by persons other than the contractor's personnel and other employees of the contractor and sub-contractors.
 - (v) Strike or lockout not solely involving the contractor's personnel and other employees of the contractor and sub-contractors.
 - (vi) Encountering munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the contractor's use of such munitions, explosives, radiation or radio- activity.
 - (vii) Natural catastrophes such as earthquake, tsunami, volcanic activity, hurricane or typhoon, flood, fire, cyclones, pandemic etc.
- 2.20.2 The following events are explicitly excluded from Force Majeure and are solely the responsibilities of the non-performing party: a) any strike, work-to-rule action, go-slow or similar labour difficulty (b) late delivery of equipment or material (unless caused by Force Majeure event) and (c) economic hardship.
- 2.20.3 If either party is prevented, hindered or delayed from or in performing any of its obligations under the Contract by an event of Force Majeure, then it shall notify the other in writing of the occurrence of such event and the circumstances thereof within 15 (fifteen) days after the occurrence of such event.
- 2.20.4 The party who has given such notice shall be excused from the performance or punctual performance of its obligations under the Contract for so long as the relevant event of Force Majeure continues and to the extent that such party's performance is prevented, hindered or delayed. The Time for Completion shall be extended by a period of time equal to period of delay caused due to such Force Majeure event.

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- 2.20.5 Delay or non-performance by either party hereto caused by the occurrence of any event of Force Majeure shall not
- (i) Constitute a default or breach of the Contract.
 - (ii) Give rise to any claim for damages or additional cost expense occasioned thereby, if and to the extent that such delay or non-performance is caused by the occurrence of an event of Force Majeure.
- 2.20.6 BHEL at its discretion may consider short closure of contract after 1 year of imposition of Force Majeure in line with extant guidelines. In any case, Contractor cannot consider deemed short-closure after 1 year of imposition of Force Majeure.

2.21 ARBITRATION & CONCILIATION

2.21.1 Arbitration:

2.21.1.1 Except as provided elsewhere in this Contract, in case Parties are unable to reach amicable settlement (whether by Conciliation to be conducted as provided in Clause 2.21.2 herein below or otherwise) in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or, in any manner touching upon the Contract (hereinafter referred to as the 'Dispute'), then, either Party may, commence arbitration in respect of such Dispute by issuance of a notice in terms of section 21 of the Arbitration & Conciliation Act, 1996 (hereinafter referred to as the 'Notice'). The Notice shall be addressed to the Head of CoE Karkhiyaon and 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. Within 60 days of receipt of the complete Notice, the Head of the BHEL CoE Karkhiyaon shall offer names of three proposed Arbitrators to the invoking Party advising to choose any one of the three names to be appointed as Sole Arbitrator. On getting confirmation from the invoking Party regarding the Arbitrator chosen from among the names so offered, the Head of the BHEL CoE Karkhiyaon, shall appoint such chosen person as the Sole Arbitrator for conducting the arbitration. 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 Varanasi (UP). The Contract shall be governed by and be construed as per provisions of the laws of

Bidder
(Signature with Name, Designation and Date)

India. Subject to this provision 2.21.1.1 regarding ARBITRATION, the principal civil court exercising ordinary civil jurisdiction over the area where the seat of arbitration is located shall have exclusive jurisdiction over any DISPUTE to the exclusion of any other court.

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

- 2.21.1.2 In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts inter se and also between CPSEs and Government Departments/Organizations (excluding disputes concerning Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for resolution through AMRCD (Administrative Mechanism for Resolution of CPSEs Disputes) as mentioned in DPE OM No. 4(1)/2013-DPE(GM)/FTS-1835 dated 22-05-2018 as amended from time to time.
- 2.21.1.3 The cost of arbitration shall initially be borne equally by the Parties subject to the final allocation thereof as per the award/order passed by the Arbitrator.
- 2.21.1.4 Notwithstanding the existence of any dispute or differences and/or reference for the arbitration, the Contractor shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and expedition in a professional manner unless the dispute inter-alia relates to cancellation, termination or short-closure of the Contract by BHEL.

2.21.2 Conciliation:

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

Notes:

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

Bidder
(Signature with Name, Designation and Date)

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

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

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

2.21.3 No Interest payable to Contractor

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

2.22 RETENTION AMOUNT: Not Applicable

2.23 PAYMENTS

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

2.23.1 Running Account Bills (RA Bills)

- (i) These are for interim payments when the contracts are in progress. The bills for such interim payments are to be prepared by Contractor in prescribed formats (RA Bill forms).
- (ii) Payments shall be made according to the extent of work done as per measurements taken up to the end of the calendar month and in line with the terms of payments described in the Tender documents.
- (iii) Recoveries on account of electricity, water, statutory deductions etc. are made as per terms of contract.
- (iv) Full rates for the work done shall be allowed only if the quantum of work has been done as per the specifications stipulated in the contract. If the work is not executed as per the stipulated specifications, BHEL may ask the contractor to redo the work according to the required specifications,

Bidder
(Signature with Name, Designation and Date)

without any extra cost. However, where this is not considered necessary 'OR' where the part work is done due to factors like non-availability of material to be supplied by BHEL 'OR' non availability of fronts 'OR' non availability of drawings, fraction payment against full rate, as is considered reasonable, may be allowed with due regard for the work remaining to be done. BHEL decision in this regard will be final and binding on the contractor.

- (v) In order to facilitate part payment, BHEL at its discretion may further split the contracted rates/percentages to suit site conditions, cash flow requirements according to the progress of work, subject to following:
- (a) Provided no 'part' payment is recommended till 25% of work in the item rate is executed.
 - (b) Payment of item rate to be made in not more than three instalments, last stage payment to be not lower than 20% of the item rate.

2.23.3 Final Bill

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

- (i) 'No Claim Certificate' by Contractor
- (ii) Clearance certificates where ever applicable viz. Clearance Certificates from BHEL, various Statutory Authorities like Labour department, PF Authorities, Commercial Tax Department etc.
- (iii) Indemnity Bond as per prescribed format.

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

2.24 PERFORMANCE GUARANTEE FOR WORKMANSHIP

- 2.24.1 Even though the work will be carried out under the supervision of BHEL Engineers the **Contractor will be responsible for the quality of the workmanship and shall guarantee the work done for a period of 12 (Twelve) months from the date of commencement of guarantee period as defined in Technical Conditions of Contract**, for good workmanship and shall rectify free of cost all defects due to faulty erection detected during the guarantee period. In the event of the Contractor failing to repair the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs of such defective works by itself, without prejudice to any other rights and recover the cost incurred for the same along with 5% overheads from the Security Deposit.

Bidder
(Signature with Name, Designation and Date)

2.24.2 BHEL shall release the Security Deposit subject to the following:

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

2.25 CLOSING OF CONTRACTS

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

Bidder
(Signature with Name, Designation and Date)

2.26 SUSPENSION OF BUSINESS DEALINGS

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

2.27 LIMITATION ON LIABILITY

Notwithstanding anything to the contrary in this Agreement or the Work Order or any other mutually agreed document between the parties, the maximum liability, for damages, of the contractor, its servants or agents, shall under no circumstances exceed an amount equal to the Price of the Agreement or the Work Order. The contractor shall not in any case be liable for loss of profit or special, punitive, exemplary, indirect or consequential losses whatsoever. This shall not be applicable on the recoveries made by Statutory Authorities from BHEL on account of Contractor, any other type of recoveries for workmanship, material, T&P etc. due from the contractor.

2.28 OTHER ISSUES

- 2.28.1 Value of Non judicial Stamp Paper for Bank Guarantees and for Contract Agreement shall be not less than Rs 100/- unless otherwise required under relevant statutes.
- 2.28.2 In case of any conflict between the General Conditions of Contract and Special Conditions of Contract, provisions contained in the Special Conditions of Contract shall prevail.
- 2.28.3 Unless otherwise specified in NIT, offers from consortium/ JVs shall not be considered.
- 2.28.4 BHEL may not insist for signing of Contract Agreements in respect of low value and short time period contracts like providing services for Hot water flushing, Chemical Cleaning, Transportation, Geo-Technical works, Hiring of T&Ps/ Vehicles/ Equipments etc. and work shall be executed as per the terms of LOI/LOA/Work Order. BHEL may not insist for signing of Contract Agreements in respect of works costing upto Rs. 2 lakhs (upto Rs. 5 lakhs in case scheduled completion period is not more than 3 months).

Bidder
(Signature with Name, Designation and Date)

2.29 BREACH OF CONTRACT, REMEDIES AND TERMINATION

In case of breach of contract, wherever the value of security instruments like performance bank guarantee available with BHEL against the said contract is atleast 10% of the contract value, the same be encashed. In case the value of the security instruments available is less than 10% of the contract value, the balance amount be recovered from other financial remedies (i.e. available bills of the contractor, retention amount, etc. with BHEL) or legal remedies be pursued. The balance scope shall be got done independently without Risk & Cost of the failed supplier/ contractor. Further, levy of liquidated damages, debarment, termination, de-scoping, short-closure, etc., shall be applied as per provisions of the contract. Accordingly, the tender/ contract terms shall be structured in such a way to ensure recovery of an amount equivalent to 10% of the contract value in case of breach of contract.

Bidder
(Signature with Name, Designation and Date)



BHARAT HEAVY ELECTRICALS LIMITED
Centre of Excellence (CoE), Karkhiyaon, Varanasi

Name of Work : Construction of Propulsion Manufacturing Block
Foundation and Miscellaneous Enabling Works at BHEL CoE,
Karkhiyaon, Varanasi.

VOLUME-1E

FORMS AND PROCEDURES

NIT No. COE/VNS/CVL/2023/001

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: will be released later

OFFER FORWARDING LETTER / TENDER SUBMISSION LETTER
(To be typed and submitted in the Letter Head of the Company/Firm of Bidder)

Offer Reference No:.....

Date:.....

To,

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

Dear Sir,

Sub : Submission of Offer against Tender Specification No:

I/We hereby offer to carry out the work detailed in the Tender Specification issued by Bharat Heavy Electricals Limited, Power Sector-....., in accordance with the terms and conditions thereof.

I/We have carefully perused the following listed documents connected with the above work and agree to abide by the same.

1. Amendments/Clarifications/Corrigenda/Errata/etc issued in respect of the Tender documents by BHEL
2. Notice Inviting Tender (NIT)
3. Price Bid
4. Technical Conditions of Contract
5. Special Conditions of Contract
6. General Conditions of Contract
7. Forms and Procedures

Should our Offer be accepted by BHEL for Award, I/we further agree to furnish 'Security Deposit' for the work as provided for in the Tender Conditions within the stipulated time as may be indicated by BHEL.

I/We further agree to execute all the works referred to in the said Tender documents upon the terms and conditions contained or referred to therein and as detailed in the appendices annexed thereto.

I/We have deposited/depositing herewith the requisite Earnest Money Deposit (EMD) as per details furnished in the Check List.

Authorised Representative of Bidder

Signature :

Name :

Address :

Place:

Date:

DECLARATION BY AUTHORISED SIGNATORY OF BIDDER

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

To,

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

Dear Sir,

Sub : **Declaration by Authorised Signatory**

Ref : 1) NIT/Tender Specification No:
2) All other pertinent issues till date

I/We, hereby certify that all the information and data furnished by me with regard to the above Tender Specification are true and complete to the best of my knowledge. I have gone through the specifications, conditions, stipulations and all other pertinent issues till date, and agree to comply with the requirements and Intent of the specification.

I further certify that I am authorised to represent on behalf of my Company/Firm for the above mentioned tender and a valid Power of Attorney to this effect is also enclosed.

Yours faithfully,

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

Date:

Enclosed : Power of Attorney

DECLARATION BY AUTHORISED SIGNATORY OF BIDDER

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

To,

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

Dear Sir,

Sub : **Declaration by Authorised Signatory regarding Authenticity of submitted documents.**

Ref : 1) NIT/Tender Specification No:
2) All other pertinent issues till date

I/We, hereby certify that all the documents submitted by us in support of possession of “Qualifying Requirements” are true copies of the original and are fully compliant required for qualifying / applying in the bid and shall produce the original of same as and when required by Bharat Heavy Electricals Limited.

I / We hereby further confirm that no tampering is done with documents submitted in support of our qualification as bidder. I / We understand that at any stage (during bidding process or while executing the awarded works) if it is found that fake / false / forged bid qualifying / supporting documents / certificates were submitted, it would lead to summarily rejection of our bid / termination of contract. BHEL shall be at liberty to initiate other appropriate actions as per the terms of the Bid / Contract and other extant policies of Bharat Heavy Electricals Limited.

Yours faithfully,

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

Date:

NO DEVIATION CERTIFICATE

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

To,

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

Dear Sir,

Sub : **No Deviation Certificate**

Ref : 1) NIT/Tender Specification No:,

2) All other pertinent issues till date

We hereby confirm that we have not changed/ modified/materially altered any of the tender documents as downloaded from the website/ issued by BHEL and in case of such observance at any stage, it shall be treated as null and void.

We also hereby confirm that we have neither set any Terms and Conditions and nor have we taken any deviation from the Tender conditions together with other references applicable for the above referred NIT/Tender Specification.

We further confirm our unqualified acceptance to all Terms and Conditions, unqualified compliance to Tender Conditions, Integrity Pact (if applicable) and acceptance to Reverse Auctioning process.

We confirm to have submitted offer in accordance with tender instructions and as per aforesaid references.

Thanking you,

Yours faithfully,

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

DECLARATION CONFIRMING KNOWLEDGE ABOUT SITE CONDITIONS
(To be typed and submitted in the Letter Head of the Company/Firm of Bidder)

To,

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

Dear Sir,

Sub : **Declaration confirming knowledge about Site conditions**

Ref : 1) NIT/Tender Specification No:,

2) All other pertinent issues till date

I/We, _____ hereby declare and confirm that we have visited the 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:

DECLARATION FOR RELATION IN BHEL

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder failing which the offer of Bidder is liable to be summarily rejected)

To,

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

Dear Sir,

Sub : **Declaration for relation in BHEL**

Ref : 1) NIT/Tender Specification No:,

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

Tick(✓) any one as applicable:

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

OR

2. The Proprieter, Partner(s), or Director(s) of our Company/Firm HAVE relation/relatives employed in BHEL and their particulars are as below:

(i)

(ii)

Signature of the Authorised Signatory

Note:

1. Attach separate sheet, if necessary.
2. If BHEL Management comes to know at a later date that the information furnished by the Bidder is false, BHEL reserves the right to take suitable against the Bidder/Contractor.

NON DISCLOSURE CERTIFICATE

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

NON DISCLOSURE CERTIFICATE

I/We understand that BHEL PS __ is committed to Information Security Management System as per their Information Security Policy.

Hence, I/We M/s.....
who are submitting offer for providing services to BHEL PS __ against
Tender Specification No:_____,
hereby undertake to comply with the following in line with Information
Security Policy of BHEL PS __, _____

- To maintain confidentiality of documents & information which shall be used during the execution of the Contract.
- The documents & information shall not be revealed to or shared with third party which shall not be in the business interest of BHEL PS__.

(Signature, date & seal of Authorized
Signatory of the bidder)

Date:

BANK ACCOUNT DETAILS FOR E-PAYMENT

(To be given on Letter head of the Company /Firm of Bidder, and **ENDORSED (SIGNED & STAMPED) BY THE BANK** to enable BHEL release payments through Electronic Fund Transfer (EFT/RTGS))

1. Beneficiary Name :
2. Beneficiary Account No. :
3. Bank Name & Branch :
4. City/Place :
5. 9 digit M ICR Code of Bank Branch :
6. IFSC Code of Bank Branch :
7. Beneficiary E-mail ID :
(for payment confirmation)

NOTE: In case Bank endorsed certificate regarding above has already been submitted earlier, Kindly submit photocopy of the same

FORMAT FOR SEEKING CLARIFICATION

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

To,

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

Dear Sir,

Sub : **Request for Clarification**Ref : 1) NIT/Tender Specification No:
2) All other pertinent issues till date

Sl no	Reference clause of Tender Document	Existing provision	Bidder's query	BHEL's clarification
1				
2				
3				
4				
5				
6				

Yours faithfully,

(Signature, date & seal of Authorized
Representative of the Bidder)

CONTRACT AGREEMENT

Form No: F-10 (Rev 00)

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)

Power Sector – Region

.....

.....

CONTRACT AGREEMENT

AGREEMENT NO. _____

NAME OF WORK	
NAME OF THE CONTRACTOR WITH FULL ADDRESS	
VALUE OF WORK AWARDED	
LETTER OF AWARD NO.	
TIME ALLOTTED FOR COMPLETING THE WORK (DATE OF COMPLETION)	

SIGNATURE OF CONTRACTOR

(SIGNATURE OF BHEL OFFICER)

CONTRACT AGREEMENT

THIS AGREEMENT MADE THIS _____ DAY OF _____ between BHARAT HEAVY ELECTRICALS LIMITED (A Government of India Enterprise) a Company incorporated under the Companies Act, 1956, having its Registered Office at BHEL House, Siri Fort New Delhi-110049 (herein after called BHEL) of the ONE PART.

AND

M/S _____
_____ (hereinafter called the 'Contractor') of the
SECOND PART.

WHEREAS M/s -----state that they
have acquired and possess extensive experience in the field of -----

And Whereas in response to an Invitation to Tender No. ----- issued by BHEL for
execution of ----- the contractor submitted their offer
No.-----dated -----And whereas BHEL has accepted the
offer of the Contractor on terms and conditions specified in the Letter of Award No.-----
-----dated -----read with the references cited therein.

THIS AGREEMENT WITNESSES AND it is hereby agreed by and between the parties as follows:

1. That the contractor shall execute the work of -----and more particularly described in Tender Specification No -----including Drawings and Specifications (hereinafter called the said works) in accordance with and subject to terms and conditions contained in these presents, instructions to Tenderers, General Conditions of Contract, Special Conditions, Annexures, Letter of Award dated ----- and such other instructions, Drawings, Specifications given to him from time to time by BHEL.
2. The Contractor is required to furnish to BHEL Security deposit in the form of cash/ approved securities/ Bank Guarantee valid upto ----- for a sum of Rs.----- towards satisfactory performance and completion of the Contract.
3. The Contractor has furnished a Bank Guarantee bearing no.-----dated ----- for a sum of Rs.-----executed by ----- in favour of BHEL towards Security Deposit valid upto -----

OR

The Contractor has furnished to BHEL an initial Security Deposit of Rs.-----in the form of cash / approved Securities/ B.G No.----- dated ----- for Rs.-----executed by ----- in favour of BHEL valid upto ----- and has agreed for recovery of the balance security deposit by BHEL @ 10% of the value of work done from each running bill till the entire Security Deposit is recovered.

OR

The contractor has furnished to BHEL an initial Security Deposit of Rs.-----(Rs.----- vide Bank draft No.-----dated -----and by adjusting EMD of Rs.----- submitted vide Bank draft No.----- dt.-----) and has agreed for recovery of balance Security Deposit by BHEL @ 10% of the value of work done from each running bill till the entire security deposit is recovered.

4. The Contractor hereby agrees to extend the validity of the Bank Guarantee for such further period or periods as may be required by BHEL and if the Contractor fails to obtain such extension(s) from the Bank, the Contractor, shall pay forthwith or accept recovery of Rs.----- from the bills in one installment and the contractor further agrees that failure to extend the validity of the Bank Guarantee or failure to pay the aforesaid amount in the manner specified above shall constitute breach of contract. In addition to above, BHEL shall be entitled to take such action as deemed fit and proper for recovering the said sum of Rs.-----

OR

In case the contractor furnishes the bank guarantee at a later date the contractor hereby agrees to extend the validity of bank guarantee for such further period or periods as may be required by BHEL and if the contractor fails to obtain such extension(s) from the bank, the contractor shall pay forthwith or accept recovery of the amount of bank guarantee given in lieu of security deposit from the bills in one installment and the contractor further agrees that failure to extend the validity of bank guarantee or failure to pay the aforesaid amount in the manner specified above shall constitute breach of contract. In addition to above, BHEL shall be entitled to take such action as deemed fit and proper for recovering the said sum.

5. That in consideration of the payments to be made to the Contractor by BHEL in accordance with this Agreement the Contractor hereby covenants and undertakes with BHEL that they shall execute, construct, complete the works in conformity, in all respects, with the terms and conditions specified in this Agreement and the documents governing the same.
6. That the Contractor shall be deemed to have carefully examined this Agreement and the documents governing the same and also to have satisfied himself as to the nature and character of the Works to be executed by him.
7. That the Contractor shall carry out and complete the execution of the said works to the entire satisfaction of the Engineer or such other officer authorised by BHEL, within the agreed time schedule.
8. That BHEL shall, after proper scrutiny of the bills submitted by the Contractor; pay to him during the progress of the said works such sum as determined by BHEL in accordance with this Agreement.
9. That this Agreement shall be deemed to have come into force from ----- the date on which the letter of Award has been issued to the Contractor.
10. That whenever under this contract or otherwise, any sum of money shall be recoverable from or payable by the Contractor, the same may be deducted in the manner as set out in the General Conditions of Contract or other conditions governing this Agreement.
11. That all charges on account of Octroi, Terminal and other taxes including sales tax or other duties on material obtained for execution of the said works shall be borne and paid by the Contractor.
12. That BHEL shall be entitled to deduct from the Contractor's running bills or otherwise Income Tax as per prevailing Income Tax Act.
13. That BHEL shall be further entitled to recover from the running bills of the Contractor or otherwise such sum as may be determined by BHEL from time to time in respect of

CONTRACT AGREEMENT

Form No: F-10 (Rev 00)

consumables supplied by BHEL, hire charges for tools and plants issued (Where applicable) and any other dues owed by the Contractor.

14. That it is hereby agreed by and between the parties that non-exercise, forbearance or omission of any of the powers conferred on BHEL and /or any of its authorities will not in any manner constitute waiver of the conditions hereto contained in these presents and the liability of the Contractor with respect to compensation payable to BHEL or Contractor's obligations shall remain unaffected.
15. It is clearly understood by and between the parties that in the event of any conflict between the Letter of Award and other documents governing this Agreement, the provisions in the Letter of Award shall prevail.

16. The following documents

1. Invitation to Tender No-----
and the documents specified therein.
2. Contractor's Offer No-----
dated-----.
3. _____
4. _____
5. _____
6. Letter of Award No. _____ dated _____.
7. _____

shall also form part of and govern this Agreement.

IN WITNESS HEREOF, the parties hereto have respectively set their signatures in the presence of

WITNESS

1.

2.

(CONTRACTOR)
(to be signed by a person holding
a valid Power of Attorney)

WITNESS

1.

2.

(For and on behalf of BHEL)

PROFORMA OF BANK GUARANTEE (in lieu of SECURITY DEPOSIT)

In consideration of Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its Unit at Bharat Heavy Electricals Limited, Power Sector Northern Region, HRDI & PSNR Complex, Plot no. 25, Sector – 16 A, Noida - 201301 having agreed to exempt (Name of the Vendor / Contractor / Supplier) with its registered office at _____¹ (hereinafter called the said "Contractor" which term includes supplier), from demand under the terms and conditions of the Contract reference No. _____ dated _____² valued at Rs. ³ (Rupees -----)³ (hereinafter called the said Contract), of Security Deposit for the due fulfilment by the said Contractor of the terms and conditions contained in the said Contract, on production of a Bank Guarantee for Rs. _____⁴ (Rupees _____ only),

We _____ (indicate the name and address of the Bank) having its Head Office at _____ (address of the head Office) (hereinafter referred to as the Bank), at the request of _____ [Contractor(s)], being the Guarantor under this Guarantee, do hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer, an amount not exceeding Rs. _____ without any demur, immediately on demand from the Employer and without any reservation, protest, and recourse and without the Employer needing to prove or demonstrate reasons for its such demand.

Any such demand made on the bank, shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any Court or Tribunal or Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

The payment so made by us under this guarantee shall be a valid discharge of our liability for payment hereunder and the Contractor(s) shall have no claim against us for making such payment.

We, further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied & the Employer certifies that the terms and conditions of the said Contract have been fully and properly carried out by the said contractor(s) or acceptance of the final bill or discharge of this guarantee by the Employer, whichever is earlier. This guarantee shall initially remain in force upto and including _____⁵ and shall be extended from time to time for such period as may be desired by the Employer. Unless a demand or claim under this guarantee is made on us in writing on or before the _____⁶, we shall be discharged from all the liability under this guarantee thereafter.

We, _____ (indicate the name of the Bank) _____ further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said contractor(s) from time to time or to postpone for any time or

PROFORMA OF BANK GUARANTEE (in lieu of SECURITY DEPOSIT)

from time to time any of the powers exercisable by the Employer against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by any reason of any such variation or extension being granted to the said contractor(s) or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

We,..... Bank lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed..... ⁴
- b) This Guarantee shall be valid up to ⁵
- c) Unless the Bank is served a written claim or demand on or before ⁶ all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Date _____ Day of _____
for _____ (indicate the name of the Bank) _____

(Signature of Authorised signatory)

- ¹ ADDRESS OF THE VENDOR/ CONTRACTOR/ SUPPLIER.
- ² DETAILS ABOUT THE NOTICE OF AWARD/ CONTRACT REFERENCE
- ³ CONTRACT VALUE
- ⁴ BG AMOUNT IN FIGURES AND WORDS
- ⁵ VALIDITY DATE
- ⁶ DATE OF EXPIRY OF CLAIM PERIOD

PROFORMA OF BANK GUARANTEE (in lieu of SECURITY DEPOSIT)

Note:

1. Bidders are advised that expiry of claim period may be kept 3-6 months after validity date..
2. The BG should be on Non-Judicial Stamp paper/ e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/ e-stamp paper shall be purchased in the name of Vendor/ Contractor/ Supplier/ Bank issuing the guarantee.

3. In Case of Bank Guarantees submitted by Foreign Vendors.

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

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

b.1 In such cases, Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank's (BHEL's Consortium Bank) branch in India. All charges for issuance of Bank Guarantee/ counter-Guarantee should be borne by the Foreign Vendor.

b.2 In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.

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

BANK GUARANTEE FOR INTEREST BEARING REFUNDABLE ADVANCE

B.G. No.

Date

This deed of Guarantee made this _____ day of _____ two thousand _____ by < **Name and Address of Bank** > hereinafter called the "The Guarantor" (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns) in favour of M/S Bharat Heavy Electricals Limited a Company incorporated under the Companies Act, 1956, having its registered office at BHEL House, Siri Fort, New Delhi - 110049 through its unit at Bharat Heavy Electricals Limited, Power Sector Northern Region, HRDI & PSNR Complex, Plot no. 25, Sector - 16 A, Noida - 201301, hereinafter called "The Company" (which expression shall unless repugnant to the context or meaning thereof be deemed to include its successors and assigns).

WHEREAS M/s. _____ (hereinafter referred to as the Contractor) have entered into a Contract arising out of Letter of Intent no. _____ dtd _____ (hereinafter referred to as "the Contract") for the < **Name of work** > with the Company.

AND WHEREAS the Contract inter-alia provides that the Company will pay to the Contractor interest bearing advance of Rs. _____ (Rupees _____ only) on certain terms and conditions specified in the Contract subject to the Contractor furnishing a Bank Guarantee for Rs. _____ (Rupees _____ only) in favour of the Company.

AND WHEREAS the Company has agreed to accept a Bank Guarantee from a Bank to cover the said advance.

AND WHEREAS the Contractor has approached the Guarantor and in consideration of the arrangement arrived at between the Contractor and the Guarantor, the Guarantor has agreed to give the Guarantee as hereinafter mentioned in favour of the Company.

NOW THIS DEED WITNESSES AS FOLLOWS:-

- (1) In consideration of the Company having agreed to advance a sum of Rs. _____ (Rupees _____ only) to the Contractor, the Guarantor do hereby guarantee the due recovery by the Company of the said advance with interest thereon as provided according to the terms and conditions of the Contract. If the said Contractor fails to utilise the said advance for the purpose of the Contract and /or the said advance together with interest as aforesaid is not fully recovered by the Company the Guarantor do hereby unconditionally and irrevocably undertake to pay to the Company without demur and merely on a demand, to the extent of the said sum of Rs. _____ (Rupees _____ only) any claim made by the Company on them for the loss or damage caused to or suffered by the Company by reasons of the Company not being able to recover in full the advance with interest as aforesaid.

BANK GUARANTEE FOR INTEREST BEARING REFUNDABLE ADVANCE

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- (2) The decision of the Company whether the Contractor has failed to utilise the said advance or any part thereof for the purpose of the Contract and / or as to the extent of loss or damage caused to or suffered by the Company by reason of the Company not being able to recover in full the said sum of Rs. _____ with interest if any shall be final and binding on the Guarantor, irrespective of the fact whether the Contractor admits or denies the default or questions the correctness of any demand made by the Company in any Court Tribunal or Arbitration proceedings or before any other Authority.
- (3) The Company shall have the fullest liberty without affecting in any way the liability of the Guarantor under this Guarantee, from time to time to vary any of the terms and conditions of the Contract or extend time of performance by the Contractor or to postpone for any time and from time to time any of the powers exercisable by it against the Contractor and either enforce or forbear from enforcing any of the terms and conditions governing the Contract or securities available to the Company and the Guarantor shall not be released from its liability under these presents by any exercise by the Company of the liberty with reference to the matters aforesaid or by reasons of time being given to the Contractor or any other forbearance, act or commission on the part of the Company or any indulgence by the Company to the Contractor or of any other matter or thing whatsoever which under the law relating to sureties would, but for this provision have the effect of so releasing the Guarantor from its liability under this guarantee.
- (4) The Guarantor further agrees that the Guarantee herein contained shall remain in full force and effect during the period till the Company discharges this Guarantee, subject to however, that the Company shall have no claim under this Guarantee after _____ i.e. (the present date of validity of Bank Guarantee unless the date of validity of this Bank Guarantee is further extended from time to time, as the case may be) unless a notice of the claim under this Guarantee has been served on the Guarantor before the expiry of the said period in which case the same shall be enforceable against the Guarantor notwithstanding the fact that the same is enforced after the expiry of the said period.
- (5) The Guarantor undertakes not to revoke this Guarantee during the period it is in force except with the previous consent of the Company in writing and agrees that any liquidation or winding up or insolvency or dissolution or any change in the constitution of the Contractor or the Guarantor shall not discharge the Guarantor's liability hereunder.
- (6) It shall not be necessary for the Company to proceed against the Contractor before proceeding against the Guarantor and the Guarantee herein contained shall be enforceable against them notwithstanding any security which the Company may have obtained or obtain from the Contractor shall at the time when proceedings are taken against the Guarantor hereunder be outstanding or unrealised.
- (7) Notwithstanding anything contained herein before, our liability under the Guarantee is restricted to Rs. _____ (Rupees _____). Our guarantee shall remain in force until _____, i.e. the present date of validity of Bank Guarantee unless the date of validity of this Bank Guarantee is further extended from time to time. Unless a claim or demand under this guarantee is made against us on or before-----, we shall be discharged from our liabilities under this Guarantee thereafter.

BANK GUARANTEE FOR INTEREST BEARING REFUNDABLE ADVANCE

- (8) Any claim or dispute arising under the terms of this document shall only be enforced or settled in the courts at New Delhi/ Delhi only.
- (9) The Guarantor hereby declares that it has power to execute this Guarantee under its Memorandum and Articles of Association and the executant has full powers to do so on its behalf under the Power of Attorney dated_____ (To be incorporated by the Bank) granted to him by the proper authorities of the Guarantor.

IN WITNESS whereof the _____(Bank) has hereunto set and subscribed its hand the day, month and year first, above written.

(Name of the Bank)

Signed for and on behalf of the Bank
(Designation of the Authorized Person Signing the Guarantee)

(Signatory No.-----)

DATED:

SEAL

=====

Notes :

1. The BG shall be executed on non-judicial stamp papers of adequate value procured in the name of the Bank in the State where the Bank is located.
2. The BG is required to be sent by the executing Bank directly to BHEL at the address where tender is submitted / accepted, under sealed cover.

FORM for EXTENSION OF VALIDITY OF BANK GUARANTEE

1. To be typed on non judicial Stamp Papers of value as applicable in the State of India from where the BG has been issued or the State of India where the BG shall be operated
2. The non judicial stamp papers shall be purchased in the name of the Party on whose behalf the BG is being issued or the BG issuing Bank

BANK GUARANTEE No:

Date:.....

To

(Write Designation and Address of Officer of BHEL inviting the Tender)

Dear Sir

Sub : Validity of Bank Guarantee No:..... Dated for
 Rs in favour of yourself, expiry date
, on account of M/s in respect of
 Contract Number....., (herein after called the Original bank Guarantee)

At the request of M/s....., we Bank,
 having its branch Office at and having Head office
 at, do hereby extend our liability under the above mentioned Bank Guarantee
 number..... dated for a further period of Months/years
 from to expire on

Except as provided above, all other terms and conditions of the Original Bank Guarantee No
 Dated..... shall remain unaltered and binding on us.

Kindly treat this extension as an integral part of the original Bank Guarantee to which it
 would be attached.

Yours faithfully

Signature.....

Name & Designation.....

Power of Attorney/Signing Power No

Seal of Bank



PS-

MONTHLY PLAN & REVIEW WITH CONTRACTOR

Page 1 of 6

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART- A: PLAN/ REVIEW OF WORK FOR THE MONTH OF

Date of Plan/ Review.....

SN.	Description of Work	Unit of Measur- ement	Unit Rate	Planned		Cumulative Shortfall attributable to contractor upto last month (Refer Note 1)		Achieved		Shortfall attributable to BHEL w.r.t Plan (as per Col. 3 of Part- D)		Cumulative Shortfall attributable to Contractor upto & including this month		REMARKS (Reasons for Shortfall attributable to Contractor. Supporting documents to be kept as record.)
				(QTY Planned for the month as per Part –C of last month)										
(a)	(b)	(c)	(d)	A		B		C		D		E=A+B-C-D		
				Phy.	Financial	Phy	Financial	Phy.	Financial	Phy.	Financial	Phy.	Financial	
	Value of Other Items not mentioned above but planned to be executed in this month													
Total					ΣA		ΣB		ΣC		ΣD		ΣE	

BHEL

(Sign with name, designation and date)

CONTRACTOR

(Sign with name, designation and date)



PS-

MONTHLY PLAN & REVIEW WITH CONTRACTOR

Page 2 of 6

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART- A: Contd.....

Note 1: **In addition to the work planned as per Col. 'A', Contractor shall also make full efforts to minimize the 'Cumulative shortfall attributable to contractor upto the month' as mentioned in Col. 'B' by enhancing its resources, so as to achieve the completion of activities as per agreed schedule. In case contractor is not able to execute the entire shortfall, then BHEL 'Engineer in-charge', shall decide the priority of work to be executed and it shall be binding on the contractor.**

Note 2: Percentage Shortfall attributable to contractor w.r.t. "Plan - Shortfall attributable to BHEL" for the month = $[(\Sigma E - \Sigma B) / (\Sigma A - \Sigma D)] \times 100$
In case, $(\Sigma E - \Sigma B)$ is negative, then it shall be treated as zero percent."

Note 3: Form 14 should include all items being planned in the current month, and all items against which shortfall was attributable to contractor till previous month. However, for practical reason, if it is not possible to mention some of the items in Form-14 being planned to be executed in this month, then also value of such items shall necessarily be included in calculation of Total Value.

Note 4: In case reason for shortfall attributable to contractor is w.r.t. T&P and Manpower, it should be in conformity with Part B1 and B2.

BHEL

(Sign with name, designation and date)

CONTRACTOR

(Sign with name, designation and date)



PS-

MONTHLY PLAN & REVIEW WITH CONTRACTOR

Page 3 of 6

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – B-1: PLAN/REVIEW OF DEPLOYMENT OF MAJOR T&Ps FOR THE MONTH OF

Date of Plan/ Review.....

CONTRACTOR'S SCOPE: -

SN.	PLAN				DEPLOYMENT STATUS			
	Major T&P to be deployed as per work planned for the month	QTY	Deployment Period (in days)	Weightage assigned to planned T&P (in fraction such that $\Sigma C = 1$)	Actual Deployed Quantity	Actual Deployment Period (in days)	Weighted T&P Deployed	REMARKS (Works affected due to non-deployment of T&Ps)
		A	B	C	D	E	$F = (C \times D \times E) / (A \times B)$	

Note: In case, $E > B$, it shall be considered as $E = B$. Similarly, in case $D > A$, it shall be considered as $D = A$.Percentage of T&P Deployed = $\Sigma F \times 100$ **BHEL SCOPE: -**

SN.	PLAN			DEPLOYMENT STATUS		
	Major T&P to be deployed as per work planned for the month	QTY	Deployment Period (in days)	Actual Deployed Quantity	Actual Deployment Period (in days)	REMARKS (Works affected due to non-deployment of T&Ps)

BHEL

(Sign with name, designation and date)

CONTRACTOR

(Sign with name, designation and date)



PS-

MONTHLY PLAN & REVIEW WITH CONTRACTOR

Page 4 of 6

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – B-2: PLAN/ REVIEW OF DEPLOYMENT OF MANPOWER FOR THE MONTH OF

Date of Plan/ Review.....

CONTRACTOR'S SCOPE: -

SN.	Area of Work	Category of Labour	No. of Labour required as per category	Deployment Period (in days)	No. of Labour actually deployed	Actual Deployment Period (in days)	REMARKS (Works affected due to non-availability of labour)
			A	B	C	D	

Percentage of Manpower Deployed= $100 \times \Sigma(C \times D) / \Sigma(A \times B)$

BHEL

(Sign with name, designation and date)

CONTRACTOR

(Sign with name, designation and date)



PS-

MONTHLY PLAN & REVIEW WITH CONTRACTOR

Page 5 of 6

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – C: PLAN(PHYSICAL) FOR THE NEXT MONTH i.e.

Date of Plan

SN.	Description of work	Original Planned Quantity	Planned Quantity (excluding shortfalls attributable to contractor till date)	Unit of Measurement	T&Ps Required				Manpower Required		REMARKS (Reasons for difference in Original Planned Quantity w.r.t. Planned quantity to be given)
					Contractor Scope		BHEL Scope		Category of Labour	No. of Labour required as per Category	
					Major T&P to be deployed as per work planned for the month	Quantity	Major T&P to be deployed as per work planned for the month	Quantity			

Note 1: Planned quantity should be based on available/ expected fronts/ inputs in the next month

Note 2: “Original Planned Quantity” shall be as per latest jointly agreed programme between BHEL and Contractor before commencement of work or at the time of latest Time Extension, as the case may be.

BHEL

(Sign with name, designation and date)

CONTRACTOR

(Sign with name, designation and date)



PS-

MONTHLY PLAN & REVIEW WITH CONTRACTOR

Page 6 of 6

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – D: REASONS FOR SHORTFALL ATTRIBUTABLE TO BHEL IN RESPECT OF PLAN FOR THE MONTH.....

SN.	Description of Work (from Part-A)	Quantities Affected		Reasons for Shortfall attributable to BHEL	Agency responsible for reasons for Shortfall	Remarks (Supporting Documents in respect of agency responsible)
		(Physical Quantity)	Unit of Measu- rement			
1	2	3	4	5	6	7

Note1: Reasons for shortfall shall include non-availability of fronts/ drawings/ materials/ T&P (BHEL Scope)/ clearances etc. and other hindrances for which contractor is not responsible.

Note2: Agency responsible may be BHEL Site/ MUs/ Design Centre/ BHEL Customer/ other Contractors etc.

BHEL

(Sign with name, designation and date)

Project		Vendor			Package/Unit	
Sl. No.	Parameter for Measurement	Classification	Max Score	Score Obtained	Measurement Key/Scheduled date	Supporting Documents
#1.01	Cumulative number of days in the month, the nominated Quality Officer or his authorised nominee was not available	QUALITY	1.5		Quality Officer or his authorised nominee should be available for all the days of working at site	Daily Log Book entry/Incident Registers/letter references
#1.02	Number of instances of non- compliance wrt FQP, Standard Drawings, Specifications, E&C Manuals etc.	QUALITY	1.5		No deviation from FQP, Standard Drawings, Specifications, E&C Manuals etc. is allowed without BHEL Engineer's approval.	Daily Log Book entry/Incident Registers/letter references
#1.03	Percentage submission of test certificates for batches of welding electrodes, cement, sand, aggregate, consumable, Paints etc. as applicable for this month OR In case of MM & MH package, monthly checks for Storage/Preservation of material.	QUALITY	1		Submission of 100% Test certificates for materials as per FQP is mandatory. MM & MH package: Storage/Preservation as per manual/procedure.	Daily Log Book entry/Incident Registers/letter references
#1.04	Number of incidences of improper storage & preservation (not in accordance to the guidelines of BHEL MUs or approved FQP) of materials, consumables (viz. gases, welding electrodes & fluxes, fuel etc.) & bought-out items (paints, fasteners etc.) under the custody of the contractor	QUALITY	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#1.05	Rework/ Rejection instances in a month necessitated due to deviation from Standard Drawings /Specifications /Manuals /E&C procedures /FQPs or due to Poor Workmanship by contractor	QUALITY	2		Reworks/ Rejection should be as minimum as possible. Total number of reworks/ rejections due to reasons attributable to contractor.	Daily Log Book entry/Incident Registers/letter references
#1.06	Delay in preparation & submission of signed protocols / log sheets / site register / NDT test reports as per approved FQP/ Qualified Welder List along with photocopies of Welder ID cards / Welder Performance Evaluation records etc. in the month OR in case of MM / MH package reconciliation statement / verification report.	QUALITY	1		Within 2 days of measurements taken or within first 3 working days of next month, as advised by BHEL Engineer	Daily Log Book entry/Incident Registers/letter references
#1.07	Number of instances for Major equipment/product failure due to negligence/improper work/poor workmanship by contractor	QUALITY	1		No such event should happen	Daily Log Book entry/Incident Registers/letter references
#1.08	Total number of complaints received in the month on the quality of finish / aesthetics	QUALITY	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references

Name and Signature of BHEL Package In-charge

Name and Signature of Contractor

Project		Vendor			Package/Unit	
Sl. No.	Parameter for Measurement	Classification	Max Score	Score Obtained	Measurement Key/Scheduled date	Supporting Documents
#2.01	Cumulative number of days of delay in submission of Plan FOR THE MONTH supported by deployment plan of Major T&Ps and Manpower (as per Form F-14) and relevant construction/layout drawings - like A4 plan / elevation views of plan status for structures / pressure parts/Civil Works, Piping isometrics for piping, Layout / PID / System reference sketch, Unloading / storage plans etc.as applicable.	PERFORMANCE	5		Number of days delayed from second working day of the month	Daily Log Book entry/Incident Registers/letter references
#2.02	Percentage of timely submission of Daily Reports for Progress of work, Resources, Consumables etc.	PERFORMANCE	1.5		Percentage of timely submission of daily reports/ Scheduled date is successive next day for each day	Daily Log Book entry/Incident Registers/letter references
#2.03	Number of days delayed for submission of FQP log sheets / protocols / Monthly Progress Reports for the work executed during the month under measurement	PERFORMANCE	1.5		Number of days delayed/Scheduled date is first 2 working days of next month	Daily Log Book entry/Incident Registers/letter references
#2.04	Percentage Shortfall attributable to contractor w.r.t. "Plan - Shortfall attributable to BHEL" for the month as per Form-14	PERFORMANCE	35		As per Part-A of Form-14	Progress review formats
#2.05	Number of days delayed in submission of Running bills with complete supporting documents (including updated reconciliation statement of BHEL issued material) for the month	PERFORMANCE	2		Number of days delayed / Scheduled date is 7th day of next month	Daily Log Book entry/Incident Registers/letter references
#2.06	Number of times the Top Management of contractor did not respond to critical issues of site, for the month	PERFORMANCE	1		Total number of instances	Daily Log Book entry/Incident Registers/letter references
#2.07	Cumulative number of days in the month the works were stopped / refused on interpretation of contract clauses/scope due to tendency of taking undue advantage by interpreting contract clauses in their favour	PERFORMANCE	2		Cumulative number of days lost	Daily Log Book entry/Incident Registers/letter references
#2.08	Number of times rework was refused by contractor	PERFORMANCE	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references

Name and Signature of BHEL Package In-charge

Name and Signature of Contractor

Project		Vendor			Package/Unit	
Sl. No.	Parameter for Measurement	Classification	Max Score	Score Obtained	Measurement Key/Scheduled date	Supporting Documents
#2.09	Cumulative number of days in the month recording / logging was not done in daily log / history register / hindrance register / soft form in a PC maintained at BHEL Site Office	PERFORMANCE	1		Cumulative number of days recording or logging was not done / all days of the month	Daily Log Book entry/Incident Registers/letter references
#3.01	Percentage of Manpower Deployed w.r.t. Plan for the month as per Form-14.	RESOURCES	7		As per Part-B2 of Form-14	Daily Log Book entry/Incident Registers/letter references
#3.02	Percentage of T&P Deployed w.r.t. Plan for the month as per Form-14.	RESOURCES	7		As per Part-B1 of Form-14	Daily Log Book entry/Incident Registers/letter references
#3.03	Cumulative number of major instances in the month hampering / affecting progress of work due to breakdown or non-availability of major T&P and MME for the work, under the scope of Contractor	RESOURCES	3		Cumulative number of instances	Daily Log Book entry/Incident Registers/letter references
#3.04	Cumulative number of major instances in the month hampering / affecting progress of work due to non-availability of Consumables/ use of improper consumables under the scope of contractor	RESOURCES	3		Cumulative number of instances	Daily Log Book entry/Incident Registers/letter references
#4.01	Number of non-compliances during the month for Statutory requirements like validity of Labour Licence, Insurance Policy, Labour Insurance, PF, BOCW Compliance etc. and any other applicable laws/ Regulation, Electrical Licence, T&P fitness certificate, Contractors' All Risk Policy etc. as applicable	SITE INFRASTRUCTURE & SERVICE	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#4.02	Cumulative number of days in a month poor illumination is reported at storage area, erection area, pre-assembly area and other designated areas by BHEL site.	SITE INFRASTRUCTURE & SERVICE	0.5		Total number of non-compliances/random checks	Daily Log Book entry/Incident Registers/letter references
#4.03	Cumulative number of days of non-availability of well-maintained toilets facilities for workers (separate for men and women) and non-availability of potable drinking water stations for workers in specified areas.	SITE INFRASTRUCTURE & SERVICE	1		Total number of non-compliances/random checks	Daily Log Book entry/Incident Registers/letter references

Name and Signature of BHEL Package In-charge

Name and Signature of Contractor

Project		Vendor			Package/Unit	
Sl. No.	Parameter for Measurement	Classification	Max Score	Score Obtained	Measurement Key/Scheduled date	Supporting Documents
#4.04	Total number of instances in the month, Housekeeping NOT attended to in spite of instructions by BHEL -i.e. removal / disposal of surplus earth / debris / scrap / unused / surplus cable drums / other electrical items / surplus steel items / packing materials, thrown out scrap like weld butts, cotton waste etc. from the working area to identified locations	SITE INFRASTRUCTURE & SERVICE	2		Total number of non-compliances/random checks	Daily Log Book entry/Incident Registers/letter references
#4.05	Total number of instances in a month, Site Office with reasonably good facilities including enough nos. of computers and printers etc. for use by office and supporting staff was not made available/maintained.	SITE INFRASTRUCTURE & SERVICE	0.5		No discrepancy during regular or surprise visits	Photograph and report of the Engineer
#5.01	Number of days delayed in making labour payments for the last month	SITE FINANCE	2		Number of days delayed / Scheduled date is 7th day of next month	Daily Log Book entry/Incident Registers/letter references
#5.02	Number of complaints from labour/ sub supplier/ sub-contractor for non-receipt of payments from contractor	SITE FINANCE	1.5		Total number of complaints or reporting	Daily Log Book entry/Incident Registers/letter references
#5.03	Number of times the site operations were hampered for want of funds at the disposal of site-in-charge.	SITE FINANCE	1.5		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#6.0	Performance against HSE Parameters (as per Annexure-AA)	HSE	10		Score as per Safety Performance Evaluation System, scaled down to 10	Safety Performance Evaluation System
Total			100			

Less Deduction in Score Due to Fatal Accidents attributable to the Contractor @ 20 points/ accident	
Less Deduction in Score Due to Major Accidents (Permanent Disability or bodily injury by which person injured is prevented to resume to work within 48 hours or more after accident,, Major Damage to Equipment etc.) attributable to the contractor @ 15 points/ accident	
Less Deduction in Score Due to Minor Accidents attributable to the contractor @ 2 points/ accident	
Less Deduction in Score Due to not Maintaining of Labour Colony (if applicable) as per BHEL HSE policy @3 points in a month on verification any day	
Final Score	

Name and Signature of BHEL Package In-charge

Name and Signature of Contractor

Project		Vendor			Package/Unit	
Sl. No.	Parameter for Measurement	Classification	Max Score	Score Obtained	Measurement Key/Scheduled date	Supporting Documents
	Performance Score Summary for the Month	Total Score	Score Obtained			
	QUALITY	10				
	PERFORMANCE	50				
	RESOURCES	20				
	SITE INFRASTRUCTURE & SERVICE	5				
	SITE FINANCE	5				
	HSE	10				
	OTHERS (deductions if any)	0	-			
	TOTAL	100				

Note:

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

Name and Signature of BHEL Package In-charge

Name and Signature of Contractor

Monthly Safety Performance Evaluation of Contractor

SL	Parameter for Measurement	M/O	Wt	Supporting Documents
1a	Induction training for new workers conducted through audio-visual medium & documented ?	M	1	Induction Training Records
1b	Tool box talk conducted regularly as per plan, and documented?	M	1	Toolbox Talk Records
1c	Contractor in charge and safety in charge attended safety meetings?	M	2	Minutes of Meeting
1d	Whether observations in safety meetings are complied before next meeting?	M	2	-do-
1e	Preparation and submission of Monthly HSE report within stipulated time	M	1	Report submission date
1f	Preparation and submission of Incident/near-miss report and RCA Report (as applicable) within stipulated time	M	1	Incident/ Near Miss Records
1g	Carrying out Inspections and submission of Inspection reports within stipulated time	M	1	Inspection Records
1h	Regular Job Specific Training ensured for High Risk Workers (through audio-visual medium) as per plan	M	1	Training & Attendance Records
2a	Whether the contractor is registered under BOCW	M	2	BOCW Registration Certificate
2b	Availability of Qualified safety officer (1 for every 500 labour)	M	2	Safety Officer qualification & experience records
2c	Availability of Qualified safety supervisor (1 for every 100 labour)	M	2	Safety Officer qualification & experience records
2d	All the workers are provided and using safety helmets and safety shoes/gum boots	M	2	PPE Issue Records, Inspection/ non-conformity records
2e	Housekeeping done on regular basis and scrap removal at site	M	1	Housekeeping records, Inspection/ non-conformity records
2f	Usage of Goggles/Face shields and Hand gloves for gas cutter and grinders		1	PPE Issue Records, Inspection/ non-conformity records
2g	Wall openings & floor openings are guarded?		1	Inspection/ non-conformity records
2h	Adequate illumination provided in all working area?		1	Inspection/ non-conformity records
2i	Safety posters, sign boards and emergency contact numbers in all prominent location are displayed?		1	Inspection/ non-conformity records
2j	Availability of automatic reverse horns, Main horn, hook latches for Vehicles, mobile cranes, Hydras		1	Inspection/ non-conformity records
2k	Ban of carrying mobile phones to work place is implemented for workers		1	Inspection/ non-conformity records
2l	Availability of Tags & Inspection Certificates for Cranes of all capacities		1	Master T&P List with internal & external test details
2l.2	Availability of Tags & Inspection Certificates for Winches of all capacities		1	Master T&P List with internal & external test details
2l.3	Availability of Tags & Inspection Certificates, colour coding for Chain pulley blocks		1	Master T&P List with internal & external test details
2l.4	Availability of Tags & Inspection Certificates for Vehicles - Trailers, Dozers, Dumpers, Excavators, Mixers etc.		1	Master T&P List with internal & external test details
2l.5	Availability of Tags & Inspection Certificates for Welding machines, grinders, Drilling machines, etc.		1	Master T&P List with internal & external test details

2l.6	Availability of Tags & Inspection Certificates, colour coding for Wire rope slings etc.		1	Master T&P List with internal & external test details
2l.7	Availability of Tags & Inspection Certificates for Batching plants		1	Master T&P List with internal & external test details
2m.1	Use of Lifting Permit as per requirement		1	Permit Records
2m.2	Use of Height Permit as per requirement		1	Permit Records
2m.3	Use of Hot Work Permit as per requirement		1	Permit Records
2m.4	Use of Excavation permit as per requirement		1	Permit Records
2m.5	Use of Confined space work permit as per requirement		1	Permit Records
2m.6	Use of Grating removal and safety net removal permit as per requirement		1	Permit Records
2m.7	Use of Lockout-Tag out permit as per requirement		1	Permit Records
2m.8	Use of Radiography permit as per requirement		1	Permit Records
2m.9	Use of Night/ Holiday Work Permit as per requirement		1	Permit Records
2m.10	Use of Any other Applicable Permit as per requirement		1	Permit Records
3a	Material safety data sheet(MSDS) available for all chemicals and displayed in usage and storage area?		1	Inspection/ non-conformity records
3b	Spillages of oil/concrete and other chemical is controlled and cleaned by proper method in case of spill?		1	Inspection/ non-conformity records
3c	Availability of adequate number of urinals in workplace and in elevations and maintained	M	1	
3d	Availability of rest rooms for workers at site	M	1	
3e	Availability of Drinking water facility at work spot		1	
3f	Hygienic Labour colony is provided for workers.		1	
4a	Is heavy/complex critical lifting permit obtained for heavy, complex materials before handling/erection activity?		1	Work Permit records
4b	Whether area below lifting activities barricaded		1	Inspection/ non-conformity records
4c	Availability of experienced rigging foreman		1	Experience details of rigging foreman
4d	Is agency is following proper storage and handling procedure as per manufacturer standard for all hazardous material?		1	Procedure for storage & handling
4e	Are oxygen and acetylene cylinders are transported to work place from storage area in trolleys		1	
5a	Whether all deep excavation has been protected by barrier		1	Inspection/ non-conformity records
5b	Sloping/benching & shoring provided for excavation as per requirement?		1	-do-
5c	Proper access and egress provided for excavations?		1	-do-
5d	Blasting is done in controlled manner?		2	-do-
6a	Whether Electrical booth is equipped with CO ₂ fire extinguishers and fire buckets filled with sand?		2	Inspection/ non-conformity records
6b	Availability of Illumination lamp in electric booth?		1	-do-
6c	whether Caution Boards have been displayed?		1	-do-
6d	Usage of Metal Plug top for all hand power tools ?		1	-do-
6e	Usage of Insulated welding cables.		1	-do-
6f	Electrical Booth/Distribution Board to be covered by proper Canopy.		1	-do-
6g	Availability of functional & individual 30mA ELCB / RCCB and MCB for protection and conducting periodical check-up?		1	-do-
6h	Double earthing for panel boards and all machinery & proper earth pit with regular inspection available?		1	-do-
6i	Whether Electrician is qualified and experienced		1	Qualification & Experience records of electrician
6j	Availability and usage of Rubber hand gloves by electrician?		1	Inspection/ non-conformity records

7a	Whether Scaffolding pipes made with steel or aluminium, are being used and checked periodically by experienced/ certified scaffolder?		2	Inspection/ non-conformity records
7b	8mm Stainless Steel wire rope with plastic cladding is provided for life line (Vertical / Horizontal) during height work?		2	-do-
7c	Availability of emergency lighting in case of power failure		1	-do-
7d	Whether all the openings are covered with Safety Nets made of fire proof Nylon?		1	-do-
7e	Whether MS pipe rails around staircases & platforms in usage are provided with top, middle rails and toe guard ?		1	-do-
7f	Whether Ladder with vertical life line /Fall arrestor is available to climb?		1	-do-
7g	Whether all workers deployed for working at height have been issued height pass after undergoing vertigo test?		1	Height Pass records
7h	Whether all workers deployed for height work / climbing ladder are provided and using Double lanyard safety belt?		1	PPE Issue records, inspection/ non-conformity reports
7i	Is all hand tools/Small material used by height workers is tied firmly to prevent fall?		1	-do-
8a	Flash back arrestors for all gas cutting sets is available on Torch side and cylinder side		1	Inspection/ non-conformity records
8b	Oxygen/Acetylene/LPG cylinders not in use have caps in place and stored separately?		1	-do-
8c	Availability of Face screen, Hand gloves, and Apron, for welders		1	-do-
8d	Protection from falling hot molten metal during metal cutting / welding at height by providing GI sheet below the cutting area especially in fire prone areas		1	-do-
9a	Pre-employment medical check-up done for all workers and submitted?		1	Medical check records
9b	Availability of first aid centre, with MBBS doctor(Own or Sharing basis)	M	2	Attendance records
9c	Availability of Ambulance facility 24 hours (Own or sharing basis)	M	2	-do-
9d	Is First aid trained personnel's are available and their names are displayed at site?	M	1	-do-
9e	Availability of Emergency vehicle at site		1	
9f	Periodical medical check-up is conducted for all the workers and submitted?		1	Medical check records
9g	Availability of sufficient number of first aid box as per standard list and maintaining record		1	Inspection records
10a	Availability of Fire extinguishers, buckets at all vulnerable points		2	Fire extinguisher records
10b	Periodic fire mock drill conducted?		1	Fire, Mock drill records
10c	Are all flammable materials are stored separately?		1	
10d	Periodic grass cutting is done in material storage area?		1	
10e	Availability of 24V DC lighting in confined space work area		1	
10f	Availability of exhaust fan in confined space work area		1	

Note:

- M: Mandatory; O: Optional. Points other than mandatory can be excluded with appropriate justification (scope etc.) by BHEL. Score obtained in selected parameters divided by maximum possible score of selected parameters shall be multiplied by 10 for use in as per point Sl. no. # 6.0 as detailed at page 4 of Form F-15.
- There shall be deduction of marks from overall score for Fatal/ Major/ Minor Accidents and for not maintaining labour colony, as detailed at page 4 of Form F-15.

MILESTONE COMPLETION CERTIFICATE
(issued by BHEL on the specific request of Contractor)

Ref :

Date:

To,

(Name & address of Contractor)

Dear Sir,

References

1. Contract No:
2. Job Description:

This is to hereby confirm that the following Milestone Activity has been achieved in respect of the Contract /Job under reference

Sl No	Milestone Activity	Remarks

This certificate is issued as per your request vide letter no
without any prejudice to the rights of BHEL in line with the terms and conditions of the
above referred Contract

Yours faithfully,

For and on behalf of Bharat Heavy Electricals Limited

Construction Manager/Head (Subcontracts)

CONTRACT COMPLETION CERTIFICATE
(Issued by BHEL/HQ on the specific request of Contractor)

Ref :

Date:

To Whom so ever it may concern

1	DESCRIPTION OF WORK	
2	NAME AND ADDRESS OF THE CONTRACTOR	
3	CONTRACT NO	
4	CONTRACT VALUE	
5	LETTER OF INTENT/ AWARD NO. & DATE	
6	CONTRACT PERIOD//CONTRACT DURATION	
7	DATE OF START/COMPLETION	
8	FINAL EXECUTED VALUE	
9	PERFORMANCE	GOOD SATISFACTORY UNSATISFACTORY

This certificate is issued as per your request vide letter no
without any prejudice to the rights of BHEL to use this certificate for evaluation of your offers for future tenders

Yours faithfully,

For and on behalf of Bharat Heavy Electricals Limited

Head (Subcontracts)

INDEMNITY BOND

(To be executed on a Non Judicial Stamp Paper of the requisite value as per Stamp Duty prevalent in the respective State)

 This Indemnity Bond executed by <name of company> having their Registered Office at <xxxxxxxxxx> in favour of M/s Bharat Heavy Electricals Limited, a Company incorporated under the Companies Act, 1956, having its Registered Office at BHEL House, Siri Fort, Asiad, New Delhi - 110049 through its Unit at Power Sector-_____ Region, _____, _____ State. (Hereinafter referred to as the Company)

And whereas the Company has entered into a Contract with M/s xxxxxxxxx, the executants of this Deed (hereinafter referred to as the Contractor) as its contractor in respect of the work of "xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx".

AND WHEREAS under the provisions of GCC further stipulates that the Contractor shall indemnify the Company against all claims of whatever nature arising during the course of execution of Contract including defects liability period of <xx Months > i.e till <xx xx xxxx>

Now this deed witness that in case the Company is made liable by any Authority including Court to pay any claim or compensation etc. in respect of all labourers or other matters at any stage under or relating to the Contract with the Contractor, the Contractor hereby covenants and agrees with the Company that they shall indemnify and reimburse the Company to the extent of such payments and for any fee, including litigation charges, lawyers' fees, etc, penalty or damages claimed against the Company by reason of the Contractor falling to comply with Central/States Laws, Rules etc, or his failure to comply with Contract (including all expenses and charges incurred by the Company).

The Contractor further indemnifies the Company for the amount which the Company may be liable to pay by way of penalty for not making deductions from the Bills of the Contractor towards such amount and depositing the same in the Government Treasury.

INDEMNITY BOND

(To be executed on a Non Judicial Stamp Paper of the requisite value as per Stamp Duty prevalent in the respective State)

The Contractor further agree that the Company shall be entitled to with hold and adjust the Security Deposit and/or with hold and adjust payment of Bills of Contractor pertaining to this Contract against any payment which the Company has made or is required to make for which the Contractor is liable under the Contract and that such amount can be withheld, adjusted by the Company till satisfactory and final settlement of all pending matters and the Contractor hereby gives his consent for the same.

The Contractor further agrees that the terms of indemnity shall survive the termination or completion of this contract.

The contractor further agrees that the liability of the contractor shall be extended on actual basis notwithstanding the limitations of liability clause, in respect of :

1. breach of terms of contract by the contractor
2. breach of laws by the contractor
3. breach of Intellectual property rights by the contractor
4. breach of confidentiality by the contractor

Nothing contained in this deed, shall be construed as absolving or limiting the liability of the Contractor under said Contract between the Company and the Contractor. That this Indemnity Bond is irrevocable and the condition of the bond is that the Contractor shall duly and punctually comply with the terms and the conditions of this deed and contractual provisions to the satisfaction of the Company.

In witness where of M/s xxxxxxxxxxxxxx these presents on the day, month and year first, above written at xxxxxxxx by the hand of its signatory Mr. xxxxxxxxxxxx.

Signed for and on behalf of
M/s xxxxxxxxxxxxxxxx

Witness:

1

2

BHARAT HEAVY ELECTRICALS LIMITED

DIVISION.....

Claim for Refund of Security Deposit
(Para 4.7.4 of Works Accounts Manual)

Ref No.:

Date:

- 1 Name and address of the contractor
- 2 Contract Agreement/Work Order No.
- 3 Date of contract agreement/work order
- 4 Name of the work undertaken
- 5 Date of commencement of the work
- 6 Date of completion of the work
- 7 Period of Maintenance
- 8 Date on which the final bill was paid
- 9 Last date of making good the defect, if any, during maintenance period
- 10 Expenditure incurred by BHEL during maintenance period, if any, recoverable
- 11 Date on which security deposit refund falls due as per contract

- 12 Amount deposited/recovered

Details	Mode	Amount

- 13 LESS amounts recoverable (with details)

- (i) Amount spent by BHEL on maintenance :
- (ii) Payments made on behalf of contractor :
- (iii) Court dues / penalties / compensation :
- (iv) Other recoveries for services etc. :
- (v) Security deposit released with final bill (%) :

- 14 Net amount recommended for release (12-13)

Details	Mode	Amount

Date:

Signature of Engineer in Charge

CERTIFICATE TO BE FURNISHED BY THE CONTRACTOR

I/We have no claim or demand outstanding against BHEL for the work done or for labor or material supplied or any other account arising out of or connected with the contract agreement/work order (No.....dated) and the payment of this bill shall be in full and final

Date:

Signature of Contractor

CERTIFICATE TO BE FURNISHED BY SENIOR ENGINEER

Certified that

– The payment recommended for release is in order and there are no demands other than those included in the claim outstanding from the contractor;

The maintenance period as per the contract agreement is over and the contractor has carried out the works required to be carried out by him during
– the period of maintenance to our satisfaction, and all expenses incurred by the company on carrying out such works have been included for adjustment;

– All the objections raised so far have been settled;

– A note of refund of security deposit has been made in the measurement book and contract agreement/work order.

Date:

Signature of Senior Engineer

FOR USE IN FINANCE DEPARTMENT

Passed for

Rs.....(Rupees.....
.....only)

Accountant

Accounts Officer

REFUND OF GUARANTEE MONEY

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR, _____ REGION

Ref No:

Date:

1. Name and Address of Contractor :
2. Contract Agreement/LOI/ LOA No. :
3. Date of Contract Agreement/LOI/ LOA :
4. Name of the Work undertaken :
5. Date of commencement of the Work :
6. Date of Completion of the Work :
7. Period of Maintenance :
(Guarantee Period)
8. Date on which the Final Bill was paid :
9. Last date of making good the defect :
during Maintenance Period
10. Expenditure incurred by BHEL during :
Maintenance Period, if any, recoverable
11. Date on which Guarantee Money refund:
falls due as per Contract
12. Amount of Guarantee Money to be refunded:
13. Less Amounts recoverable (with details)
 - a. Amount spent by BHEL on maintenance :
 - b. Payments made by BHEL on behalf of Contractor:
 - c. Court dues/penalties/compensation :
 - d. Other recoveries for Services, etc :
 - e. Total of 'a' to 'd' :
14. Net Amount recommended for release (12-13) :

Signature of BHEL Engineer

Date: _____

REFUND OF GUARANTEE MONEY

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR, _____ REGION

CERTIFICATE TO BE FURNISHED BY THE CONTRACTOR

I/We have no claim or demand outstanding against BHEL _____, for the work done or for labour or material supplied or any other account arising out of or connected with the Contract Agreement/LOI/ LOA (No _____ dated _____) and the payment of this bill shall be in full and final settlement of all my/our claims and demands including the 'Deposits' of the Contract Agreement/LOI/ LOA referred to.

Signature of Contractor

Date:

CERTIFICATE TO BE FURNISHED BY SENIOR ENGINEER/CONSTRUCTION MANAGER

1. Certified that
 - a. The payment recommended for release is in order and there are no demands other than those included in the claim outstanding from the Contractor
 - b. Maintenance period (Contract Guarantee period) is over and the Contractor has carried out the works required to be carried out by him during the period of maintenance (Guarantee) to our satisfaction, and all expenses incurred by the Company on carrying out such works have been included for adjustment
 - c. All objections raised so far have been settled
 - d. A note for refund of Guarantee Amount has been made in the Measurement Book and Contract Agreement/Work Order

Signature of BHEL Engineer

Construction Manager

Date:-----

FOR USE IN ACCOUNTS DEPARTMENT

Passed for Rs _____ (Rupees _____ only)

Accountant

Accounts Officer

ACKNOWLEDGE BY THE CONTRACTOR

Received Rs _____ in full and final settlement of my/our claim

Signature of Contractor

Date:

**POWER OF ATTORNEY for SUBMISSION OF TENDER/SIGNING CONTRACT
AGREEMENT (To be typed on non-judicial stamp paper of minimum Rs. 100/- and
Notarized)**

KNOW ALL MEN BY THESE PRESENTS, that I/We do hereby make, nominate, constitute and appoint Mr , whose signature given below herewith to be true and lawful Attorney of M/s..... hereinafter called 'Company', for submitting Tender/entering into Contract and inter alia, sign, execute all papers and to do necessary lawful acts on behalf of Company with M/s Bharat Heavy Electricals Ltd, Power Sector _____ Region, _____, in connection with
.....
.....
..... vide Tender Specification No : _____, dated _____.

And the Company do hereby agree to ratify and confirm all acts, deeds, things or proceedings as may be lawfully done by the said attorney and by or on behalf of the company and in the name of the company, by virtue of the powers conferred herein and the same shall be binding on the company and shall have full force and effect.

IN WITNESS WHEREOF the common seal of the company has been hereunto affixed in the manner hereinafter appearing on the document.

Dated at _____, this _____ day of _____

Director/CMD/Partner/Proprietor

Signature of Mr.....(Attorney)

Attested by: Director/CMD/Partner/Proprietor

Witness

Notary Public

ANALYSIS OF UNIT RATES QUOTED

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

Offer Reference No:.....

Date:.....

To,

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

Dear Sir,

Sub : Analysis of Unit Rates Quoted

Ref : Tender Specification No:

Analysis of Unit Rates quoted by us in respect of above Tender is as detailed

SN	DESCRIPTION	% OF QUOTED RATE	REMARKS
01	SITE FACILITIES VIZ., ELECTRICITY, WATER OTHER INFRASTRUCTURE.		
02	SALARY AND WAGES + RETRENCHMENT BENEFITS		
03	CONSUMABLES		
04	T&P DEPRECIATION & MAINTENANCE		
05	ESTABLISHMENT & ADMINISTRATIVE EXPENSES		
06	OVERHEADS		
07	PROFIT		
	TOTAL	100%	

Yours faithfully,

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

BHARAT HEAVY ELECTRICALS LIMITED
DIVISION.....
Running Account Bill
(Para 4.3.1 of Works Accounts Manual)

Name of the Contractor

Name of the Work:

Sanctioned Estimate:

Code No.:

Contract Agreement No.:

Dated:

Division:

Date of written order to
commence the Work:

Date of commencement
of work:

Due date of completion as per
agreement

Date of approval of Competent Authority for time extension as applicable
(copy to be enclosed).

Departmental Bill No.

Date:

Sub-Division:

Period of work covered in this
bill:

I. ACCOUNT OF WORK EXECUTED

Adhoc payment for work not previously measured **			Item No. of work	Description of work	Quantity as per agreement	Quantity executed upto date	Rate	Unit	Payment on the basis of actual measurement upto date	Quantity executed since last RA bill	Payment on the basis of actual measurement since last running account bill	Remarks
Total as per last running account bill	Since last running account bill	Total upto date										
1	2	3	4	5	6	7	8	9	10	11	12	13

** 1. Whenever payment is made on adhoc basis without actual measurements the amount in whole rupees should be entered in columns 1 to 3 only and not in columns 7 to 12
2. Whenever there is an entry in column 12 on the basis of actual measurement, the whole of the amount previously paid without detailed measurement should be adjusted by a minus entry in column 2 equivalent to the amount shown in column 1, so that the total upto date in column 3 may become nil.

Total value of work done upto date (A) -----

Deduct value of work shown on the last Running Account Bill (B) -----

Net value of work done since last Running Account Bill (C) -----

Rupees (in words) Only

Note :
Wherever adhoc payments to contractors against running bills are made in accordance with the extant Works Policy, the amount so paid shall be adjusted.

II. MEMORANDUM OF PAYMENTS

		I	II
1.	Total value of work actually measured as per Account No. I, Column 10	(A) -----	-----
2.	Total upto date adhoc payment for work covered by approximate or plan measurements as per Account I, Col. 3	(B) -----	-----
4.	Total upto date payments [(A)+(B)]	(C) -----	-----
	Total amount of payments already made as per entry (D) of last Running Account Bill No. dated forwarded to the Accounts Department on	(D) -----	-----
6.	Balance [(C) - (D)]		-----
7.	Payments now to be made:	-----	
	a) by cash / cheque	-----	
	b) by deduction for value of materials supplied by BHEL vide Annexure A attached	-----	
	c) by deduction for hire of tools and plant vide Annexure B attached	-----	
	d) by deduction for other charges vide Annexure C attached	-----	
	e) by deduction on account of security deposit	-----	
	f) by deduction on account of Income Tax		-----

Note : Amounts relating to items 4 to 6 above should be entered in column II and those relating to item 7 in column I. The amount shown against item 6 and the total of item 7 should agree with each other.

III. CERTIFICATE OF THE ENGINEER IN CHARGE

1	The measurements on which the entries in column 7 to 12 of Part I of this Bill (Account of work executed) are based were made by ----- and are reorded at pages - ----- of Measurement Book No. ----- (Name and Designation)
2	Certified that the methods of measurement are correct and the work has been carried out in accordance with the terms and conditions, schedules, specifications and drawings etc. forming part of the contract agreement, subject to deviations included in the deviation statement (Annexure D)
3	Certified that in addition to and quite apart from the quantities of work actually executed as shown in column 10 of Part I, some work has actually been done in connection with several items and the value of the such work is, in no case, less than the adhoc payments as per column 3 of Part I, made or proposed to be made, for the convenience of the contractor in anticipation of, and subject to the results of, detailed measurement which will be made as soon as possible.
4	Certified that measurements by Engineer-incharge and test check of prescribed percentage of measurements by the concerned superior authorities has been carried out.
5	Certified that there are no pending recoveries from the contractor on account of chargeable items (e.g T&P, consumables, material, etc.) issued either by BHEL or by the customer and other recoveries like power, water, quarter, tax liability towards declaration forms etc.
6	Certified that with regard to the free issues, regular reconciliation is being done, completed upto ----- and there are no recoveries pending from the contractor on account of such issues in excess of requirement for execution of work as per contract.
7	Certified that there is no pending recovery for damaged material issued free of cost.
8	Certified that the contractor has fulfilled all the requirements as per contract with reference to statutory obligations (PF, ESI, Minimum Wages, BOCW, Insurance etc.), support services such as service manpower, computer system , T&P etc

Signature of Contractor

Signature of Engineer in Charge

Designation:

Date:

Date:

IV. CERTIFICATE OF THE SENIOR ENGINEER

1	Certified that the measurements have been check measured to the prescribed extent by at site and also by the undersigned and the relevant entries have been initialed in the Measurement Book. (vide pages) (Name and Designation)
2	Certified that all the measurements recorded in the measurement book have been correctly billed for
3	Certified that all recoverable amounts in respect of materials tools and plant etc. and other charges have been correctly made vide annexures A to C attached.

Certified for payment * of Rs. (Rupees only)

* Here specify the net amount payable.

Date:

Signature of Senior Engineer

V. ENTRIES TO BE MADE IN THE FINANCE DEPARTMENT

Accounts Bill No. dated

Entered in Journal Book vide entry No. dated

Passed for Rs.

Less Deductions Rs.

Net amount payable Rs.

(Rupees only)

Payable to Shri / M/s by cheque / cash

Entered in Contractors ledger No. Page

Estimate No :

Debit

Credit

(Gross amount)

(Deductions)

Name of Work :

Account code head

Total

Code No.:

ALLOCATION

Assistant

Date:

Accountant

Date:

Finance Executive

Date:

ANNEXURE A

Statement showing details of materials issued to the contractor Shri / M/S..... in respect of Contract Agreement / Work Order No.....Dated..... and covered by the agreement

Sl.No.	Stores Issue Voucher No. and date	Issue voucher No. and date allotted by stores to the SIV	Description of material issued issued to the contractor	Quantity issued		Quantity actually incorporated in the work	Balance quantity with contractor		If recoverable from the contractor				
				Free	Chargeable		Free	Chargeable	Rate at which recoverable	Amount recoverable	Amount recovered upto previous bill	Balance now recovered	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Total

Certified that (balance quantity of free issue material as per Col. 8 above) is physically available with the Contractor.

Signature of Contractor

Date:

Signature of Engineer in Charge

Date:

Signature of Senior Engineer

Date:

ANNEXURE B

Statement showing tools and plant issued to the contractor Shri/M/s..... in respect of Contract Agreement No.....Dated.....

Sl. No.	Description of Tools and Plant Issued	Period for which issued	Rate at which recovery is to be made	Amount recoverable	Amount recovered upto previous bill	Balance Recovered now	Remarks
1	2	3	4	5	6	7	8

TOTAL

Signature of Contractor

Date :

Signature of Engineer in Charge

Date :

Signature of Senior Engineer

Date:

ANNEXURE C

Form WAM 6 (Contd.)

Statement showing details of other recoveries to be made from the contractor Shri/M/s-----in respect of contract Agreement No. Dated

S. No.	Particulars	Unit	Quantity	Rate	Amount recoverable	Amount recovered up to previous bill	Amount now recovered	Remarks
1	2	3	4	5	6	7	8	9
1	Water charges							
2	Electricity charges							
3	Seignorage charges							
4	Medical charges							
5	Cost of empty gunny bags and empty containers not returned							
6								
7								
8								

TOTAL

Signature of Contractor

Date :

Signature of Engineer in Charge

Date :

Signature of Senior Engineer

Date:

ANNEXURE D
DEVIATION STATEMENT

Name of the Contractor:

Contract Agreement No

Name of Work:

Date:

S. No.	Description of Item	Unit	Quantity as per agreement	Quantity as executed	Quantity further anticipated	Total quantity anticipated on completion	Rate as per agreement	Rate as executed	Amount as per agreement	Amount as executed	Amount further anticipated	Total Amount anticipated on completion	Difference		Reason for deviation with authority, if any
													Excess	Savings	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Signature of Engineer in Charge

Date :

Signature of Senior Engineer

Date :

BHARAT HEAVY ELECTRICALS LIMITED
DIVISION.....
.....And Final Bill
(Para 4.3.2 of Works Accounts Manual)

Departmental Bill No:

Date:

Name of the Contractor:

Name of the Work:

Division:

Date of Written order to commence the work:

Sub-Division:

Sanctioned Estimate:

Contract Agreement/ Work Order No:

Date of actual completion of the work:

Date of commencement of the Work:

Dated:

Due date of completion as per Agreement:

I. ACCOUNT OF WORK EXECUTED

Adhoc payment for work not previously measured **			Item no. of the agreement / work order	Description of work	Quantity as per agreement	Quantity executed upto date	Rate	Unit	Payment on the basis of actual measurement upto date	Quantity since last running account bill	Payment on the basis of actual measurement since last running account bill	Remarks
Total as per last running account bill	Since last running account bill	Total upto date										
1	2	3	4	5	6	7	8	9	10	11	12	13

** Whenever there is an entry in column 12 on the basis of actual measurement, the whole of the amount previously paid without detailed measurement should be adjusted by a minus entry in column 2 equivalent to the amount shown in column 1, so that the total upto date in column 3 may become nil.

Total value of work done upto date (A) -----

Deduct value of work shown on the last Running Account Bill (B) -----

Net value of work done since last Running Account Bill (C) -----

Rupees (in words) Only

I/ We hereby certify that I/We have performed the work as per the terms and conditions of Contract Agreement/Work Order No.....Dated.....for which payment is claimed as above and that I/We have no further claim under this agreement/work order.

Date:

III CERTIFICATE OF THE ENGINEER IN CHARGE

Designation:

IV CERTIFICATE OF THE SENIOR ENGINEER

1. Certified that I have personally inspected the work and that the work has been physically completed on the due date in accordance with the terms and conditions, schedules, specifications and drawings etc., forming part of the contract agreement, subject to the deviations noted in Deviation Statement (Annexure D).
2. Certified that the measurements have been check measured to the prescribed extent by..... and by the undersigned at site and the relevant entries have been initiated in the measurement book (vide pages.....) (Name and Designation)
3. Certified that the methods of measurement are correct.
4. Certified that the measurements have been technically checked with reference to contract drawings, deviations etc.
5. Certified that the measurements recorded in the measurement book have been correctly billed for at the contract rates or approved rates.
6. Certified that all recoverable amounts in respect of stores, tools and plant, water, electricity charges etc. have been correctly made vide Annexures A to C and that there are no other demands outstanding against the contractor on this contract.
7. Certified that the issues of all stores as per statement attached (whether charged to the contractor or direct to the work) have been technically checked and represent fair and reasonable issues for the items of work executed vide Annexure E.
8. Certified that all statutory requirements including PF, ESI, Minimum wages, Insurance, GST, BOCW, etc. are complied with by the Contractor. This should be duly backed by the relevant documents.

Certified for payment of * Rs.....(Rupees.....only).

*Here specify the net amount payable

Signature of Senior Engineer

Date

IV ENTRIES TO BE MADE IN THE FINANCE DEPARTMENT

Passed for.....Rs.....
Less Deductions.....Rs.....
Net Amount Payable.....Rs.....
(Rupees.....only)

Account code head	Debit	Credit
	(Gross Amount)	(Deductions)
TOTAL		

Assistant

Date:

Accountant

Date:

Finance Executive

Date:

ANNEXURE A
Part I

Statement showing details of materials issued to the contractor Shri / M/S.....in respect of Contract Agreement / Work Order No.....Dated..... and covered by the agreement.

Sl.No.	Stores Issue Voucher No. and date	Issue voucher No. and date allotted by stores to the SIV	Description of material issued issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Whether recoverable from the contractor or supplied free	If recoverable from the Contractor				
							Rate at which recoverable	Amount recoverable	Amount recovered upto previous bill	Balance now recovered	Remarks

1	2	3	4	5	6	7	8	9	10	11	12

Total

Signature of Contractor
Date:

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

ANNEXURE A
Part II

Statement showing details of materials issued to the contractor Shri / M/S..... in respect of Contract Agreement / Work Order No.....Dated..... and not covered by the agreement

Sl.No	Stores Issue Voucher No. and Date	Issue Voucher No. and date allotted by stores to the SIV	Description of material issued to the contractor	Quantity issued	Quantity actually incorporated in the work	Issue Rate	Amount recoverable	Amount recovered upto previous bill	Balance now recovered	Remarks

1	2	3	4	5	6	7	8	9	10	11

TOTAL
Add Departmental Charges
Add GST (Wherever applicable)

GRAND TOTAL

Signature of Contractor
Date:

Signature of Engineer-in-Charge
Date:

Signature of Senior Engineer
Date:

Note: Cost of materials recovered in this bill should be shown against item 4 (a) of the memorandum of payments. The amounts of taxes and departmental charges recovered in this bill should be incorporated in Annexure C.

ANNEXURE B

Statement showing tools and plant issued to the contractor Shri /M/S.....in respect of contract Agreement / Work Order No.....Dated.....

Sl.No.	Description of Tools and Plant Issued	Period for which issued	Rate at which recovery is to be made	Amount recoverable	Amount recovered upto previous bill	Balance now recovered	Remarks
1	2	3	4	5	6	7	8

TOTAL

Signature of Contractor

Date

Signature of Engineer-in-Charge

Date

Signature of Senior Engineer

Date

ANNEXURE C

Statement showing details of other recoveries to be made from the contractor Shri/M/s..... In respect of Contract Agreement / Work Order No.....Dated.....

Sl.No.	Particulars	Unit	Quantity	Rate	Amount recoverable	Amount recovered upto previous bill	Amount now recovered	Remarks
1	2	3	4	5	6	7	8	9
1	Water charges							
2	Electricity charges							
3	Medical charges							
4	Cost of empty gunny bags and empty containers not returned							
5								
6								
7								

TOTAL

Signature of Contractor

Date

Signature of Engineer in Charge

Date

Signature of Senior Engineer

Date

**ANNEXURE D
DEVIATION STATEMENT**

Name of the Contractor:

Contract Agreement/Work Order No.

Name of the Work:

Date:

SL. No.	Description of Item	Unit	Quantity as per agreement	Quantity as executed	Rate as per agreement	Rate as executed	Amount as per agreement	Amount as executed	Difference		Reason for the deviation with authority, if any
									Excess	Savings	
1	2	3	4	5	6	7	8	9	10	11	12

Signature of Engineer in Charge

Signature of Senior Engineer

Date:

Date:

ANNEXURE E

Statement showing the consumption of materials issued to the contractor Shri/M/s..... in respect of Contract Agreement / Work Order No.....Dated.....

Name of the Work:

ON RECOVERY BASIS

SL. No.	Description of material	Unit	Quantity actually issued	Quantity actually incorporated in the work	Balance	Particulars of disposal of balance	Quantity to be issued as per approved data for work actually done	Variation in consumption (difference between colum 5 & 8)		Rate chargeable for excess/short consumption, if any	Amount Recoverable for excess/short consumption, including materials not returned, if any	Remarks
								More	Less			
1	Cement											
2	Bricks											
3	Wood											
4	Asbestos Sheet											
5	Iron Material											
6												
7												

Signature of Contractor

Signature of Engineer in Charge

Signature of Senior Engineer

Date:

Date:

Date:

Note

1. The quantities shown in columns 4 and 5 above should tally with those shown in columns 5 & 6 respectively of Annexure A (Part I and II)

2. Data statement of theoretical consumption should be attached in support of quantity specified in column 8.

ANNEXURE F

Form WAM 7 (Contd.)

Statement showing details of materials issued to the contractor Shri/M/s..... in respect of Contract Agreement / Work Order No.....dated.....

Name of the Work:

FREE OF COST

Sl.No	Stores Issue Voucher No.	Description of material	Unit	Quantity issued	Quantity required as per data	Quantity consumed in the work	Balance (if any)	Nature of disposal for the balance	Rate chargeable for material not returned	Amount recoverable for material not returned	Remarks
1	2	3	4	5	6	7	8	9	10	11	12

Signature of Contractor
Date:

Signature of Engineer in Charge
Date:

Signature of Senior Engineer
Date:

ANNEXURE G
QUESTIONNAIRE TO BE ANSWERED BY THE ENGINEER IN CHARGE AND SENIOR ENGINEER
(Correct particulars and answers to be recorded)

1. Name of the Work:
2. Name of the Contractor:
3. Date of commencement of the Work:
4. Contract agreement /Work Order No. and date:
5. Reference to the supplementary Agreement No. if any:
6. Whether administrative approval and technical sanction has been accorded by the competent authority? If so, cite reference?
7. Whether sanction of the competent authority and financial concurrence of the Finance Department for award of the work has been accorded? If so, cite reference.
8. Whether the work has been completed in time? If not whether penalty has been levied or sanction of the competent authority for extension of time granted and communicated to the Finance Department with reasons for grant of extension? (Due and actual date of completion of the work and reference to letter No. and date granting the extension of time should be given).
9. (a) Whether the rates allowed in the bill have been checked with the contract agreement?
 (b) Whether the rates for extra/supplemental items have been approved by the competent authority and the sanction communicated to the Finance Department together with rate analysis? If so, cite reference
10. Whether deviations have been approved by the competent authority? If yes, give reference to the approval; if not, give reasons.
11. Whether the rates of recovery of stores issued to the contractor which are not provided for in the contract agreement have been settled in consultation with Finance?
12. Whether discrepancies pointed out by the Finance department in the stores statement have been reconciled and accepted by the Finance Department?
13. Whether materials issued to the contractor in excess of the theoretical requirements have been returned to the Stores department and the No. and date of such returned stores vouchers have been shown in Stores statement? If not, whether the cost of such excess materials has been recovered at the prescribed rate? Whether consumption statements in respect of materials chargeable to the work have been attached to the bill?
14. Whether consumption of materials shown has been technically checked by Senior Engineer?
15. Whether materials issued and used in the work is not less than that required for consumption in work according to our specifications? If consumption is less, whether necessary recovery has been made in the bill?
16. Whether measurements have been checked by the Engineer and Senior Engineer to the extent required and certificates of check recorded in the measurement books?
17. Whether contractor has signed the bill and the measurement books without reservations? If not, whether reasons have been intimated to the Finance Department?
18. Whether arithmetical calculations have been checked and certificate recorded in the measurement books by a person other than the one who calculated initially?
19. Whether any work was done at the risk and cost of the contractor and whether such cost has been recovered from him? Give particulars.
20. Whether all advance payments on running accounts have been recovered?
21. Whether all the recoveries due for services given to the contractor like rent of accommodation, water charges, electricity charges have been recovered and whether payments made by the company on behalf of the contractor have been adjusted?
22. Whether the files containing abstracts from measurement books/standard measurement books have been completed/updated?
23. Whether hire charges for tools & plant have been recovered and the statement of hire charges with full details attached?
24. Whether the certificate of workmanship and completion of work according to specifications, drawings etc. is recorded by Engineer Incharge/Senior Engineer and whether recoveries have been made for defective works, if any?
25. Whether all corrections in the bill/measurement books etc. have been neatly made and attested and there are no overwriting?
26. Whether final measurements have been taken as soon as possible after completion of the work and the certificate of completion issued? If not, whether reasons for delay have been recorded and communicated to finance department?
27. In respect of quantities reduced in the final bill as compared to the running payment, whether adequate reasons have been recorded and communicated to finance department?
28. Whether the expenditure has been classified correctly according to heads of account recorded in the sanctioned estimate?
29. Whether the work has been completed within the estimated cost? If not, what is the percentage of excess over the sanctioned estimate/ administrative approval? In case the excess is beyond the competency of the Senior Engineer, what action has been taken for obtaining the approval of the authority competent to sanction the excess?
30. (a) If the contractor has furnished bank guarantee in lieu of cash security deposit towards proper execution of works and guarantee against defects during the maintenance period, whether the period of currency of the bank guarantee covers the entire maintenance period?
 (b) If not whether security deposit has been proposed to be recovered from the final bill?
31. Whether all the previous audit objections raised on running account bills have been settled? If so, cite references.

Signature of Engineer in Charge
 Date:

Signature of Senior Engineer
 Date:

PROFORMA OF BANK GUARANTEE (in lieu of EARNEST MONEY)
(On non-Judicial stamp paper of appropriate value)

Bank Guarantee No.....

Date.....

To

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR NORTHERN REGION,
HRDI & PSNR COMPLEX, PLOT NO. 25,
SECTOR – 16 A, NOIDA – 201301, U.P.

Dear Sirs,

In accordance with the terms and conditions of Invitation for Bids/ Notice Inviting Tender No.....¹ (Tender Conditions), M/s. having its registered office at ² (hereinafter referred to as the 'Tenderer'), is submitting its bid for the work of.....³ invited by M/s Bharat Heavy Electricals Limited (A Govt. of India Undertaking) a company incorporated under the Companies Act, 1956, having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its Unit at Bharat Heavy Electricals Limited, Power Sector Northern Region, HRDI & PSNR Complex, Plot no. 25, Sector – 16 A, Noida – 201301, U.P.

The Tender Conditions provide that the Tenderer shall pay a sum of Rs as Earnest Money Deposit in the form therein mentioned. The form of payment of Earnest Money Deposit includes Bank Guarantee executed by a Scheduled Bank.

In lieu of the stipulations contained in the aforesaid Tender Conditions that an irrevocable and unconditional Bank Guarantee against Earnest Money Deposit for an amount of ⁴ is required to be submitted by the Tenderer as a condition precedent for participation in the said Tender and the Tenderer having approached us for giving the said Guarantee,

we, the[Name & address of the Bank]..... having our Registered Office at(hereinafter referred to as the Bank) being the Guarantor under this Guarantee, hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer without any demur, merely on your first demand any sum or sums of Rs. ⁴(in words Rupees.....) without any reservation, protest, and recourse and without the beneficiary needing to prove or demonstrate reasons for its such demand.

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

PROFORMA OF BANK GUARANTEE (in lieu of EARNEST MONEY)
(On non-Judicial stamp paper of appropriate value)

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Vendor/ Contractor/ Supplier in any suit or proceeding pending before any Court or Tribunal, Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment hereunder and the Tenderer shall have no claim against us for making such payment.

We Bank further agree that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Tender or to extend the time of submission of from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Tenderer and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Tenderer or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Tenderer or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Tenderer and notwithstanding any security or other guarantee that the Employer may have in relation to the Tenderer's liabilities.

This Guarantee shall be irrevocable and shall remain in force upto and including.....⁵ and shall be extended from time to time for such period as may be desired by the Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Tenderer but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms hereof. However, unless a demand or claim under this Guarantee is made on us in writing on or before the ⁶ we shall be discharged from all liabilities under this Guarantee.

We, ... Bank lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....⁴.....
- b) This Guarantee shall be valid up to ⁵
- c) Unless the Bank is served a written claim or demand on or before _____⁶ all rights under this guarantee shall be forfeited and the Bank shall be relieved and

PROFORMA OF BANK GUARANTEE (in lieu of EARNEST MONEY)
(On non-Judicial stamp paper of appropriate value)

discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of
(Name of the Bank)

Date.....

Place of Issue.....

- ¹ Details of the Invitation to Bid/ Notice Inviting Tender
- ² Name and Address of the Tenderer
- ³ Details of the Work
- ⁴ BG Amount in words and Figures
- ⁵ Validity Date
- ⁶ Date of Expiry of Claim Period

Note:

1. Bidders are advised that expiry of claim period may be kept 3-6 months after validity date..
2. The BG should be on Non-Judicial Stamp paper/ e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/ e-stamp paper shall be purchased in the name of Vendor/ Contractor/ Supplier/ Bank issuing the guarantee.

3. In Case of Bank Guarantees submitted by Foreign Vendors.

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

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

b.1 In such cases, Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank's (BHEL's Consortium Bank) branch in India. All charges for issuance of Bank Guarantee/ counter-Guarantee should be borne by the Foreign Vendor.

PROFORMA OF BANK GUARANTEE (in lieu of EARNEST MONEY)
(On non-Judicial stamp paper of appropriate value)

- b.2** In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.
- b.3** The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time).

PROFORMA OF BANK GUARANTEE (in lieu of RETENTION AMOUNT)

B.G. NO.

Date

In consideration of Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at _____¹ through its Unit at.....(name of the Unit) having agreed to exempt (Name of the Vendor / Contractor / Supplier) with its registered office at _____² (hereinafter called the said "Contractor" which term includes supplier), from demand under the terms and conditions of the Contract reference No. _____ dated _____³ valued at Rs. ⁴ (Rupees -----)⁴ (hereinafter called the said Contract), of Retention Amount for the due fulfilment by the said Contractor of the terms and conditions contained in the said Contract, on production of a Bank Guarantee for Rs. _____ 5 (Rupees _____ only),

We ____ (indicate the name and address of the Bank) having its Head Office at _____ (address of the head Office) (hereinafter referred to as the Bank), at the request of _____ [Contractor(s)], being the Guarantor under this Guarantee, do hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer, an amount not exceeding Rs. _____ without any demur, immediately on demand from the Employer and without any reservation, protest, and recourse and without the Employer needing to prove or demonstrate reasons for its such demand.

Any such demand made on the bank, shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any Court or Tribunal or Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

The payment so made by us under this guarantee shall be a valid discharge of our liability for payment hereunder and the Contractor(s) shall have no claim against us for making such payment.

We, further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied & the Employer certifies that the terms and conditions of the said Contract have been fully and properly carried out by the said contractor(s) or acceptance of the final bill or discharge of this guarantee by the Employer, whichever is earlier. This guarantee shall initially remain in force upto and including _____⁶ and shall be extended from time to time for such period as may be desired by the Employer. Unless a demand or claim under this guarantee is made on us in writing on or before the _____⁷, we shall be discharged from all the liability under this guarantee thereafter.

PROFORMA OF BANK GUARANTEE (in lieu of RETENTION AMOUNT)

We, _____(indicate the name of the Bank)_____ further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by any reason of any such variation or extension being granted to the said contractor(s) or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

We..... BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed.....⁵

b) This Guarantee shall be valid up to ⁶

c) Unless the Bank is served a written claim or demand on or before ⁷ all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Date _____ Day of _____

for_____(indicate the name of the Bank)____

(Signature of Authorized signatory)

PROFORMA OF BANK GUARANTEE (in lieu of RETENTION AMOUNT)

- ¹ ADDRESS OF THE EMPLOYER. i.e. Bharat Heavy Electricals Limited
- ² ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.
- ³ DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE
- ⁴ CONTRACT VALUE
- ⁵ BG AMOUNT IN FIGURES AND WORDS
- ⁶ VALIDITY DATE
- ⁷ DATE OF EXPIRY OF CLAIM PERIOD

Note:

1. Units are advised that expiry of claim period may be kept 3-6 months after validity date. It may be ensured that the same is in line with the agreement/ contract entered with the Vendor.

2. The BG should be on Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Vendor/Contractor/Supplier /Bank issuing the guarantee.

3. In line with the GCC, SCC or contractual terms, Unit may carry out minor modifications in the Standard BG Formats. If required, such modifications may be carried out after taking up appropriately with the Unit/Region's Law Deptt.

4. In Case of Bank Guarantees submitted by Foreign Vendors-

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

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

b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank's (BHEL's Consortium Bank) branch in India. It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

b.2 In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.

b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). The BG Format provided to them should clearly specify the same.

**STATEMENT OF CLAIMS/COUNTER CLAIMS TO BE SUBMITTED TO THE
IEC BY BOTH THE PARTIES**

1. Chronology of the Disputes
2. Brief of the Contract/MoU/Agreement/LOI/LOA
3. Brief history of the Disputes:
4. Issues:
5. Details of Claim(s)/Counter Claim(s):

SI. No.	Description of claim(s)/Counter Claim	Amount (in INR)Or currency applicable in the contract	Relevant contract clause

6. Basis/Ground of claim(s)/counter claim(s) (along with relevant clause of contract)

Note– *The Statement of Claims/ Counter Claims may ideally be restricted to maximum limit of 20 pages. Relevant documents may be compiled and submitted along with the statement of Claims/ Counter Claims. The statement of Claims/ Counter Claims is to be submitted to all IEC members and to the other party by post as well as by email.*

FORMAT FOR NOTICE INVOKING CONCILIATION CLAUSE BY BHEL FOR REFERRING THE DISPUTES TO CONCILIATION THROUGH IEC

To,

M/s. (Stakeholder's name)

Subject: **NOTICE FOR INVOCATION OF THE CONCILIATION CLAUSE OF THE CONTRACT BY BHEL**

Ref: Contract No/MoU/Agreement/LOI/LOA& date _____.

Dear Sir/Madam,

As you are aware, with reference to above referred Contract/MoU/Agreement/LOI/LOA, certain disputes have arisen, which, in spite of several rounds of mutual discussions and various correspondences have remained unresolved. The brief particulars of our claims which arise out of the above- referred Contract/MoU/Agreement/LOI/LOA are reproduced hereunder:

Sl. No.	Claim description	Amount involved

As you are aware, there is a provision in the captioned Contract/MoU/Agreement/LOI/ LOA for referring disputes to conciliation.

In terms of Clause -----of Procedure i.e., Annexure ----- to the Contract/MoU /Agreement / LOI / LOA, we hereby seek your consent to refer the matter to Conciliation by Independent Experts Committee to be appointed by BHEL. You are invited to provide your consent in writing to proceed with conciliation into the above mentioned disputes within a period of 30 days from the date of this letter along with details of counter-claims, if any, which you might have with regard to the subject Contract/ MoU/ Agreement/ LOI/ LOA.

Please note that upon receipt of your consent in writing within 30 days of the date of receipt of this letter by you, BHEL shall appoint suitable person(s) from the BHEL Panel of Conciliators.

This letter is being issued without prejudice to our rights and contentions available under the contract and law.

Thanking you
Yours faithfully

Representative of BHEL

Note: The Format may be suitably modified, as required, based on facts and circumstances of the case.

**FORMAT FOR NOTICE INVOKING CONCILIATION CLAUSE BY A
STAKEHOLDER FOR REFERRING THE DISPUTES TO CONCILIATION
THROUGH IEC**

To,

BHEL (Head of the Unit/Division/Region/Business Group)

Subject: **NOTICE FOR INVOCATION OF THE CONCILIATION CLAUSE OF THE
CONTRACT BY A STAKEHOLDER**

Ref: Contract No/MoU/Agreement/LOI/LOA& date _____.

Dear Sir/Madam,

As you are aware, with reference to above referred Contract/MoU/Agreement/LOI/LOA, certain disputes have arisen, which, in spite of several rounds of mutual discussions and various correspondences have remained unresolved. The brief particulars of our claims which have arisen out of the above-referred Contract/MoU/Agreement/LOI/LOA are enumerated hereunder:

Sl. No.	Claim description	Amount involved

As you are aware, there is a provision in the captioned Contract/MoU/Agreement/LOI/ LOA for referring inter-se disputes of the Parties to conciliation.

We wish to refer the above-said disputes to Conciliation as per the said Clause of the captioned Contract/MoU/Agreement/LOI/ LOA. In terms of Clause -----of Procedure i.e., Annexure ----- to the Contract/MoU /Agreement / LOI / LOA, we hereby invite BHEL to provide its consent in writing to proceed with conciliation into the above mentioned disputes within a period of 30 days from the date of this letter along with details of counter-claims, if any, which it might have with regard to the subject Contract/ MoU/ Agreement/ LOI/ LOA and to appoint suitable person(s) as Conciliator(s) from the BHEL Panel of Conciliators.

This letter is being issued without prejudice to our rights and contentions available under the contract and law.

Thanking you
Yours faithfully

Representative of the Stakeholder

Note: The Format may be suitably modified, as required, based on facts and circumstances of the case.

FORMAT FOR INTIMATION TO THE STAKEHOLDER ABOUT APPOINTMENT OF CONCILIATOR/IEC

To,

M/s. (Stakeholder's name)

Subject: **INTIMATION BY BHEL TO THE STAKEHOLDER AND CONCILIATOR(S) ABOUT APPOINTMENT OF CONCILIATOR/IEC**

Ref: Contract No/MoU/Agreement/LOI/LOA& date _____.

Sir,

This is with reference to letter dated ----- regarding reference of the disputes arising in connection with the subject Contract No /MoU/Agreement/LOI/LOA to conciliation and appointment of Conciliator(s).

In pursuance of the said letter, the said disputes are assigned to conciliation and the following persons are nominated as Conciliator(s) for conciliating and assisting the Parties to amicably resolve the disputes in terms of the Arbitration & Conciliation Act, 1996 and the Procedure ---- to the subject Contract/MoU/Agreement/LOI/LOA, if possible.

Name and contact details of Conciliator(s)

a)

b)

c)

You are requested to submit the Statement of Claims or Counter-Claims (strike off whichever is inapplicable) before the Conciliator(s) in Format 29 (enclosed herewith) as per the time limit as prescribed by the Conciliator(s).

Yours faithfully,

Representative of BHEL

CC: To Conciliator(s)... for Kind Information please.

Encl: As above

Note: The Format may be suitably modified, as required, based on facts and circumstances of the case.

PROCEDURE FOR CONDUCT OF CONCILIATION PROCEEDINGS

1. 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 herein:
2. The party desirous of resorting to Conciliation shall send an invitation/notice in writing to the other party to conciliate specifying all points of Disputes with details of the amount claimed. The party concerned shall not raise any new issue thereafter. Parties shall also not claim any interest on claims/counter-claims from the date of notice invoking Conciliation till the conclusion of the Conciliation proceedings. If BHEL is to initiate Conciliation, then, the invitation to Conciliate shall be extended to the concerned Stakeholder in **Format-30** hereto. Where the stakeholder is to initiate the Conciliation, the notice for initiation of Conciliation shall be sent in **Format-31** hereto.
3. The party receiving the invitation/notice for Conciliation shall within 30 days of receipt of the notice of Conciliation intimate its consent for Conciliation along with its counter-claims, if any.
4. The Conciliation in a matter involving claim or counter-claim (whichever is higher) up to Rs 5 crores shall be carried out by sole Conciliator nominated by BHEL while in a matter involving claim or counter-claim (whichever is higher) of more than Rs 5 crores Conciliation shall be carried out by 3 Conciliators nominated by BHEL. The appointment of Conciliator(s) shall be completed and communicated by the concerned Department/Group of BHEL Unit/Division/Region/Business Group to the other party and the Conciliator(s) within 30 days from the date of acceptance of the invitation to conciliate by the concerned party in the **Format-32**. The details of the Claim, and counter-claim, if any, shall be intimated to the Conciliator(s) simultaneously in **Format-29**.
5. The Parties shall be represented by only their duly authorized in-house executives/officers and neither Party shall be represented by a Lawyer.
6. The first meeting of the IEC shall be convened by the IEC by sending appropriate communication/notice to both the parties as soon as possible but not later than 30 days from the date of his/their appointment. The hearings in the Conciliation proceeding shall ordinarily be concluded within two (2) months and, in exceptional cases where parties have expressed willingness to settle the matter or there exists possibility of settlement in the matter, the proceedings may be extended by the IEC by a maximum of further 2 months with the consent of the Parties subject to cogent reasons being recorded in writing.

- 7.** The IEC shall thereafter formulate recommendations for settlement of the Disputes supported by reasons at the earliest but in any case within 15 days from the date of conclusion of the last hearing. The recommendations so formulated along with the reasons shall be furnished by the IEC to both the Parties at the earliest but in any case within 1 month from the date of conclusion of the last hearing.
- 8.** Response/modifications/suggestions of the Parties on the recommendations of the IEC are to be submitted to the IEC within time limit stipulated by the IEC but not more than 15 days from the date of receipt of the recommendations from the IEC.
- 9.** In the event, upon consideration, further review of the recommendations is considered necessary, whether by BHEL or by the other Party, then, the matter can be remitted back to the IEC with request to reconsider the same in light of the issues projected by either/both the Parties and to submit its recommendations thereon within the following 15 days from the date of remitting of the case by either of the Parties.
- 10.** Upon the recommendations by the Parties, with or without modifications, as considered necessary, the IEC shall be called upon to draw up the Draft Settlement Agreement in terms of the recommendations.
- 11.** When a consensus can be arrived at between the parties only in regard to any one or some of the issues referred for Conciliation the draft Settlement Agreement shall be accordingly formulated in regard to the said Issue(s), and the said Settlement Agreement, if signed, by the parties, shall be valid only for the said issues. As regards the balance issues not settled, the parties may seek to resolve them further as per terms and conditions provided in the contract.
- 12.** In case no settlement can be reached between the parties, the IEC shall by a written declaration, pronounce that the Conciliation between the parties has failed and is accordingly terminated.
- 13.** Unless the Conciliation proceedings are terminated in terms of para 22 (b), (c) & (d) herein below, the IEC shall forward his/its recommendations as to possible terms of settlement within one (1) month from the date of last hearing. The date of first hearing of Conciliation shall be the starting date for calculating the period of 2 months.
- 14.** In case of 3 members IEC, 2 members of IEC present will constitute a valid quorum for IEC and meeting can take place to proceed in the matter after

seeking consent from the member who is not available. If necessary, videoconferencing may be arranged for facilitating participation of the members. However, the IEC recommendations will be signed by all members. Where there is more than one (1) Conciliator, as a general rule they shall act jointly. In the event of differences between the Members of IEC, the decision/recommendations of the majority of the Members of IEC shall prevail and be construed as the recommendation of the IEC.

- 15.** The Draft Settlement Agreement prepared by the IEC in terms of the consensus arrived at during the Conciliation proceedings between the Parties shall be given by the IEC to both the parties for putting up for approval of their respective Competent Authority.
- 16.** Before submitting the draft settlement agreement to BHEL's Competent Authority viz. the Board Level Committee on Alternative Dispute Resolution (BLCADR) for approval, concurrence of the other party's Competent Authority to the draft settlement agreement shall be obtained by the other party and informed to BHEL within 15 days of receipt of the final draft settlement agreement by it. Upon approval by the Competent Authority, the Settlement Agreement would thereafter be signed by the authorized representatives of both the Parties and authenticated by the members of the IEC.
- 17.** In case the Draft Settlement Agreement is rejected by the Competent Authority of BHEL or the other Party, the Conciliation proceedings would stand terminated.
- 18.** A Settlement Agreement shall contain a statement to the effect that each of the person(s) signing thereto (i) is fully authorized by the respective Party(ies) he/she represents, (ii) has fully understood the contents of the same and (iii) is signing on the same out of complete freewill and consent, without any pressure, undue influence.
- 19.** The Settlement Agreement shall thereafter have the same legal status and effect as an arbitration award on agreed terms on the substance of the dispute rendered by an arbitral tribunal passed under section 30 of the Arbitration and Conciliation Act, 1996.
- 20.** Acceptance of the Draft Settlement Agreement/recommendations of the Conciliator and/or signing of the Settlement Agreement by BHEL shall however, be subject to withdrawal/closure of any arbitral and/or judicial proceedings initiated by the concerned Party in regard to such settled issues.
- 21.** Unless otherwise provided for in the agreement, contract or the Memorandum of Understanding, as the case may be, in the event of likelihood of prolonged

absence of the Conciliator or any member of IEC, for any reason/incapacity, the Competent Authority/Head of Unit/Division/Region/Business Group of BHEL may substitute the Conciliator or such member at any stage of the proceedings. Upon appointment of the substitute Conciliator(s), such reconstituted IEC may, with the consent of the Parties, proceed with further Conciliation into the matter either de-novo or from the stage already reached by the previous IEC before the substitution.

22. The proceedings of Conciliation under this Scheme may be terminated as follows:

- a.** On the date of signing of the Settlement agreement by the Parties; or,
- b.** By a written declaration of the IEC, after consultation with the parties, to the effect that further efforts at conciliation are no longer justified, on the date of the declaration; or,
- c.** By a written declaration of the Parties addressed to the IEC to the effect that the Conciliation proceedings are terminated, on the date of the declaration; or,
- d.** By a written declaration of a Party to the other Party and the IEC, if appointed, to the effect that the Conciliation proceedings are terminated, on the date of the declaration; or,
- e.** On rejection of the Draft Settlement Agreement by the Competent Authority of BHEL or the other Party.

23. The Conciliator(s) shall be entitled to following fees and facilities:

Sl No	Particulars	Amount
1	Sitting fees	Each Member shall be paid a Lump Sum fee of Rs 75,000/- for the whole case payable in terms of paragraph No. 27 herein below.
2	Towards drafting of settlement agreement	In cases involving claim and/or counter-claim of up to Rs 5crores. Rs 50,000/- (Sole Conciliator) In cases involving claim and/or counter-claim of exceeding Rs 5 crores but less than Rs 10 crores. Rs 75,000 (per Conciliator)

Sl No	Particulars	Amount
		In cases involving claim and/or counter-claim of more than Rs 10 crores. Rs 1,00,000/- (per Conciliator) Note: The aforesaid fees for the drafting of the Settlement Agreement shall be paid on the, Signing of the Settlement Agreement after approval of the Competent Authority or Rejection of the proposed Settlement Agreement by the Competent Authority of BHEL.
3	Secretarial expenses	Rs 10,000/- (one time) for the whole case for Conciliation by a Sole Member IEC. Where Conciliation is by multi member Conciliators –Rs 30,000/- (one time)- to be paid to the IEC
4	Travel and transportation and stay at outstation Retired Senior Officials of other Public Sector Undertakings (pay scale wise equivalent to or more than E-8 level of BHEL)	As per entitlement of the equivalent officer (pay scale wise) in BHEL.
	Others	As per the extant entitlement of whole time Functional Directors in BHEL. Ordinarily, the IEC Member(s) would be entitled to travel by air Economy Class.
5	Venue for meeting	Unless otherwise agreed in the agreement, contract or the Memorandum of Understanding, as the case may be, the venue/seat of proceedings shall be the location of the concerned Unit / Division / Region /

Sl No	Particulars	Amount
		Business Group of BHEL. Without prejudice to the seat/venue of the Conciliation being at the location of concerned BHEL Unit / Division / Region / Business Group, the IEC after consulting the Parties may decide to hold the proceedings at any other place/venue to facilitate the proceedings. Unless, Parties agree to conduct Conciliation at BHEL premises, the venue is to be arranged by either Party alternately.

- 24.** The parties will bear their own costs including cost of presenting their cases/evidence/witness(es)/expert(s) on their behalf. The parties agree to rely upon documentary evidence in support of their claims and not to bring any oral evidence in IEC proceedings.
- 25.** If any witness(es) or expert(s) is/are, with the consent of the parties, called upon to appear at the instance of the IEC in connection with the matter, then, the costs towards such witness(es)/expert(s) shall be determined by the IEC with the consent of the Parties and the cost so determined shall be borne equally by the Parties.
- 26.** The other expenditures/costs in connection with the Conciliation proceedings as well as the IEC's fees and expenses shall be shared by the Parties equally.
- 27.** Out of the lump sum fees of Rs 75,000/- for Sitting Fees, 50% shall be payable after the first meeting of the IEC and the remaining 50% of the Sitting Fees shall be payable only after termination of the conciliation proceedings in terms of para 22 hereinabove.
- 28.** The travelling, transportation and stay at outstation shall be arranged by concerned Unit as per entitlements as per Serial No. 4 of the Table at para 23 above, and in case such arrangements are not made by the BHEL Unit, the same shall be reimbursed to the IEC on actuals limited to their entitlement as per Serial No. 4 of the Table at Para 23 above against supporting documents. The IEC Member(s) shall submit necessary invoice for claiming the fees/reimbursements.
- 29.** The Parties shall keep confidential all matters relating to the conciliation proceedings. Confidentiality shall extend also to the settlement agreement,

except where its disclosure is necessary for purposes of its implementation and enforcement or as required by or under a law or as per directions of a Court/Governmental authority/ regulatory body, as the case may be.

- 30.** The Parties shall not rely upon or introduce as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the Disputes that is the subject of the Conciliation proceedings:
- a.** Views expressed or suggestions made by the other party in respect of a possible settlement of the Disputes;
 - b.** admissions made by the other party in the course of the Conciliator proceedings;
 - c.** proposals made by the Conciliator;
 - d.** The fact that the other Party had indicated his willingness to accept a proposal for settlement made by the Conciliator.
- 31.** The Parties shall not present the Conciliator(s) as witness in any Alternative Dispute Resolution or Judicial proceedings in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.
- 32.** None of the Conciliators shall act as an arbitrator or as a representative or counsel of a Party in any arbitral or judicial proceeding in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.
- 33.** The Parties shall not initiate, during the Conciliation proceedings, any arbitral or judicial proceedings in respect of a Disputes that is the subject matter of the Conciliation proceedings except that a Party may initiate arbitral or judicial proceedings where, in his opinion, such proceedings are necessary for preserving his rights including for preventing expiry of period of limitation. Unless terminated as per the provisions of this Scheme, the Conciliation proceedings shall continue notwithstanding the commencement of the arbitral or judicial proceedings and the arbitral or judicial proceedings shall be primarily for the purpose of preserving rights including preventing expiry of period of limitation.
- 34.** The official language of Conciliation proceedings under this Scheme shall be English unless the Parties agree to some other language.



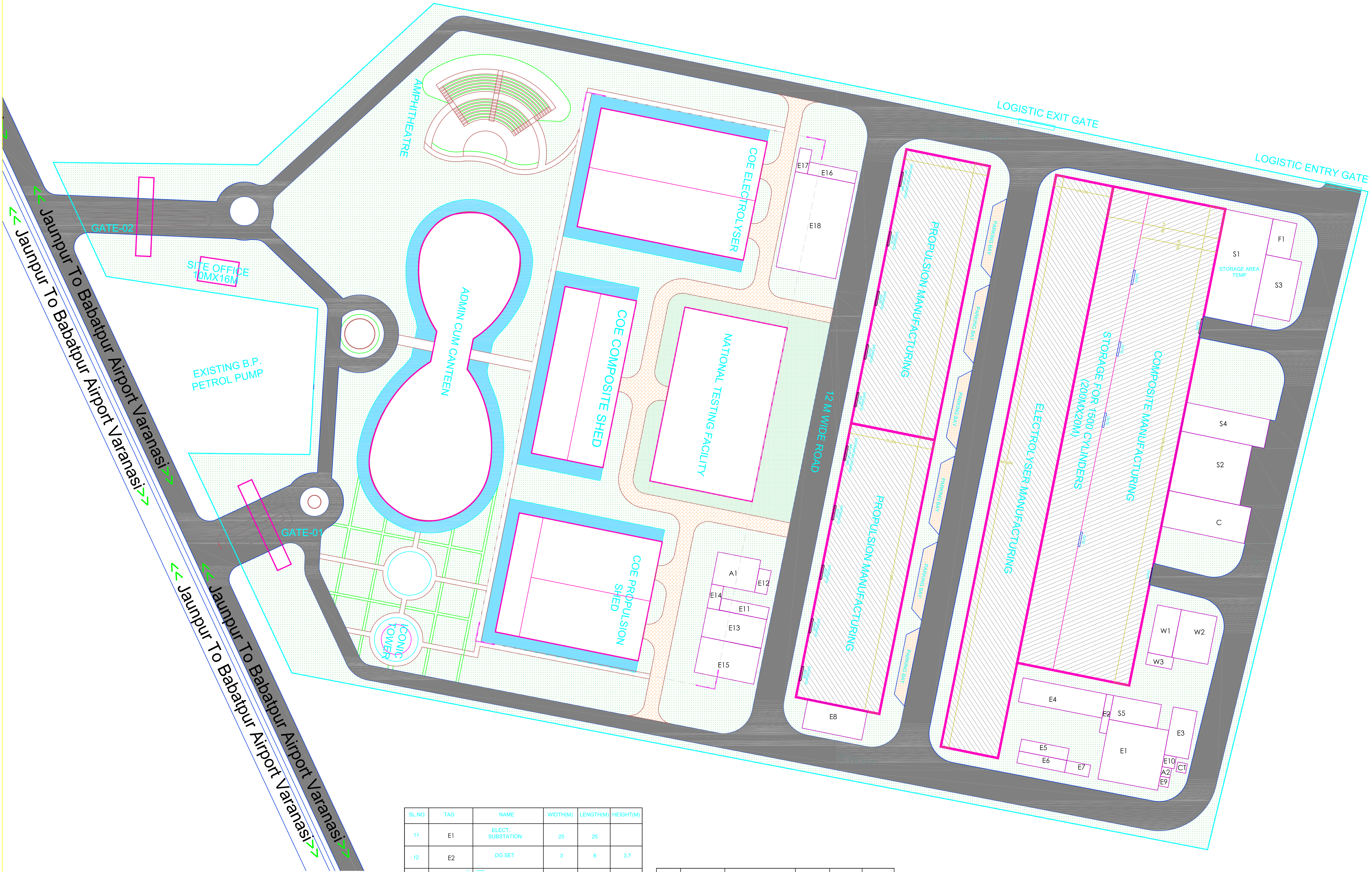
BHARAT HEAVY ELECTRICALS LIMITED
Centre of Excellence (CoE), Karkhiyaon, Varanasi

Name Of Work:
Construction of Propulsion Manufacturing Block
Foundation and Miscellaneous Enabling Works at
BHEL CoE, Karkhiyaon, Varanasi

Tender Enquiry No. : COE/VNS/CVL/2023/001

VOLUME-1F

Tender Drawings



SL.NO	TAG	NAME	WIDTH(M)	LENGTH(M)	HEIGHT(M)
1	S1	CLOSED SHED	20	45	
2	S2	SHED AREA	25	30	15
3	S3	HYDRA SHED	15	25	
4	S4	RAW MATERIAL STORAGE SHED	12	35	4.5
5	S5	WASTE INCINERATOR SHED	10	15	6
6	F1	FIRE STATION	10	15	
7	C	EOT CRANE AREA	17	35	22
8	W1	RAIN WATER & FIRE WATER RESERVOIR	10	20	
9	W2	STP AREA	15	20	
10	W3	FWPH	10	5	

SL.NO	TAG	NAME	WIDTH(M)	LENGTH(M)	HEIGHT(M)
11	E1	ELECT. SUBSTATION	25	25	
12	E2	DG SET	3	8	3.7
13	E3	TRANSFORMER SPACE	10	20	
14	E4	ELECT. ANNEXE FOR ELECTROLYZER & COMPOSITE MANUFACTURING	10	35	
15	E5	ELECT. ANNEXE FOR PROPULSION MANUFACTURING	5	20	
16	E6	TRANSFORMER	5	20	
17	E7	TRANSFORMER	5	10	
18	E8	SWITCH GEAR YARD	12	25	
19	E9	CONTROL PANEL	4	4	
20	E10	BATTERY ROOM	5	5	
21	CT	COOLING TOWER	4	4	
22	A1	COMPRESSOR HOUSE	13.5	18	
23	A2	COMPRESSOR ROOM	4	4	

SL.NO	TAG	NAME	WIDTH(M)	LENGTH(M)	HEIGHT(M)
24	B1	BUILDING	30	40	5
25	B2	BUILDING	20	45	6
26	E11	ELECT. ANNEXE FOR NTF	5	20	
27	E12	TRANSFORMER	5	10	
28	E13	ELECT. ANNEXE FOR ADMIN BLDG.	12	25	
29	E14	TRANSFORMER	5	10	
30	E15	EFFLUENT MANAGEMENT CENTRE	15	25	
31	E16	ELECT. ANNEXE FOR COE PROPULSION & COE ELECTROLYZER	15	25	
32	E17	TRANSFORMER	5	10	
33	E18	TRANSFORMER YARD AREA	25	40	

KEY PLAN

GENERAL NOTES:

- ALL DIMENSIONS AND LEVELS ARE IN MM UNLESS OTHERWISE SPECIFIED.
- ALL DIMENSIONS ARE TO BE CHECKED AND CO-RELATED WITH THE RELEVANT ARCHITECTURAL, STRUCTURAL AND SERVICES DRAWINGS AND ANY AMBIGUITY, DISCREPANCY OR OMISSION SHALL BE BROUGHT IN TO NOTICE OF ARCHITECT.
- DO NOT SCALE THE DRAWING. WRITTEN DIMENSION TO BE FOLLOWED.
- THIS DRAWING TO BE READ IN CONJUNCTION WITH THE RELEVANT SERVICES AND STRUCTURAL DRAWINGS.

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Number	Revision Description	Date

PROJECT TITLE :

ARCHITECTURAL & ENGINEERING CONSULTANCY SERVICES FOR DESIGN OF BUILDINGS / FACILITIES/UTILITIES IN BHEL COMPLEX AT KARKHIYAON, VARANASI, (U.P.)

CLIENT:



BHEL : BHARAT HEAVY ELECTRICALS LIMITED
KARKHIYAON, VARANASI, UTTAR PRADESH

PMC AGENCY:

ARCHITECTURAL AND ENGINEERING CONSULTANTS :

ARCOP ARCOP ASSOCIATES NEW DELHI
A-15 , Pamposh Enclave, Greater Kallash-I
New Delhi-110048

STRUCTURAL CONSULTANT :

GLOBAL DESIGN ENGINEERS
H.NO. A112, Block A, Sector 108
Noida, Uttar Pradesh 201304
Tel. : +91 97155 48278
e-Mail:globaldesignengineers2016@gmail.com

PLUMBING CONSULTANT :

ARK Consultants
1/30 Roshan Garden-II, Kakrola road,Najafgarh,
New Delhi-110043
Email:consultants.ark@gmail.com
Tel: +91-9891973781

BIMS CONSULTANT :

Envirotech Design Pvt. Ltd.
G-73, 3rd Floor (Above PUMA Showroom)
Near Kalindi Kunj (Main Road)
New Delhi -110025 , TEL: 011-29948091 ,
Email: projects@envirotech.in

LANDSCAPE CONSULTANT :

DESIGN PROCESS
Phone No.- +91 9811736490 ,
Email: chhitiz@designprocess.co.in

LIGHTING CONSULTANT :

ETHEREAL DESIGN
61-A, Harsh Apartment, Pkt 1, Sec-10
Dwarka, New Delhi 110075.
TEL:011-45507504 Phone No.- +91 9819626202 ,
Email: jaspreet@ethdesigns.com

DRAWING DISCIPLINE	STAGE/ISSUED FOR		
	☐ Concept	☐ Preliminary	☐ Approval
	☐ Tender	☐ Construction	☐ GFC

BUILDING:	DRAWING TITLE :	
	MASTER PLAN LAYOUT	
DATE :	DRAWING NO :	REVISION
16-11-2023		
SCALE: 1:750	DRAWN BY :	CHECKED BY :