TENDER DOCUMENT FOR RESTORATION OF DAMAGES FOR EXTERNAL SERVICES WORKS

AT

GLOBAL GATEWAY

M.G ROAD, GURUGRAM

CLIENT

UNITECH LTD
8th & 13th Floor, Tower-B
Signature Tower, South City -1,
Gurugram

PMC

Rudrabhishek Enterprises ltd
A-6, Sector-58, Noida, U.P-201301

MASTER INDEX

NAME OF WORK : **RESTORATION OF DAMAGES FOR EXTERNAL SERVICES WORKS AT GLOBAL GATEWAY M.G. ROAD, GURUGRAM, (HARYANA) - 122002**

TENDER NO. : **UL:RED:GG:001**

NOTICE INVITING TENDER

Unitech Limited
8th & 13th Floor, Tower B
Signature Tower, South City-1
Gurugram, 122001, Haryana

NOTICE INVITING TENDER (NIT)

Date: 04/07/2022

Unitech Limited, invites tenders from experienced and eligible agencies for Restoration of Damages for External Services Works at Global Gateway, M.G. Road, Gurugram, (Haryana) – 122002 for Unitech Limited at 13th Floor, Signature Tower-B, Sector 30, South City-1 , Gurugram as per Data Sheet:-

Tender Document No.	UL:RED:GG:001
Name of the Work	Restoration of Damages for External Services Works at GlobalGateway, M.G. Road, Gurugram, (Haryana) - 122002
Brief Scope of Work	Restoration / Reconstruction of Landscape, Rain Water harvesting System, External Plumbing & External Electrical Works
Estimated Cost	Rs. 1,44,80,214.00/- (One Crore Forty Four Lac Eighty Thousand Two Hundred Fourteen Only)
Completion Period	3 Months
Type of Tender	Percentage Rate Tender
Earnest Money Deposit	Rs. 2,89,604.00 /- (Rupees Two Lac Eighty Nine Thousand Six Hundred Four Only) in the form of Demand Draft / Pay Order or Banker's Cheque/ Bank Guarantee in favour of M/s Unitech Limited, payable at Gurugram.
Cost of Tender document & processing fee (Non-refundable)	Rs.17,700/- {(Cost ot Tender -10000) + (5000 Processing Fee) + 18 % GST) in the shape of DemandDraft In the favour of " Unitech Limited" payable at Gurugram
Tender Document downloading Start Date	04-07-2022 at 10:00:00 onwards
Tender Document downloading End Date	18-07-2022 at 18:00:00
Pre-bid Meeting Time & Venue (Physically)	11:00:00 am on 11-07-2022 at Unitech Limited at 13th Floor, Signature Tower-B, Sector 30, South City-1 , Gurugram-122001, Haryana.

	Contact Person: Mr. Ashwani Rao Email:- ashwani.rao@unitechgroup.com Mob.9891990861 Note – Kindly send your queries before Pre-bid meeting
Last Date & Time for submission of Bids in sealed Covers	18-07-2022 Up by 18:00:00 at Mr. Ashwani Rao Unitech Limited at 13th Floor, Signature Tower-B, Sector30, South City-1, Gurugram-122001 Haryana.
Period during which hard copy in original of EMD, Cost of Tender Document, tender processing fee and other document as per NIT shall be submitted.	18-07-2022 Up by 18:00:00 at Mr. Ashwani Rao Unitech Limited at 13th Floor, Signature Tower-B, Sector30, South City-1, Gurugram-122001 Haryana.
Site Visit	**Bidder may contact-:** Mr. R.C. Bagoli Mob.- 9654888859
Date & time of opening of Bid	20-07-2022 at 16:00:00
Bid Validity Period	180 days

If any of the day mentioned above happens to be Unitech Limited holiday, the next working day shall be implied.

The tender document can be downloaded from website www.unitechgroup.com **Corrigendum,if any, would appear only on the website www.unitechgroup.com and not to be published in any News Paper.**

Interested parties are requested to get the details and submit their bids only in sealed covers on or before 18-07-2022 Up by 18:00:00. The Bids sent through e-mail or without Cost of Tender Document & tender processing fee will be entertained

2.0 Eligibility Criteria:

The interested bidders should meet the following minimum qualifying criteria:

A. Work Experience:

i) Experience of having successfully completed similar works during the last 07 (seven) years ending previous day of last date of submission of tenders.

a. Three similar works each costing not less than 40% of the estimated costput to tender

OR

b. Two similar works each costing not less than 60% of the estimated cost put to tender

OR

c. One similar work costing not less than 80% of the estimated cost put to tender.

AND

ii) One of the building proposed by bidder for the qualification should at least have equal to or more than 60% of the number of floors in the completed Building (rounded off to higher value) of the tallest building as mentioned in the brief scope of work, above

"Similar works" shall mean "Commercial / Institutional /Multistoried residential buildings***".***

Notes –

i) The past experience in similar nature of work should be supported by certificates i.e. copies of Letter of Award & completion certificate issued by the respective client's organizations. In case, the work experience is of Private sector, the said certificates shall be supported with copies of Corresponding TDS Certificates. Value of work will be considered equivalent to the amount of TDS Certificates.

ii) The value of executed works shall be brought to the current level by enhancing the actual value of work done at a simple rate of 7% per annum, calculated from the date of completion to previous day of last day of submission of tenders.

iii) The values of completed work shall be exclusive of GST. Bidder shall produce documentary evidence against the Taxes & Duties applicable against the concerned job(s). In case the value of job submitted by the bidder does not have clarity with regard to inclusion/ exclusion of GST, the amount appearing in the Completion Certificate shall be considered inclusive of tax and shall be evaluated accordingly.

iv) Joint-venture / consortia of firms / companies shall not be allowed and the bidders should meet the above criteria themselves.

v) Certificates of Subsidiary/Group Companies:

Any company/firm while submitting the bid can use the work experience of its subsidiary company to the extent of its ownership in the subsidiary company. However, the companies/firms which intend to get qualified on the basis of experience of the parental company/group company/Own works shall not be considered. In case of a Company/firm, formed after merger and/ or acquisition of other companies/firms, past experience and other antecedents of the merged/ acquired companies/firms will be considered for qualification of such Company/firm provided such Company/firm continues to own the requisite assets and resources of the merged/ acquired companies/firms relevant to the claimed experience.

vi) Foreign Certificate:

a. In case the work experience is for the work executed outside India, the bidders have to submit the completion/experience certificate issued by the owner duly signed & stamped and affidavit to the correctness of the completion/experience certificates. The contractor shall also get the completion/experience certificates attested by the Indian Embassy/Consulate/ High Commission in the respective country.

   In the event of submission of completion /experience certificate by the Bidder in a language other than English, the English translation of the same shall be duly authenticated by Chamber of Commerce of the respective country and attested by the Indian Embassy/consulate / High Commission in the respective country be should be submitted by the Bidder.

b. For the purpose of evaluation of bidders, the conversion rate of such currency into INR shall be the daily representative exchange rate published by the IMF as on 7 (Seven) days prior to Submission of tender including extension(s) given if any.

B. Financial Strength:

i) The Average annual financial turnover for last 3 years shall be at least 50% of the estimated cost put to tender. The requisite Turn Over shall be duly certified by a Chartered Accountant with his Seal/ signatures and registration number.

   In case of Companies/Firms less than 3 years old, the Average annual financial turnover shall be worked out for the available period only.

ii) Net Worth of the company /firm as on last day of preceding Financial Year should be positive.

   Net worth means paid up share capital, Share Application Money pending allotment* and reserves # less accumulated losses and deferred expenditure to the extent not written off. Net worth has been calculated using the following formula.

   # Reserves to be considered for the purpose of Net worth shall be all reserves created out of the profits and securities premium account but shall not include reserves created out of revaluation of assets, write back of depreciation and amalgamation.

   ***** *Share Application Money pending allotment will be considered only in respect of share to be allotted.*

Paid up share capital	XX
Add: Share Application Money pending allotment	XX
Add: Reserves (As defined Above)	XX

Less: accumulated losses	XX
Less: Deferred Revenue Expenditure to the Extent not written off	XX
NET WORTH	XX

Notes -

i) Self-certified copy of Bank Solvency Certificate issued from Nationalized or any Schedule Bank should be at least 40% of Estimated Cost of the Project put to tender. The certificate should have been issued within 6 months from original last date of the submission of the tender.

Bank Solvency Certificate is not required if estimated cost put to tender is up to Rs.25 Crore.

ii) The bidders are required to submit page of summarized Balance Sheet (Audited) and also page of summarized Profit & Loss Account (Audited) for last three years.

3.0 The intending bidder must read the terms and conditions of this document carefully. He should only submit his tender if he considers himself eligible and he is in possession of all the documents required. Information and Instructions for bidders posted on Website(s) shall form part of Tender Document.

4.0 The Tender Document as uploaded can be viewed and downloaded free of cost by anyone including intending tenderer. But the tender can only be submitted after depositing the mandatory documents such as a) Demand Draft / Pay order or Banker`s Cheque towards cost of tender document, b) Tender Processing Fee, c) Demand Draft/Pay Order or Banker's Cheque / Bank Guarantee of any Nationalized or all Commercial Scheduled Bank against EMD & all other documents shall be as per Notice Inviting tender.

5.0 Set of Contract/Tender Documents:

The following documents will constitute set of tender documents:

a) Notice Inviting e-Tender
b) Quoting Sheet for Tenderer
c) Instructions to Tenderers & General Conditions of Contract
d) Technical Specifications
e) Bill of Quantities
f) List of approved makes of materials
g) Tender Drawings
h) General Details Annexure-I
i) Acceptance of Tender Conditions
j) Integrity pact (To be signed and stamped by the contractors to be submit with the bid)

k) Addendum/Corrigendum, if any- duly signed by authorized person

l) Special Conditions of Contract

6.0 The bidders are required to quote strictly as per terms and conditions, specifications, standards given in the tender documents and not to stipulateany deviations.

The bidders are advised to submit complete details with their bids as Technical Bid Evaluation will be done on the basis of documents sent along with tender by the bidders with the bids. The information should be submitted in the prescribed proforma. Bids with Incomplete /Ambiguous information will be rejected.

The Bank Guarantee for EMD submitted by the bidders shall be strictly in the format prescribed in GCC. In case, EMD is not found verbatim in the prescribed format, the bid will be liable for rejection.

7.0 The bidders are advised in their own interest to submit their bid documents well in advance from last date/time of submission of bids so as to avoid problems which the bidders may face in submission at last moment/during rush hours.

8.0 ~~On opening date, the tenderer can login and see the tender opening process~~.

9.0 ~~Bidder to upload documents in the form of PDF format.~~

10.0 Bidder to submit all the documents including valid GST registration/EPF registration, PAN No. as stipulated in the tender document.

11.0 If the bidder is found ineligible after opening of bid, his bid shall become invalid and cost of bid document and processing fee shall not be refunded by Unitech Limited to the said Bidder.

12.0 ~~If any discrepancy is noticed between the documents as uploaded at the time of submission of tender and hard copies as submitted physically by the Bidder the tender shall become invalid, and cost of tender document and processing fee shall not be refunded by Unitech Limited.~~

13.0 Notwithstanding anything stated above, Unitech Limited reserves the right to assess the capabilities and capacity of the tenderer to perform the contract, in the overall interest of work. In case, bidder's capabilities and capacities are not found satisfactory, Unitech Limited reserves the right to reject the tender, and bidder will have no objection to it.

14.0 Certificate of Financial Turn Over:

At the time of Affidavit/Certificate submission of bid, the bidder shall submit the certificate from Chartered Accountant mentioning Financial Turnover of last 3 years or for the period as specified in the tender document. There is no need to submit entire voluminous balance sheets. However, one page of summarized balance sheet (Audited) and one page of summarized Profit & Loss Account (Audited) copy for last 03 years shall be submitted in hard copy.

15.0 The bidder must ensure to quote separate rates of percentage for Schedule-A and Schedule-B items. The Rate shall be quoted up to two decimals places. The rate of percentage quoted by the bidder for Schedule-A items will be applicable to all items covered under Schedule-A and the rate of percentage quoted by the bidder for Schedule-B items will be applicable to all items covered under Schedule-B. The evaluation of Lowest (L1) bid shall be done based on the SUM of the rates of percentage quoted by the bidder towards Schedule-A and Schedule-B items.

16.0 The tenderer(s) if required, may submit queries, if any, through E-mail and in writing to the tender inviting authority to seek clarifications within 7 days from the date of uploading of Tender on website but latest by so as to reach office not less than 2 days prior to the date of Pre-bid meeting (if to be held as per NIT). Unitech Limited will reply only those queries which are essentially required for submission of bids. Unitech Limited will not reply the queries which are not considered fit, viz. replies of which can be implied /found in the NIT/ Tender documents or which are not relevant or in contravention to NIT/Tender Documents, queries received after 7 days from

the date of uploading of Tender on website, request for extension of time for opening of technical bids, etc. Technical Bids are to be opened on the scheduled dates. Requests for Extension of opening of Technical Bids will not be entertained.

The Pre-Bid meeting shall be attended by the intending bidders only and not by vendors/manufacturers. The intending bidders should depute their authorized person with authorization letter in original to attend the pre-bid meeting.

17.0 **Integrity Pact**

Integrity Pact duly signed by the tenderer shall be submitted. Any tender without signed integrity Pact shall be liable for rejection

18.0 List of Documents to be submitted in hard copy withinthe period of tender submission:

a) Demand Draft/Pay Order or Banker's Cheque/ Bank Guarantee of any Nationalized or all Commercial Scheduled Bank against EMD.

b) Demand Draft/Pay Order or Banker's Cheque of any Scheduled Bank towards cost of Tender Document.

c) GENERAL DETAILS as per Annexure-I.

d) Unconditional Letter of Acceptance of Tender Conditions (in original) On Letter Head of the Applicant/ Bidder.

e) Integrity pact duly signed by the contractor. The bidders are required to download the Integrity Pact as uploaded in the tender documents, and sign on the same,.

f) Details of Work Experience Certificates –FORM A.

g) Details of Similar Works – FORM B.

h) Financial Details- FORM C.

i) TDS details for Private Sector Projects – FORM D.

j) Self-certified copy of Bank Solvency Certificate- FORM E.

k) Documents regarding Net Worth of the Company Firm.

l) General Information – Form-F.

m) Work Experience Certificates consisting of details as mentioned in Form-G

n) Affidavit duly notarized by Notary Public on Non-Judicial Stamp Paper of Rs. 100 for correctness of Documents /Information – Form H.

o) Power of Attorney in the name of the person authorized for signing/submitting the tender.

p) E-payment Transaction details towards cost of processing fees.

q) Valid GST registration, EPF registration & PAN NO.

r) All pages of the entire Corrigendum (if any) duly signed by the authorized Person.

s) Pre-bid clarifications, if any.

t) Registration Details of the bidder in the GST Act- Form-I

NOTE:

1. All the submitted documents should be in readable, printable and legible form failing which the Bids are liable for rejection. The document submitted in hard copy should be indexed and duly page numbered.

2. In case of foreign bidders participating individually, the bidder is exempted from submission of GST/EPF/ESIC registration/PAN etc. including all other statutory registrations/ permissions/ approvals for executing work in India during bid submission. However, foreign bidders have to submit undertaking stating that they will be complying with such mandatory requirements within 60 days of issue of Letter of award.

   The Contract agreement shall be signed with successful Bidder only after meeting out all above requirements. No payment due during the execution of work shall be released till the compliance to above requirements. In case of non-fulfilment of any such requirement by the bidder in due course of time, EMD shall be forfeited and the party will be put under holiday list of Unitech Limited.
   The foreign bidder can provide the credit limit documents in lieu of Solvency Certificate.

19.0 (a) No Clarification will be sought in case of non-submission of Cost of tender document or EMD of requisite amount or Unconditional letter of acceptance or Affidavit for correctness of document/information. In such cases the bid shall be rejected out rightly without seeking any further clarification/document.

(b) All the submitted documents shall be considered as duly signed by bidder.

20.0 Unitech Limited reserves the right to reject any or all tenders or cancel/withdraw the invitation for bid without assigning any reasons whatsoever thereof Client does not bind itself to accept lowest tender.

21.0 Canvassing in connection with the tender is strictly prohibited, and such canvassed tenders submitted by the bidder will be liable to be rejected and his earnest money shall be forfeited.

22.0 In case of any query, please contact Mr. Ashwani Rao, AGM (Contract) Unitech Limited, Email- ashwani.rao@unitechgroup.com (Mob.9891990861) during Office hours on all working days.

Annexure-I

GENERAL DETAILS

Sl. No.	Description	Cl. No. of NIT/ Clauses of Contract (CC)	Values/Description to be Applicable for Relevant Clause(s)
1)	Name of Work		Restoration of Damages for External Services Works at Global Gateway, M.G. Road , Gurugram,(Haryana) - 122002
2)	Client		Unitech Limited
3)	Type of Tender		Percentage Rate Tender.
4)	Earnest Money Deposit	NIT	Rs. 2,89,604.00 /- (Rupees Two Lac Eighty Nine Thousand Six Hundred Four Only) in the form of Demand Draft / Pay Order or Banker's Cheque/ Bank Guarantee in favour of M/s Unitech Limited, payable at Gurugram.
5)	Estimated Cost	NIT	Rs. 1,44,80,214.00/- (One Crore Forty Four Lac Eighty Thousand Two Hundred Fourteen Only)
6)	Time allowed for Completion of Work	NIT	03 Months
7)	Mobilization Advance	GCC 4.0	Up to 5% of Contract value
8)	Interest Rate of Mobilization Advance	GCC 4.0	Mobilization Advance shall bear an Interest @ 10% per annum
9)	Validity of Tender	ITT / 8.0	180 days
10)	Performance Guarantee	GCC 2.0	5.00 % (Five Percent Only) of contract value to be submitted within 15 days from the issue of Letter of Award
11)	Security Deposit/ Retention Money	GCC 3.0	5% (Five Percent Only) of the gross value of each running/final bill.
12)	Time allowed for starting the work	ITT / 15.0	The date of start of contract shall be reckoned from 7th day from the date of issue of letter of Award.
13)	Deviation limit beyond which clause 6.2 & 6.3 shall apply for all works except foundation.	GCC 6.0	BUILDING WORK: 30% / ROADWORK: 50%
14)	Deviation limit beyond which clause 6.2 & 6.3 shall apply for foundation work	GCC 6.0	BUILDINGWORK: 100% / ROAD WORK: NA

Sl. No.	Description	Cl. No. of NIT/ Clauses of Contract (CC)	Values/Description to be Applicable for Relevant Clause(s)
15)	Escalation	GCC 7.0	(a) For Contracts having a Contract period up to 24 months, all rates shall be firm and fixed for entire contract period as well as extended period for completion of the works. No escalation shall be applicable on this contract. (b) For Contracts having a Contract Period of more than 24 months, Escalation to be paid as per Clause 7.0 shall be applicable. It is a term of Contract that all Structural Works has to be completed within 24 months from the date of Start of Works.
16)	Defect Liability Period	GCC 38.0	05 (Five) years from the date of Issuance of taking over Certificate for the works by the Unitech.

INSTRUCTIONS TO TENDERER

Instructions to Tenderers (ITT)

Percentage rate open tenders are invited from eligible agencies Restoration of Damages for External Services Works at Global Gateway, M.G. Road, Gurugram, (Haryana) – 122001 for Unitech Limited at Gurugram.

1. The work is estimated to cost Rs.1,44,80,214/-. This estimate, however, is given merely as a rough guide.
2. The tender document as uploaded can be seen on website www.unitechgroup.com and can be downloaded free of cost.

3. **Earnest Money Deposit**

   i) Earnest Money Deposit to be submitted along with the tender.

   ii) The EMD shall be valid for minimum period of 180 (One Hundred Eighty) days from the original last day of submission of Tender.

   iii) The Bid will be rejected by Unitech Limited in case EMD is not received in Physical form.

   iv) The EMD of bidders other than L1 bidder will be returned within 15 days, after the date of opening of Financial Bid.

   v) The EMD of the successful bidder will be discharged after the contractor has furnished the performance guarantee.

   vi) No interest shall be paid by Unitech Limited on the EMD.

   vii) The EMD shall be forfeited:

   a) If the bidder withdraws the bid after bid opening during the period of validity;

   b) Any unilateral revision in the offer made by the tenderer during the validity of the offer.

   c) Upon non acceptance of LOI/LOA by bidder, if and when placed by Unitech Limited.

   d) In the case of a successful bidder; if the bidder fails to Sign the Agreement with in the 30 days from the date of issue of LOA or furnish the required performance Guarantee or fail to commence the work within the stipulated time period prescribed in the contract.

   e) If any bidder furnishes any incorrect or false statement/ information/document.

   f) If the bidder does not intimate the names of persons who are working with him in any capacity or are subsequently employed by him who are near relatives to any member of Unitech Limited

g) If bidder commits any breach of Integrity Pact.

4. Interested bidder who intends to participate in the tender has also to make following payments in the form of Demand Draft/Pay Order or Banker's Cheque of any Scheduled Bank and to be submitted along with Tender.

   Cost of Tender Document & Processing Fee - Rs.17,700 /- [Cost of tender -(10000 +18 % GST) & [Processing Fee - (5000 +18 % GST)]- in the shape of Demand Draft/Pay Order or Banker's Cheque / Bank Guarantee In the favour of Unitech Limited payable at Gurugram.

5. **Submission Details :**
   - Bidders shall submit physically their bids in two separate part in sealed envelope Super-scribed with due date, time & Project Name.
   - Envelope-1- Bid Security / EMD & Tender fee in a separate sealed envelope superscripted with for "Name of the Project".
   - Envelope-2- Financial & Technical Proposal in a separate sealed envelope superscripted for"Name of the project".
   - Envelope-1 and 2 should be placed in envelope-3 clearly marked as "Proposal for "Name of the project & Bidder's Name"".

6. The documents are to be submitted in the office of Unitech Limited before last date & time of submission of tender as mentioned in the NIT

7. Bids shall be opened only of those tenderers, whose Earnest Money Deposit, Cost of Tender Document and Tender Processing Fee and other documents placed in the envelope are found in order. The Price tender of those tenderers whose documents found to be in order shall be opened. The date of opening of price tender shall be informed to the tenderer.

8. **VALIDITY OF TENDER**
   The tender for the works shall remain open for acceptance for a period of 180 days from the date of opening of financial tender. If any tenderer withdraws his tender before the said period or issue of letter of acceptance, whichever is earlier, or makes any modifications in the terms and conditions of the tender which are not acceptable to the Unitech Limited, then the Unitech Limited shall, without prejudice to any other right or remedy, be at liberty to forfeit the earnest money deposit. Further the tenderers shall not be allowed to participate in the retendering process of work.

9. The tender submitted shall become invalid if:
   a) The tenderer is found ineligible.

b) The tenderer does not submit all the documents (including GST Registration) as stipulated in the tender document.

~~c) If any discrepancy is noticed between the documents as uploaded at the time of submission of tender and hard copies as submitted physically in the office of tender opening authority.~~

10. **ACCEPTANCE OF TENDER**
Unitech Limited reserves the right to reject any or all the tenders in part or full without assigning any reason whatsoever.

11. The tenders shall be strictly as per the conditions of contract. Tenders with any additional condition(s)/modifications shall be rejected. Tenders in which, any of the prescribed conditions are not fulfilled or found incomplete in any respect are liable to be rejected.

12. On acceptance of tender, the name of the accredited representative(s)of the contractor who would be responsible for taking instructions from Engineer-in-Charge shall be intimated by the contractor within 07 days of issue date of letter of Awards by Unitech Limited.

13. The tenderer shall not be permitted to tender for works if his near relative is posted in the project office or concerned Zonal Office of the Unitech Limited. The contractor shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any of the officers in Unitech Limited. Any breach of this condition by the tenderer would render him liable to the withdrawal of the work awarded to him and forfeiture of Earnest Money and Security Deposit. This may also debar the contractor from tendering for future works under Unitech Limited. For the purpose of operation of this clause a near relative shall mean wife, husband, parents, grandparents, children, grandchildren, brothers, sisters, uncles, aunts, cousins and their corresponding in-laws.

14. The time of completion of the entire work, as contained in contract shall be as mentioned in “GENERAL DETAILS - Annexure-I”.

15. Canvassing whether directly or indirectly, in connection with tenderers isstrictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable for rejection.

16. The tender award, execution and completion of work shall be governed by tender documents consisting of (but not limited to) Letter of Award/Letter of work order, Bill of Quantities, Special Conditions of Contract, General Conditions of Contract, Specifications, Drawings. The tenderers shall be deemed to have gone through the various conditions including sub-soil water conditions, topography of the land, drainage and accessibility etc. or any other condition which in the opinion of contractor will affect his price/rates before quoting their rates. No claim whatsoever against the foregoing shall be entertained at any stage after the award of works.

17. The drawings issued with the tender documents are Tender Drawing and are indicative only. Works shall be carried out as per GFC drawings issued by the PMC to the Contractor, and approved shop drawings prepared by the Contractor.

18. **ADDENDA/ CORRIGENDA**
Addenda/Corrigenda to the tender documents may be issued prior to thedate of submission of the tender to clarify or effect modification in specification and/or contract terms included in various tender documents. The tenderer shall suitably take into consideration such Addenda/Corrigenda while submitting his tender. The tenderer shall return such Addenda/

Corrigenda duly signed and stamped as confirmation of its receipt & acceptance and submit along with the tender document. All addenda/ Corrigenda shall be signed and stamped on each page by the tenderer and shall become part of the tender and contract documents.

19. **SITE VISIT AND COLLECTING LOCAL INFORMATION**

Before tendering, the tenderers are advised to visit the site of work, its surroundings to assess and satisfy themselves about the local conditions such as the working and other constraints at site, approach roads to the site, availability of water & power supply, application of taxes, duties and levies as applicable & any other relevant information required by them to execute the complete scope of work. The tenderer may obtain all necessary information as to risks, weather conditions, contingencies & other circumstances (insurgencies etc.) which may influence or affect their tender prices. Tenderer shall be deemed to have considered site conditions whether he has inspected it or not and to have satisfied himself in all respect before quoting his rates and no claim or extra charges whatsoever in this regard shall be entertained / payable by the Unitech Limited at a later date after award of work.

20. **ACCESS BY ROAD**

Contractor, if necessary, shall build temporary access roads to the actual site of construction for the works at his own cost to make the site accessible. The Contractor shall maintain the same in motorable condition at all the times as directed by Engineer-in-Charge at his own cost. The contractor shall be required to permit the use of any roads so constructed by him for vehicles of Unitech Limited or any other agencies/ contractors who may be engaged on the project site, free of cost.

Non-availability of access roads or approach to site, for the use of the contractor shall in no case condone any delay in the execution of work nor be the cause for any claim for compensation.

21. **HANDING OVER & CLEARING OF SITE**

The Contractor should note that area for construction may be made available in phases as per availability and in conjunction with pace of actual progress of work at site. The work may be required to be carried out in constrained situations. The work is to be carried out in such a way that the traffic, people movement, if any, is kept operative and nothing extra shall be payable to the contractor due to this phasing / sequencing of the work. The contractor is required to arrange the resources to complete the entire project within total stipulated completion time of the contract. Traffic diversion, if required, is to be done and maintained as per requirement of local traffic police, by the contractor at his own cost and the contractor shall not be entitled for any extra payment, whatsoever, in this regard.

The efforts will be made by the Unitech Limited to handover the site to the Contractor free of encumbrances. However, in case of any delay in handing over of the site to the Contractor, the Unitech Limited shall only consider suitable extension of time for the execution of the work. It should be clearly understood that the Unitech Limited shall not consider any revision in contract price or any other compensation whatsoever viz. towards idleness of Contractor's labour, equipment etc.

Old/Temporary structures on the site of work, if required, shall be demolished by the contractor properly at his own cost unless and otherwise mentioned elsewhere in the tender document. The useful material obtained from demolition of structures & services shall be the property of the Client and these materials shall be stacked in workmanship like at the place specified by the Engineer-in-charge.

Necessary arrangement including its maintenance is to be made bythe contractor for temporary diversion of flow of existing drain and road, as the case may be. The existing drain, road would

be demolished, wherever required, with the progress of work under the scope of work. The existing Road and Drain which are not in the alignment of the said project but are affected and/ or need to demolished during execution for smooth progress of theproject, shall be rehabilitated to its original status and condition (including black topping) by the contractor at his own cost. The cost to be incurred by contractor in this regard shall be deemed tobe included in the quoted rates of the bill of quantity items and contractor shall not be entitled for any extra payment.

The information about the public utilities (whether over ground or underground) like electrical/ telephone/ water supply lines, OFC Cables, open drain etc. is the responsibility of contractor to ascertain whether the utilities will affect the works through the site investigation.

The contractor shall be responsible to obtain necessary approval from the respective statutory authorities for shifting/ re-alignment of existing public utilities. Unitech Limited shall only assist the contractor for liasioning in obtaining the approval from the concerned statutory authorities.

Any services affected by the works must be temporarily supported by the bidder/contractor who must also take all measures reasonably required by the various government/private bodies to protect their services and property during the progress of works. It shall be deemed to bethe part of the contract and no extra payment shall be made to thecontractor for the same.

22. **SCOPE OF WORK**

The scope of work covered in this tender shall be as per the Bill of Quantities, specifications, drawings, instructions, orders issued tothe contractor from time to time during the pendency of work. The drawings for this work, which may be referred for tendering, provide general idea only about the work to be performed under the scope of this contract. These may not be the final drawings and may not indicate the full range of the work under the scopeof this contract. The work will be executed according to the drawings to be released as "GOOD FOR CONSTRUCTION" from time to time by the Engineer-in-charge and according to any additions/ modifications/ alterations/ deletions made from time to time, as required by any other drawings that would be issued to the contractor progressively during execution of work.It shall be the responsibility of the contractor to incorporate the changes that may be in this scope of work, envisaged at the timeof tendering and as actually required to be executed.

The quantities of various items as entered in the "BILL OF QUANTITIES" are indicative only and may vary depending upon the actual requirement. The contractor shall be bound to carry out and complete the stipulated work irrespective of the variation in individual items specified in the bill of quantities. The variation of quantities will be governed as per clause No. 6.0 of contract.

23. **APPROVAL OF TEMPORARY / ENABLING WORKS**

The setting and nature of all offices, huts, access road to the work areasand all other temporary works as may be required for the properexecution of the works shall be subject to the approval of the Engineer- in-charge. All the equipment, labour, material including cement, reinforcement and the structural steel required for the enabling/ temporary works associated with the entire Contract-shall have to be arranged by the Contractor only. Nothing extra shall be paid to the Contractor on this account.

24. **CLARIFICATION AFTER TENDER SUBMISSION**

Tenderer's attention is drawn to the fact that during the period, the tenders are under consideration, the tenderers are advised to refrain from contacting by any means, the CLIENT

and/or his employees/ representatives on matters related to the tender under consideration and that, if necessary, CLIENT will obtain clarifications in writing or as may be necessary. The tender evaluation and process of award of works is done by duly authorized Tender Scrutiny Committee and this committee is authorized to discuss and get clarification from the tenderers.

25. **ORDER OF PRECEDENCE OF DOCUMENTS**

In case of difference, contradiction, discrepancy, with regard to conditions of contract, Specifications, Drawings, Bill of quantities etc. forming part of the contract, the following shall prevail in order of precedence;

i) Contract Agreement
ii) Letter of Award
iii) Bill of Quantities
iv) GFC Drawing
v) Technical Specifications
vi) Special Condition of Contract
vii) Instructions to Tenderer
viii) General Conditions of Contract

ANNEXURE-II

INTEGRITY PACT

BETWEEN

Unitech Limited hereinafter referred to as **"The Principal"** (which expression, unless repugnant to the context thereof, shall mean and include its legal representatives, heirs and assigns)
AND

.....hereinafter referred to as **"The Bidder/Contractor"** (which expression, unless repugnant to the context thereof, shall mean and include its legal representatives, heirs and assigns)

Preamble

The Principal intends to award, under laid down organizational procedures, contract(s) for ..... (Here in after referred to as the 'Project'). The Principal necessarily requires full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/ transparency in its relations with its Bidder(s) and/or Contractor(s).

In order to achieve these goals, the Principal will appoint an Independent External Monitor (IEM), who will monitor the tender process and the execution of the Contract for compliance with the Integrity Pact by all parties concerned, for all works covered inthe Project.

To meet the purpose aforesaid both the parties have agreed to comply this Integrity Agreement (hereinafter referred to as "Integrity Pact" or "Pact"), the terms and conditions of which shall also be read as integral part and parcel of the Tender/Bid documents and Contract between the parties.

NOW, THEREFORE, in consideration of mutual covenants contained parties in this Pact, the hereby agree as follows and this Pact witnesses as under:

Section 1 – Commitments of the Principal

Obligations on Principal

The Employer is committed to follow the principle of Transparency, Equity andCompetitiveness in Public Procurement.

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

a. No employee of the Principal, personally or through family members or throughany other channel, 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.

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

c. The Principal will exclude from the process all known prejudiced persons. The Principal shall obtain bids from only those parties who have been short-listed or pre-qualified or through a process of open advertisement/ web publishing or any combination thereof.

(2) If the Principal obtains information on the conduct of any of its employees, Contractor(s) and/or Bidder(s), which is a criminal offence under the IPC/PC Act, or if there be a substantive suspicion in this regard, the Principal will inform the Chief Vigilance Officer or the principal will take remedial actions as per department/conduct rules and subject to its discretion, can additionally initiate disciplinary actions.

(3) The Principal will enter into agreements with identical conditions with all Bidders for the different Work Packages in the aforesaid Project.

(4) The Principal will disqualify from the tender process all Contractor(s)/Bidder(s) with estimated cost of work put to tender of Rs 5.0 crores and above, who do not sign this Pact or violate its provisions.

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

Obligations on Bidder/Contractor

To accept and comply with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by Employer. Duration of the Integrity Agreement shall be in the line with section 8 of the Integrity Agreement.

Bidder/Contractor acknowledge that in the event of breach of the Integrity Agreement Employer shall have unqualified, absolute and unfettered right to takeaction under section 3.

(1) It is required that each Bidder/Contractor (including their respective officers, employees and sub-contractors) adhere to the highest ethical standards, and report to the Government / Department all suspected acts of fraud or corruption or Coercion or Collusion of which it has knowledge or becomes aware, during the tendering process and throughout the negotiation or award of a contract.

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

(a) The Bidder(s) / Contractor(s) will not, directly or through any other person or firm offer, promise or give to any of the Principal's employees involved in the tender process or the execution of the contract any material or 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.

(b) The Bidder(s)/Contractor(s) will not enter with other undisclosed Bidders into any 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.

(c) The Bidder(s)/Contractor(s) will not commit any offence under the relevant IPC/PC Act. Further the Bidder(s)/Contractor(s) will not u e improperly, for purpose 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.

(d) The Bidder(s) / Contractor(s) of foreign origin shall disclose the name andaddress of the Agents/representatives in India, if any. Similarly, the Bidder(s) / Contractor(s) of Indian Nationality shall furnish the name and address of the foreign principals, if any. Either the Indian agent on behalf of the foreign principal or the foreign principal directly could bid in a tender but not both. It shall be incumbent on the Indian agent and the foreign principal to Adhere to the relevant guidelines of Government of India, issued from Time to time regarding availing services of Indian Agents for foreign Suppliers.

(e) Further details as mentioned in the "Guidelines on Indian Agents of Foreign Suppliers" shall be disclosed by the Bidder(s) / Contractor(s). Further, as mentioned in the Guidelines all the payments made to the Indian agent/representative have to be in Indian Rupees only.

(f) The Bidder(s) / Contractor(s) will, when submitting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

(g) The Bidder(s) / Contractor(s) to disclose any transgression with any other company that may impinge on the anti-corruption principle.

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

(4) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm indulge in fraudulent practice means a willful misrepresentation or omission of facts or submission of fake/forged documents in order to induce public official to act in reliance thereof, with the purpose of obtaining unjust advantage by or causing damage to justified interest of others and/or to influence the procurement process to the detriment of the Government interests.

(5) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm use Coercive Practices (means the act of obtaining something, compelling an action or influencing a decision through intimidation, threat or the use of force directly or indirectly, where potential or actual injury may befall upon a person, his/ her reputation or property to influence their participation process) in the tendering.

(6) The Bidder(s)/Contractor(s) signing IP shall not approach the Courts while representing the matters to IEM and he/she will await their decision in the matter.

(7) The Bidder(s)/Contractor(s), in case of sub-contracting, the Principal contractor shall takethe responsibility of the adoption of IP by the sub-contractor.

Section 3: Disqualification from tender process and/or exclusion from futurecontracts.

Without prejudice to any rights that may be available to the Employer under law or the Contract or its established policies and laid down procedures, the Employer shall have the following rights in case of breach of this Integrity Pact by the Bidder(s)/ Contractor(s) and the Bidder/ Contractor accepts and undertakes to respect and uphold the Employer absolute right:

(1) If the Bidder(s) / Contractor(s), before awarding the Project or during execution has committed a transgression by violating Section 2 above or in any other form so as to put his reliability or credibility in question, the Principal, at its sole discretion, after giving proper opportunity to the bidder is entitled to disqualify the Bidder(s) / Contractor(s) from the tender process or terminate the contract, if already awarded or exclude the Bidder/Contractor from future contract award processes, for that reason, without prejudice to any other legal rights or remedies available to the principal under the relevant clauses of GCC/SCC of the tender/contract. The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Principal. Such exclusion may be forever or for a limited period as decided by the Principal.

(2) If the Contractor(s)/Bidder(s) has committed a transgression through a violation of any of the terms under Section 2 above or in any other form such as to put his reliability or credibility into question, the Principal will also be entitled to exclude such Contractor(s)/Bidder(s) from future tenders/contract award processes. The imposition and duration of the exclusion will be determined by the Principal, keeping in view the severity of the transgression. The severity will be determined by the circumstances of the case, in particular, the number of transgressions and/or the amount of the damage.

(3) If it is observed after payment of final bill but before the expiry of validity of Integrity Pact that the contractor has committed a transgression, through a violation of any of the terms under Section 2 above or any other term(s) of this Pact, during the execution of contract, the Principal will be entitled to exclude the contractor from further tender/contract award processes.

(4) The exclusion will be imposed for a minimum period of six (6) months and a maximum period of three (3) years.

(5) If the Contractor(s)/Bidder(s) can prove that he has restored/recouped the damage to the Principal caused by him and has installed a suitable corruption prevention system, the Principal may, at its sole discretion, revoke or reduce the exclusion period before the expiry of the period of such exclusion.

Section 4: Compensation for Damages

(1) If the Principal has disqualified the Bidder(s)/Contractor(s) from the tender process prior to the awarding of the Project according to Section 3, the Earnest Money Deposit (EMD)/ Bid Security furnished, if any, along with the offer, as per terms of the Invitation of Tender, shall also be forfeited. The Bidder(s) /Contractor(s) understands and agrees that this will be in addition to the disqualification and exclusion of the Contractor(s)/Bidder(s) as may be imposed by the principal, in terms of Section 3 above.

(2) If, at any time after the awarding of the Project, 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 Security Deposit/Performance Bank furnished by the contractor, if any, as per the terms of the NIT/Contract shall be forfeited without prejudice to any other legal rights and remedies available to the Principal under the relevant clauses of General/ Special Conditions of Contract.

(3) The Contractor(s) / Bidder(s) understands and agrees that this will be in addition to the disqualification and exclusion of the Bidder(s)/Contractor(s), as may be imposed by the Principal in terms of Section 3 above.

Section 5: Previous transgression

(1) The Bidder(s)/Contractor(s) herein declares that it has committed no transgressions in the last 5 years with any other Company in any country conforming to the anti-corruption approach as detailed herein or with government/ Central Government or State Government or any other Public Sector Enterprise in India that could justify its exclusion from the tender process.

(2) If at any point of time during the tender process or after the awarding of the Contract, it is found that the Bidder(s)/Contractor(s) has made an incorrect statement on this subject, he can be disqualified from the tender process or if, as the case may be, that the Contract, is already awarded, it will be terminated for such reason and the Bidder(s)/Contractor(s) can be black listed in terms of Section 3 above.

(3) If the Bidder/Contractor can prove that he has resorted / recouped the damage caused by him and has installed a suitable corruption prevention system, the Employer may, at its own discretion, revoke the exclusion prematurely.

Section 6: Independent External Monitor / Monitors

(1) The Principal shall, in case where the Project Value is in excess of Rs 5.0 crore and above, appoint competent and credible Independent External Monitor(s) with clearance from Central Vigilance Commission. The Monitor shall review independently, the cases referred to it to assess whether and to what extent the parties concerned comply with the obligations under this Integrity Pact.

(2) In case of non-compliance of the provisions of the Integrity Pact, the complaint/ non-compliance is to be lodged by the aggrieved party with the Nodal Officer only, as shall be

appointed by the CMD. The Nodal Officer shall refer the complaint/ non-compliance so received by him to the aforesaid Monitor.

(3) The Monitor will not be subject to any instructions by the representatives of the parties and will perform its functions neutrally and independently. The Monitor shall report to the Chairman-cum-Managing Director, CLIENT.

(4) The Bidder(s) / Contractor(s) accepts that the Monitor shall access, have the right to without restriction, all Project documentation of the Principal including that provided by the Contractor. The Contractor will also grant the Monitor, upon his/her request and unconditional access demonstration of a valid interest, to its project documentation. The unrestricted and Monitor is under contractual obligation to treat the information and documents of the Bidder(s) / Contractor(s) with confidentiality.

(5) The Principal will provide to the Monitor, sufficient information about all meetings among the parties related to the Project, provided such meetings could have an impact on the contractual relations between the Principal and the Contractor.

(6) As soon as the Monitor notes, or believes to note, a violation of this Pact, he willso inform the Principal and request the Principal to discontinue and/or take corrective action, or to take other relevant action(s). The Monitor can in this regard submit non-binding recommendations. However, beyond this, the Monitor has no right to demand from the parties that they act in a specific manner and/or refrain from action and/or tolerate action.

(7) The Principal will provide to the Monitor, sufficient information about all meetings among the parties related to the Project, provided such meetings could have an impact on the contractual relations between the Principal and the Contractor.

(8) As soon as the Monitor notes, or believes to note, a violation of this Pact, he willso inform the Principal and request the Principal to discontinue and/or take corrective action, or to take other relevant action(s). The Monitor can in this regard submit non-binding recommendations. However, beyond this, the Monitor has no right to demand from the parties that they act in a specific manner and/or refrain from action and/or tolerate action.

(9) The Monitor will submit a written report to the CMD, CLIENT within 4 to 6 weeksfrom the date of reference or intimation to it and, should the occasion arise, submit proposals for corrective actions for the violation or the breaches of the provisions of the agreement noticed by the Monitor.

(10) If the Monitor has reported to the CMD, CLIENT, of a substantiated suspicion of an offence under relevant IPC/PC Act, and the CMD, CLIENT, has not, within the reasonable time taken visible action to proceed against such offence or reported it to the Chief Vigilance Officer, the Monitor may also transmit this information directly to the Chief Vigilance Officer, CLIENT.

(11) The word 'Monitor' means Independent External Monitor and includes both singular and plural forms.

(12) 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.

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

(14) The role of IEM is advisory, would not be legally binding and it is restricted to resolving issued 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 organizations.

(15) Issues like warranty / guarantee etc. should be outside the purview of IEMs.

(16) The role of the CVO of the organization shall remain unaffected by the presence of IEMs. A matter being examined by the IEMs can be separately investigated by the CVO in terms of the provisions of the CVC Act or Vigilance Manual, If a complaint is received by him/her or directed to him/her by the commission

Section 7 – Criminal charges against violating Bidder(s)/Contractor(s)/ Subcontractor(s)

If the Principal obtains knowledge of conduct of a Bidder/Contractor or any employee or a representative or an associate of a Bidder/Contractor, which constitutes a criminal offence under the IPC/PC Act, or if the Principal has substantive suspicion in this regard, the Principal will forthwith inform the same to the Chief Vigilance Officer, CLIENT.

Section 8 – Duration of the Integrity Pact

This Pact shall come into force when both parties have legally signed it. The Pact shall expire, in case of the Contractor(s), 3 (three) months after the last payment under the Contract is made and in case of the unsuccessful Bidder(s), 2 (two) months after the contract for the project has been awarded.

If any claims is made / lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it isdischarged / determined by CMD of CLIENT.

The Bidder(s)/Contractor(s), however, understands and agrees that even upon the completion of the Project and/or the last payment under the Contract having been made, if any transgression/violation of the terms of this Pact comes/is brought to the notice of the Principal, it may, subject to its discretion, blacklist and/or exclude such Bidder(s)/Contractor(s) as provided for in Section 3, without prejudice to any other legal right or remedy so available to the Principal.

Section 9 – Other provisions

(1) This agreement is subject to Indian Law. Place of performance and jurisdiction is the Registered Office of the Principal, i.e. New Delhi.

(2) Changes and supplements as well as termination notices need to be made inwriting.

(3) If the Bidder/Contractor is a partnership or a consortium, this agreement must besigned by all partners or consortium members.

(4) Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement shall remain valid and binding. In such a case, the parties will strive to come to an agreement in accordance to their original intentions.

(5) Wherever he or his as indicated in the above sections, the same may be read ashe/she or his/her, as the case may be.

(6) It is agreed term and condition that any dispute or difference arising between the parties with regard to the terms of this Integrity Agreement / Pact, any action taken by the Principal in accordance with this Integrity Agreement! Pact or interpretation thereof shall not be subject to arbitration.

_____

(For & On behalf of Bidder/ Contractor)

Place -
Date -

Witness 1:
(Name & Address)

Witness 2:
(Name & Address)

FORM-A

Tender for: .....

MANDATORY INFORMATION DOCUMENTS:

DETAILS OF WORK EXPERIENCE CERTIFICATES

S. No	Name of workand its location	Name of Client	Date and No. of Completion Certificate	Date of Start	Date of Completion	Cost of Work on completion	Value of TDS in case of Private Work	Reference and Page No.of Documentary Proof of the detail missing in completion certificate
1.								
2.								
3.								

1. Certified that the Completion Certificates of above works are enclosed with the Tender Documents.

2. Details mentioned in the above Form are as per Completion Certificates and have not been presumed.

Note: If any detail is not mentioned in the Work Completion Certificate, documentary proof of the details like drawings, LOA, BOQ, completion certificate/occupation certificate, copy of final bill, etc. is to be submitted along with the Completion Certificate.

Signature of Bidder with Seal

FORM-B

Tender for: .....

MANDATORY INFORMATION DOCUMENTS:

DETAILS OF SIMILAR WORKS

S. no.	Name of work for which Experience Certificate has been submitted	Name of clients	Date and no. of completion certificate	Type of Work	No. of Basements	No. of Storeys	Height of Building	Ref & Page no. of Documentary Proof of the detail missing in completion certificate
1								
2								
3								

If any detail is not mentioned in the Work Completion Certificate, documentary proof of detail is to be submitted along with the Completion Certificate.

Signature of Bidder with Seal

FORM-C

FINANCIAL DETAILS

Tender For: .....

MANDATORY INFORMATION DOCUMENTS:

		1st FY Rs. (in Lacs)	2nd FY Rs. (in Lacs)	3rd FY (& Last FY) Rs. (in Lacs)
		a	b	C
i.)	Profit/Loss			
ii.)	Gross Annual Turnover of Previous 3 financial years ending as on last day of the preceding Financial Year.			
iii.)	Average Annual Turnover for previous 3 financial years (Rs. In Lacs) =(a+b+c)/3			
iv.)	Net Worth (paid up capital + reserves) as on last day of the preceding Financial Year.			
v.)	Bank Solvency amount as mentioned in the Bank Solvency Certificate			

1. Summarized page of Audited Profit & Loss Account of previous three Financial Years duly certified by the chartered account, is to be submitted.

2. Summarized page of Audited Balance Sheet of last Financial Year (ending on last day of the preceding financial year) to be duly certified by the chartered account, is to be submitted.

This Form-C is to be submitted in original.

Signature of Chartered Accountant with Seal

Seal and Signature of bidder

FORM-D

TDS DETAILS FOR PRIVATE SECTOR PROJECTS

S. No.	Nameof Work	Name of Clients	Project Cost in Crores	No. And Date of Completion Certificate	Cost of the work on completion in Crores	Payments Received as per TDS In Crores	TDS Corresponding to the Payments	Year wise TDS as per Form-26AS/Form 16A relating to the work
1.								
2.								
3.								

Note:
Value of Work done will be considered commensurate with value of TDS Certificates.

In case of multiple contracts undertaken from a client, details of TDS/Form- 26AS foreach work mentioned above need to be segregated and given separately.

This form need to be supported with Form-26AS taken in HTML format or Form -16A.

Signature of Chartered Accountant
With Stamp and Membership Number

Signature of Bidder with Seal

FORM-E

Dispatch number of bank/ Date

SOLVENCY CERTIFICATE ON LETTER HEAD OF BANK

This is to state that to the best of our knowledge and information that M/s..... having/registered office address.....is customer of bank and has been maintaining his accounts with our branch since As per records available with the bank, M/s..... Can be treated as solvent up toa limit of Rs..... (Rupees in words).

It is clarified that the above information is furnished and this certificate is being issued at the specific request of the customer.

Name, designation, Signature with seal

Notes:-

1. The certificate should have been issued within 6 months from original last date of the submission of the tender.

FORM -F

GENERAL INFORMATION

1.	Name of Applicant/Company	
2.	Address for correspondence	
3.	Official e-mail for communication	
4.	Contact Person: Telephone Nos. Fax Nos. Mobile	
5.	Type of Organization: a) An individual b) A proprietary firm c) A firm in partnership (Attach copy of Partnership) d) A Limited Company (Attach copy of Article of Association) e) Any other (mention the type)	
6.	Place and Year of Incorporation	
7.	Name of Directors/Partners in theorganization	
8.	Name(s) and Designation of the persons, who is authorized to deal with CLIENT (Attach copy of power of Attorney)	
9.	Bank Details : Name of Bank, Address of Bank Branch, Account No., RTGS, IFS Code	

Signature of Bidder with Seal

FORM- G

Name of the Client with Address, email & phone no.

Dispatch No..... Date: .....

WORK EXPERIENCE CERTIFICATE

Name of Contractor_____

1	Name of work / project & Location				
2	Name and Address of the Clients				
3	Agreement Amount				
4	Cost of work on completion				
5	Date of start				
6	Stipulated date of completion				
7	Actual date of completion				
8	Amount of compensation levied for delayed completion, if any				
9	Type of Work: Residential/ Non Residential Building				
10	No. of Basements in any Building of this work				
11	Maximum Height of any Building of this work				
12	Maximum No. of storeys of any Building of this work				
13	Performance report	Outstanding	Very Good	Good	Poor
(a)	Quality of work				
(b)	Resourcefulness				
(c)	Financial soundness				
(d)	Technical proficiency				
(e)	General behavior				

Date

Name & Designation
Signature with Seal of issuing Authority

AFFIDAVIT

(To be submitted by bidder on non-judicial stamp paper of Rs.100/ (RupeesHundred only) duly attested by Notary Public)

Affidavit of Mr. .....S/o.....
R/o.....

I, the deponent above named do hereby solemnly affirm and declare as under:

1. That I am the Proprietor/Authorized signatory of M/s ..... Having its Head Office/Regd. Office at .....

2. That the information/documents/Experience certificates submitted by M/s..... along with the tender for ..... *(Name of work)*..... To CLIENT are genuine and true and nothing has been concealed.

3. I shall have no objection in case CLIENT verifies them from issuing authority (ies). I shall also have no objection in providing the original copy of the document(s), in case CLIENT demands so for verification.

4. That_____ (Name of the bidder) shall fully comply with the DIPP's PPP-MII order no P-45021/2/2017/E II dated 15.06.17 or any further revision at any laterdate during the entire tenancy of the contract.

   Note: In case of procurement for a value in excess of Rs 10 crore, above undertaking shall be provided from a statutory auditor or cost auditor of the company(in the case of companies) or from a practicing chartered accountant (incase of tenderer other than companies)

5. I hereby confirm that in case, any document, information & / or certificate submitted by me found to be incorrect / false / fabricated, CLIENT at its discretion may disqualify / reject / terminate the bid/contract and also forfeit the EMD / All dues.

6. I shall have no objection in case CLIENT verifies any or all Bank Guarantee(s) underany of the clause(s) of Contract including those issued towards EMD and Performance Guarantee from the Zonal / Branch office of issuing Bank and I/We shall have no right or claim on my submitted EMD before CLIENT receives said verification.

7. That the Bank Guarantee issued against the EMD issued by (name and address of the Bank) is genuine and if found at any stage to be incorrect / false / fabricated, CLIENT shall reject my bid, cancel pre-qualification and debar me from participating in any future tender for three years.

8. I hereby confirm that our firm /company is not blacklisted/ barred /banned from tendering by CLIENT. If this information is found incorrect, CLIENT at its discretion may disqualify / reject / terminate the bid/contract.

9. The person who has signed the tender documents is our authorized representative.The Company is responsible for all of his acts and omissions in the tender.

I..... the Proprietor / Authorized signatory of M/s..... do hereby confirm that the contents of the above Affidavit are true to my knowledge and nothing has been from and t concealed there that no part of it is false.

DEPONENT

Verified at .....this.....day of.....

DEPONENT

ATTESTED BY (NOTARY PUBLIC)

FORM-I

GST Registration Details of Contractor/Vendor	
Name	
Address (As per registration with GST)	
City	
Postal Code	
Region/State (Complete State Name)	
Permanent Account Number	
GSTIN ID/Provisional ID No.: (copy of Acknowledgement required)	
Type of Business (As per registration with GST)	
Service Accounting Code/HSN Code:	
Contact Person	
Phone Number and Mobile Number	
Email ID	
Compliance Rating (if updated by GSTN)	

Annexure –III

Site Visit Certificate

I, _____residing at _____since _____Years, having office premises at_____declare that,

i. I (Bidder Name) am fully acquainted with the local conditions & factors, such as historical, geographical, social, political, legal, and administrative and/or infrastructure etc., which would have any effect on the performance of the contract and/or the cost.

ii. I (Bidder Name) know all conditions & factors, which may have any effect on the execution of the contract after issue of LOA/ Work order as described in bidding documents. The Unitech Limited shall not entertain any request for clarification from the bidder regarding such local condition.

iii. As part of my responsibility, I (Bidder Name) have properly investigated such factors and considered while submitting my bid proposals and I shall have no claim whatsoever including those for financial adjustment to the contract awarded under the bidding document. Neither any change in the time schedule of the contract nor any financial adjustment arising there of shall be permitted by the Unitech Limited in case of failure on my side of not knowing the local laws/conditions or not visiting the site properly.

iv. I (Bidder Name) have visited and examined the location and its surrounding and obtained all information that may be necessary for preparing the bid at my own interest and cost.

v. I (Bidder Name) have visited the site on_____at_____hours.

vi. Site visit is my responsibility and no excuse of not visiting the site properly shall be taken in to account by Unitech Limited at any cost after opening of tender.

Date & Time of Site Visit : _____

Name & Designation of Representative of Bidder who visited the site : (with sign & stamp) _____

Name of accompanying Unitech Limited Representative (with sign) : _____

QUOTATION SHEET FOR RESTORATION OF DAMAGES FOR EXTERNAL SERVICES WORKS

AT

GLOBAL GATEWAY

M.G ROAD, GURUGRAM

CLIENT

unitech

UNITECH LTD
8th & 13th Floor, Tower-B
Signature Tower, South City -1Gurugram

PMC

REPL®
The Power of Knowledge

Rudrabhishek Enterprises ltd
A-6, Sector-58, Noida, U.P-201301

UNITECH LIMITED.

QUOTING SHEET FOR BIDDERS

Name of work -

NIT No: XYZ **DATE- 04.07.2021**

Name of Bidder -

Sl. No.	SUMMARY OF WORK	AMOUNT IN RS.	
		In Fig	In Words
1	RESTORATION OF DAMAGES FOR EXTERNAL SERVICES WORKS AT GLOBAL GATEWAY M.G. ROAD GURUGRAM, (HARYANA) - 122002		
	Grand Total in Fig	0.00	
	Grand Total in Words		

Note: Excluding GST

G.C.C. FOR RESTORATION OF DAMAGES FOR EXTERNAL SERVICES WORKS

AT

GLOBAL GATEWAY M.G ROAD, GURUGRAM

CLIENT

UNITECH LTD
8th & 13th Floor, Tower-B
Signature Tower, South City-1,
Gurugram

PMC

REPL®
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Rudrabhishek Enterprises ltd
A-6, Sector-58, Noida, U.P-201301

INDEX

1.0 DEFINITIONS

1.1 The Contract means the documents forming the tender and acceptance thereof and the formal agreement executed between Unitech Limited and the contractor, together with the documents referred to therein including these conditions, the specifications, designs, drawings and instructions issued from time to time by the Engineer-in-Charge and all these documents taken together, shall be deemed to form one contract and shall be complementary to one another.

1.2 **CLIENT / OWNER** means M/s Unitech Limited, with its registered office at 8/13th Floor, Tower-B, Signature Tower, South City-1, Gurugram - 122 007, Haryana, his Authorized Representatives, Agents, Successors, Beneficiaries, Legal Heirs, who has awarded the work to PMC and/or appointed PMC as Implementing / Executing Agency/ Project Manager and/ or for whom PMC is acting as an agent and/or on whose behalf PMC is entering into the contract and getting the work executed.

1.3 **AUTHORIZED REPRESENTATIVE OF CLIENT** means the person designated by Client/Owner and shall include his authorized nominee or agent provided, provided, however the owner's representative may be one person for certain aspect of this agreement and another person for other aspects of work covered by this contract.

1.4 **TPIA** mean Third Party Inspection & monitoring agency i.e. M/s Engineers India Limited (A Govt. of India Undertaking) appointed by M/s Unitech Limited for Inspection & quality control of the works.

1.5 **PMC** mean Project Management Consultancy Company appointed by Client for the works, his Authorized Representatives, Agents, Successors, Beneficiaries, and Legal Heirs.

1.6 In the contract, the following expressions shall, unless the context otherwise requires, have the meanings, hereby respectively assigned to them;

a) APPROVAL means approved in writing including subsequent written confirmation of previous verbal approval.

b) BILL OF QUANTITIES or SCHEDULE OF QUANTITIES means the priced and complete bill of quantities or schedule of quantities forming part of the complete bill of tender.

c) **CONTRACTOR** shall mean the individual, firm**,** or company, whether incorporated or not, undertaking the works and shall include the legal personal representative of such individual or the persons composing such firm or company, or the successors of such firm or company and the permitted assignees of such individual, firm or company.

d) **CONTRACT VALUE** means the sum for which the tender is accepted as per the letter of Award.

e) **DRAWINGS** mean the drawings referred to in the contract document including modifications, if any and such other drawings as may from time to time be furnished and/ or approved by Engineers-in-charge.

f) **DATE OF COMMENCEMENT OF WORK:** The date of start of contract shall be reckoned from 10 days after the date of issue of letter of Award.

g) **ENGINEER-IN-CHARGE** shall mean the Authorized representative of Client.

h) **LANGUAGE:** All documents and correspondence in respect of this contract shall be in English Language.

i) **"LETTER OF AWARD"** shall mean Client's notification letter conveying its acceptance of

the tender subject to the conditions as may have been stated therein.

j) **MONTH** means English Calendar month 'Day' means a Calendar Day of 24 Hrs each.

k) SITE means the lands and other places on, under, in or through which the works are to be executed or carried out and any other lands or places provided by Client or used for the purpose of the contract.

l) **TENDER or BID** means the tender submitted by the bidder for acceptant by Owner/Client.

m) **WRITING** means any manuscript typed written or printed statement under or over signature and/or seal as the case may be.

n) **Works or Work** shall unless there be something in the subject or either context repugnant to such construction, be construed and taken to mean the works by or by virtue of the contract contracted to be executed whether temporary or permanent, and whether original, altered, substituted or additional.

o) Headings in the clauses/conditions of tender documents are for convenience only and shall not be used for interpretation of the clause/condition.

p) Words imparting the singular meaning only also include the plurals and vice versa where the context requires. Words importing persons or parties shall include firms and corporations and organizations having legal capacities.

q) **Excepted Risk** are risks due to riots (other than that among contractor's employees), war (whether declared or not), invasion, act of foreign enemies, hostilities, civil war, rebellion revolution, insurrection, military or usurped power, any acts of Government, damages from aircraft, acts of God, such as earthquake, lightening and unprecedented floods, pandemic and other causes over which the contractor has no control and accepted as such by the Client or causes solely due to use or occupation by Government/Owner of the part of the works in respect of which a certificate of completion has been issued or a cause solely due to Client's faulty design of works.

r) **Market Rate** shall be the rate as decided by the Engineer-in-Charge on the basis of the prevailing cost of materials and labour at the site of work where the work is to be executed plus the 15%(Fifteen percent) to cover all overheads and profits of the contractor.

2.0 PERFORMANCE GUARANTEE

Within 15 (Fifteen) days from the date of issue of Letter of Award, the contractor shall submit an irrevocable Performance Guarantee of 5% (Five percent) of the tendered amount in addition to other deposits mentioned elsewhere in the contract for his proper performance of the contract agreement (not withstanding and/or without prejudice to any other provisions in the contract). The Performance Guarantee shall be initially valid up to the stipulated date of completion of work plus 60 days. In case the time for completion of works gets extended, the contractor shall get the validity of Performance Guarantee extended upto such extent to cover such extended time for completion of work. After recording the completion certificate for the work by the Engineer in charge, the performance guarantee shall be returned to the contractor without any interest thereon. However, in case of contracts involving maintenance of building and services/any other work after completion of the works then 50% of Performance Guarantee shall be retained as Security Deposit. The same shall be returned year wise proportionately.

The Engineer-in-Charge shall make a claim under the performance guarantee except for amounts to which the Engineer in charge is entitled under the contract (not withstanding and/or without prejudice to any other provisions in the contract agreement) in the event of:

(a) Failure by the contractor to extend the validity of the Performance Guarantee as described herein above, in which event the Engineer-in-Charge may claim the full amount of the Performance Guarantee.

(b) Failure by the contractor to pay any amount due, either as agreed by the contractor or determined under any of the Clauses/Conditions of the agreement, within 30 days of the service of notice to this effect by Engineer-in-Charge.

(c) In the event of the contract being determined or rescinded under provision of any of the Clause/Condition of the agreement, the performance guarantee shall stand forfeited in full and shall be absolutely at the disposal of Engineer in charge.

(d) On substantial Completion of any work which has been completed to such an extent that the intended purpose of the work is met and ready to use, then a provisional Completion certificate shall be recorded by the Engineer-in-Charge. The provisional certificate shall have appended with a list of outstanding balance item of work that need to be completed in accordance with the provisions of the contract.

3.0 SECURITY DEPOSIT/ RETENTION MONEY

3.1 The Contractor shall permit Engineer In charge at the time of making payment to him towards each running and final bill for the work done under the contract to deduct a sum at the rate of 5% (five percent) of the gross amount of bill till the sum deducted will amount to security deposit of 5% (five percent) of the tendered value of the work. Such deductions will be made and held by the Engineer in charge by way of Security Deposit unless the Contractor has deposited the amount of Security at the rate mentioned above in cash or in the form of Bank guarantee. At any event, if the Bank guarantee is to be revoked by Engineer in charge, and the Bank is unable to make payment against the said bank guarantee, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the Engineer in charge to make good the deficit.

3.2 All compensations or the other sums of money payable by the contractor under the terms of this contract may be deducted from, or paid by the sale of a sufficient part of his security deposit or from the interest arising there from, or from any sums which may be due to or may become due to the contractor by Engineer in charge on any account whatsoever and in the event of his Security Deposit being reduced by reason of any such deductions or sale as aforesaid, the contractor shall within 10 days make good in cash or fixed deposit receipt tendered by the State Bank of India or by Scheduled Banks or Government Securities (if deposited for more than 12 months) endorsed in favour of Unitech Limited, any sum or sums which may have been deducted from, or raised by sale of his security deposit or any part thereof.

4.0 MOBILIZATION ADVANCE

4.1 Mobilization advance up to 5% of the contract value shall be paid to the contractor, at an Simple interest rate of 10% per annum, if requested by him, on submission of irrevocable Bank Guarantee of an amount 110% of the respective installment of mobilization advance valid for contract period from a scheduled bank in the enclosed Performa.

4.1.1 The mobilization advance shall be paid in three installments as follows:

i) First Installment of Twenty percent (20%) of total mobilization advance shall be paid after;

a) Signing of contract agreement by the contractor.

b) Submission of bank guarantee in approved proforma (annexed under Forms and Formats).

This installment shall be paid if the request made by the contractor within 30 days from date of issuance of LOA/LOI.

ii) Second installment of Forty percent (40%) of total mobilization advance shall be paid after the contractor has constructed Site Office, storage shed, fabrication yard, site laboratory, etc. and has physically mobilized plant and machinery, scaffolding & shuttering materials etc. at site and is ready to start the work to the entire satisfaction of Engineer-in-Charge and commenced the work at site.

This mobilization advance installment, since it is also for Machinery and equipment, will be issued only upon the contractor providing insurance and hypothecation of the required machinery and equipment to the employer.

The above installment will be released subject to the actions at Sl. No. (ii), above are performed by the contractor within 60 days of signing the contract and/or 90 days from the date of issuance of LOA/LOI, whichever is earlier.

iii) The Balance Forty percent (40%) of mobilization advance shall be paid to the contractor on submission of Utilization Certificate of 60% of mobilization advance already paid to him.

4.2 The mobilization advance shall be recovered from each running account bill @ 12% of gross amount of RA bill in such a manner that the total Mobilization Advance is recovered when 85% of the contract value gets paid.

4.3 The bank guarantee submitted by contractor against mobilization advance shall initially be made for the full amount as mentioned in para 4.1 above and valid for the entire contract period, and be kept renewed from time to time to cover the balance amount and likely period of completion of recovery togetherwith interest. The contractor can also submit part bank guarantees against the mobilization advance in as many numbers as per proposed number of recovery installments equivalent to the amount of each installment.

5.0 SECURED ADVANCE

Interest free secured advance upto a maximum of 75% (seventy five percent) of the assessed value of the materials or the 75% (seventy five percent) of cost of materials as derived from the tendered item rate of the contractor, whichever is less, required for incorporation in the permanent works and brought to site and duly certified by Engineer in charge shall be paid to the Contractor for all non-perishable items. The advance will be paid only on submission of Indemnity Bond in the prescribed proforma.

The contractor shall construct suitable go-down at the site of work for safe storage of the materials against any possible damages due to sun, rain, dampness, fire, theft etc. at his own cost. He shall also employ necessary watch & ward establishment for the purpose at his costs and risks.

Such secured advance shall also be payable on other items of perishable nature, fragile and combustible with the approval of the Engineer-in-Charge provided the contractor provides a separate comprehensive insurance cover for the full cost of such materials. The decision of Engineer-in-Charge shall be final and binding on the contractor in this matter. No secured advance shall however, be paid on high-risk materials such as ordinary glass, sand, petrol, diesel etc.

5.1 Recovery of Secured Advance

When materials on account of which an advance has been paid under clause 5.0, are incorporated in the work, the amount of such advance shall be recovered from the next payment to be made to the contractor under any of the clauses of this contract.

Amount of advance paid against each material shall be recovered within 3 months from the date of advance payment. In case, recovery could not be made within the said period due to non-incorporation of the material in permanent works, interest rate @ 10% of shall be charged on the outstanding advance amount on the date of next payment.

6.0 DEVIATIONS / VARIATIONS EXTENT AND PRICING

The Engineer-in-Charge shall have power to (i) make alteration in, omissions from, additions to, or substitutions for the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work, and (ii) omit a part of the works in case of non-availability of a portion of the site or for

any other reasons and the contractor shall be bound to carry out the works in accordance with any instructions given to him in writing by the Engineer-in-Charge and such alterations, omissions, additions or substitutions shall form part of the contract as if originally provided therein and any altered, additional or substituted work which the contractor may be directed to do in the manner specified above as part of the works, shall be carried out by the contractor on the same conditions in all respects including price on which he agreed to do the main work except as hereafter provided.

6.1 The time for completion of the works shall, in the event of any deviations resulting in additional cost over the tendered value sum being ordered, be extended, if requested by the contractor, as follows;

(i) In the proportion which the additional cost of the altered, additional or substituted work, bears to the original tendered value plus

(ii) 25% of the time calculated in (i) above or such further additional time as may be considered reasonable by the Engineer-in-Charge.

6.2 DEVIATIONS, EXTRA ITEMS & PRICING

In the case of extra item(s) (items that are completely new, and are in addition to the items contained in the contract), the contractor may within 15 days of receipt of order or occurrence of the item(s) submit market rate claim rates, supported by proper analysis which shall include invoices, vouchers etc. and manufacturer's specification for the work failing which the rate approved later by the Engineer- in- charge shall be binding on the contractor and the Engineer-in-Charge shall within prescribed time limit of the receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

In the case of substituted items (items that are taken up with partial substitution or in lieu of items of work in the contract), the rate for the agreement item (to be substituted) and substituted item shall also be determined in the manner as mentioned in the following para;

a) If the market rate for the substituted item so determined is more than the market rate of the agreement item (to be substituted), the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so increased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted)

b) If the market rate for the substituted item so determined is less than the market rate of the agreement item (to be substituted), the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so decreased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).

Market rates to be determined as per various sub-clauses under clause 6.0 shall be on the basis of prevailing rates of materials excluding GST unless mentioned otherwise, relevant authority rate for labor, market rates of T&P etc. plus 15% towards contractor's Overhead and profits. The quantity/coefficient towards labour and materials shall be taken from latest revision of Delhi Analysis of Rates for the purpose of Market rate analysis.

6.3 DEVIATION, DEVIATED QUANTITIES & PRICING

In the case of contract items, substituted items, contract cum substituted items, which exceed the limits laid down in General details (Annexure-I), the contractor may within fifteen days of receipt of order or occurrence of the excess, claim revision of the rates, supported by proper analysis for the work in excess of the above mentioned limits, provided that if the rates so claimed are in excess of the rates specified in the schedule of quantities, the Engineer-in-Charge shall within prescribed time limit of receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates (as per invoice, vouchers from the manufacturers or suppliers submitted by the agency and duly verified by Engineer in

Charge or his representative) and the contractor shall be paid in accordance with the rates so determined.

The prescribed time limit for finalizing rates for Extra Item(s), Substitute Item(s) and Deviated Quantities of contract items is within 45 days after submission of proposal by the contractor without observation of the Engineer-in-Charge.

The provisions of the preceding paragraph shall also apply to the decrease in the rates of items for the work in excess of the limits laid down in General details (Annexure-I), and the Engineer-in-Charge shall after giving notice to the contractor within one month of occurrence of the excess and after taking into consideration any reply received from him within fifteen days of the receipt of the notice, revise the rates for the work in question within one month of the expiry of the said period of fifteen days having regard to the market rates.

For the purpose of operation/Accounting of quantities in deviation, the following works shall be treated as works relating to foundation unless & otherwise defined in the contract;

a) For Buildings: All works up to 1.2 meter above ground level or up to floor 1 level whichever is lower.
b) For abutments, piers and well staining: All works up to 1.2 meter above the bed level.
c) For retaining walls, wing walls, compound walls, chimneys, overhead reservoirs/ tanks and other elevated structures: All works up to 1.2 meter above the ground level.
d) For reservoirs/tanks (other than overhead reservoirs/tanks): All works up to 1.2 meter above the ground level.
e) For basement: All works up to 1.2 meter above ground level or up to floor 1 level whichever is lower.
f) For Roads, all items of excavation and filling including treatment of sub base.

Any operation incidental to or necessarily has to be in contemplation of tenderer while quoting tender, or necessary for proper execution of the item included in the Schedule of quantities or in the schedule of rates mentioned above, whether or not, specifically indicated in the description of the item and the relevant specifications, shall be deemed to be included in the rates quoted by the tenderer or the rate given in the said schedule of rates, as the case may be. Nothing extra shall be admissible for such operations.

7.0 PAYMENT DUE TO VARIATION IN PRICES OF MATERIALS AFTER RECEIPT OF TENDER

The Rate quoted by the Bidder shall remain firm till the completion of the work & No escalation/ Price Variation of material shall be allowed

8.0 COMPENSATION FOR DELAY

If the contractor fails to maintain the required progress in terms of clause 16 or to complete the work and clear the site on or before the stipulated date of completion of contract or justified extended date of completion as well as any extension granted under any other clause, he shall, without prejudice to any other right or remedy available under the law to the Client on account of such breach, pay as compensation the amount calculated at the rates stipulated below, as Engineer in charge may decide on the amount of accepted Tendered Value of the work for every completed day/ month (as determined) that the progress remains below that specified in Clause 16 or that thework remains incomplete.

Compensation for delay of work - With maximum rate @ 1% (one percent) per month of delay to be computed on per day basis based on quantum of damage suffered due to stated delay on the part of Contractor.

Provided always that the total amount of compensation for delay to be paid under this condition shall not exceed 10 % (ten percent) of actual contract value.

In case, no compensation has been decided by Engineer in charge during the progress of work, this shall be no waiver of right to levy compensation by Engineer in charge if the work remains incomplete on final justified extended date of completion.

9.0 ACTION IN CASE WORK NOT DONE AS PER SPECIFICATIONS

All works under or in course of execution or executed in pursuance of the contract, shall at all times be open and accessible to the inspection and supervision of the Engineer-in-charge, his authorized subordinates, ~~in charge of the work~~ and all the superior officers, officer of the Quality Assurance Unit of the Client or any organization engaged by the Client for Quality Assurance and of the Chief Technical Examiner's Office, and the contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of such officers has been given to the contractor, either himself be present to receive orders and instructions or have a responsible representative duly accredited in writing, present for that purpose. Orders given to the Contractor's representative shall be considered to have the same force as if they had been given to the contractor himself.

If it shall appear to the Engineer-in-charge or his authorized subordinates or to the officer of Quality Assurance or his subordinate officers or the officers of the organization engaged by the Client for assurance or to the Chief Technical Examiner or his Quality subordinate officers, that any work has been executed with unsound, imperfect, or unskillful workmanship, or with materials or articles provided by him for the execution of the work which are unsound or of a quality inferior to that contracted or otherwise not in accordance with the contract, the contractor shall, on demand in writing which shall be made within twelve months of the completion of the work from the Engineer-in-Charge specifying the work, materials or articles complained of notwithstanding that the same may have been passed, certified and paid for 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 charge and cost. In the event of the failing to do so within a period specified by the Engineer-in-Charge in his demand aforesaid, then the contractor shall be liable to pay compensation at the same rate as under clause 8.0 of the contract (for non-completion of the work in time) for this default. In such case the Engineer-in- Charge may not accept the item of work at the rates applicable under the contract but may accept such items at reduced rates as the Engineer in charge may consider reasonable during the preparation of on account bills or final bill if the item is so acceptable without detriment to the safety and utility of the item and the structure or he may reject the work outright without any payment and/or get it and other connected and incidental items rectified, or removed and re-executed at the risk and cost of the contractor. Decision of the Engineer in charge to be conveyed in writing in respect of the same will be final and binding on the contractor.

10.0 ACTION IN CASE OF BAD WORK

If it shall appear to the Engineer-in-Charge or his authorized representative or to the Chief Technical Examiner or to any other inspecting agency of Government/ State Government/ Owner where the work is being executed, that any work has been executed with unsound, imperfect, or unskillful workmanship or with materials of any inferior description, or that any materials or articles provided by him for the execution unsound or not in of a quality inferior to that contracted for or of the work are otherwise accordance with the contract, the contractor shall on demand in writing which shall be made within twelve months of the completion of the work from the Engineer-in-Charge specifying the work, materials or articles complained of notwithstanding that the same may have been passed, Certified and paid for 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 to be specified by the Engineer-in-Charge in his demand aforesaid while the contractor failure to do so shall continue, the Engineer-in-Charge may rectify or remove and re-execute the work or remove and replace with others, the material or articles complained of as the case may be at the risk and expense in all respects of the contractor.

11.0 CANCELLATION/DETERMINATION OF CONTRACT IN FULL OR PART

11.1 Subject to other provisions contained in this clause, the Engineer-in-Charge may, without prejudice to his any other rights or remedy against the contractor in respect of any delay, or not following safety norms, inferior workmanship, any claims for damages and / or any other provisions of this contract or otherwise, and whether the date of completion has or has not elapsed, by notice in writing absolutely determine the contract in any of the following cases:

i) If the contractor having been given by the Engineer-in-Charge a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in an inefficient or otherwise improper or un- workmanlike manner shall omit to comply with the requirement of such notice for a period of seven days thereafter.

ii) If the contractor has, without reasonable cause, suspended the progress ofthe work or has failed to proceed with the work with due diligence so that in the opinion of the Engineer-in-Charge (which shall be final and binding) he will be unable to secure completion of the work by the date for completion and continues to do so after a notice in writing of seven days from the Engineer-in-Charge.

iii) If the contractor fails to complete the work within the stipulated date or items of work with individual date of completion on or before the stipulated or justified extended date; and the Engineer in Charge without any prejudice to any other right or remedy under any other provision in the contract has given further reasonable time in a notice given in writing in that behalf as either mutually agreed or in absence of such mutual agreement by his own assessment making such time essence of contract and in the opinion of Engineer-in-Charge the contractor will be unable to complete the same or does not complete the same within the period specified.

iv) If the contractor persistently neglects to carry out his obligations under the contract and / or commits default in complying with any of the terms and conditions of the contract and does not remedy it or take effective steps to remedy it within 7 days after a notice in writing is given to him in that behalf by the Engineer-in-Charge.

v) If the contractor shall offer or give or agree to give to any person in Client's service or to any other person on his behalf, any gift or consideration of any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any action relation to the obtaining or execution of this or any other contract for Client.

vi) If the contractor shall enter into a contract with Client in connection with which commission has been paid or agreed to be paid by him or to his knowledge, unless the particulars of any such commission and the terms of payment thereof have been previously disclosed in writing to the Engineer- in-Charge.

vii) If the contractor has secured the contract with Client as a result of wrong tendering or other non-bona-fide methods of competitive tendering or commits breach of Integrity Pact.

viii) If the contractor being an individual, or if a firm, any partner thereof shall at any time be adjudged insolvent or have a receiving order or order for administration of his estate made against him or shall take any proceedings for liquidation or composition (other than a voluntary liquidation for the purpose of amalgamation or reconstruction) under any Insolvency Act for the time being in force or make any conveyance or assignment of his effects or composition or arrangement for the benefit of his creditors

or purport so to do, or if any application be made under any Insolvency Act for the time being in force for the sequestration of his estate or if a trust deed be executed by him for benefit of his creditors.

ix) If the contractor being a company shall pass a resolution or the court shall make an order that the company shall be wound up or if a receiver or a manager on behalf of a creditor shall be appointed or if circumstances shall arise which entitle the court or the creditor to appoint a receiver or a manager or which entitle the court to make a winding up order.

x) If the contractor assigns (excluding part(s) of work assigned to other agency(s) by the contractor as per terms of contract), transfers, sublets (engagement of labour on a piece-work basis or of labour with materials not to be incorporated in the work, shall not be deemed to be subletting) or otherwise parts with or attempts to assign, transfer, sublet or otherwise parts with the entire works or any portion thereof without the prior written approval of the Engineer -in-Charge.

When the contractor has made himself liable for action under any of the cases aforesaid, the Engineer-in-Charge shall have powers:

a) To determine or rescind the contract as aforesaid in full or part (of which termination or rescission notice in writing to the contractor under the hand of the Engineer-in-Charge shall be conclusive evidence) and get the same executed at the risk & cost of the contractor. Upon such determination or rescission, Security Deposit already recovered, Security deposit payable and Performance Guarantee under the contract shall be liable to be forfeited and shall be absolutely at the disposal of Engineer in charge and unused materials, construction plants, implements, temporary buildings, etc. shall be taken over by Engineer in charge and shall be absolutely at the disposal of the Engineer in charge.

b) After giving notice to the contractor to measure up the work of the contractor and to take such whole, or the balance or part thereof, as shall be un-executed out of his hands and to give it to another contractor to complete the work. The contractor, whose contract is determined as above, shall not be allowed to participate in the tendering process for the balance work including any new items needed to complete the work. In the event of above courses being adopted by the Engineer-in-Charge, the contractor shall have no claim to compensation for any loss sustained by him by reasons of his having purchased or procured any materials or entered into any engagements or made any advances on account or with a view to the execution of the work or the performance of the contract. And in case action is taken under any of the provision aforesaid, the contractor shall not be entitled to recover or be paid any sum for any work thereof or actually performed under this contract unless and until the Engineer-in-Charge has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

11.2 Any sums in excess of the amounts due to Client and unsold materials, constructional plant etc. shall be returned to the contractor, provided always that if cost or anticipated cost of completion by Client of the works or part of the works is less than the amount which the contractor would have been paid had he completed the works or part of the works, such benefit shall not accrue to the contractor.

11.3 In the event of anyone or more of the above courses being adopted by the Engineer- in-Charge, the contractor shall have no claim towards compensation for any loss sustained by him by reasons of his having purchased or procured any materials or entered into any engagements or made any advances on account or with a view to the execution of the work or the performance of the contract. In case action is taken under any of the aforesaid provisions, the contractor shall not be entitled to recover or be paid any sum for any work thereof or actually performed under this contract unless and until the Engineer-in-Charge

has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

12.0 CONTRACTOR LIABLE TO PAY COMPENSATION EVEN IF ACTION NOTTAKEN UNDER CLAUSE 11.0

In any case in which any of the powers conferred upon the Engineer-in-Charge by relevant clause thereof, shall have become exercisable and the same are not exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any future case of default by the contractor and the liability of the contractor for compensation shall remain unaffected. In the event of the Engineer-in-Charge putting in force all or any of the powers vested in him under any clause he may, if he so desires after giving a notice in writing to the contractor, take possession of (or at the sole discretion of the Engineer-in-Charge which shall be final and binding on the contractor) use as on hire (the amount of the hire money being also in the final determination of the Engineer-in-Charge) all or any tools, plant, materials and stores, in or upon the works, or the site thereof belonging to the contractor, or procured by the contractor and intended to the used for the execution of the work/or any part thereof, paying or allowing for the same in account at the contract rates, or in the case of these not being applicable, at current market rates to be certified by the Engineer-in-Charge, whose certificate thereof shall be final and binding on the contractor and/or direct the contractor, his representative to remove such tools, plant, materials, or stores from the premises (within a time to be specified in such notice) in the event of the contractor failing to comply with any such requisition, the Engineer-in-Charge may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and his risk in all respects and the certificate of the Engineer-in-Charge as to the expenses of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the contractor.

13.0 CARRYING OUT PART WORK AT RISK & COST OF CONTRACTOR

If contractor:

(i) At any time makes default during currency of work or does not execute any part of the work with due diligence and continues to do so even after giving a notice in writing of 7 days in this respect from the Engineer-in-charge;

(ii) Commits default in complying with any of the terms and conditions of the contract and does not remedy it or takes effective steps to remedy it within 7 days even after a notice in writing is given in that behalf by the Engineer-in-Charge;

(iii) Fails to complete the work(s) or items of work with individual dates of completion, on or before the date(s) so determined, and does not complete them within the period specified in the notice given in writing in that behalf by the Engineer-in-Charge;

The Engineer-in-Charge without invoking action under clause 11.0 of contract may, without prejudice to any other right or remedy against the contractor which have either accrued or accrue thereafter to Client, by a notice in writing to take the part work/part incomplete work of any item(s) out of his hands and shall have powers to:

(a) Take possession of the site and any materials, constructional plant, implements, stores, etc., thereon; and/or

(b) Carry out the part work / part incomplete work of any item(s) byany means at the risk and cost of the contractor.

The Engineer-in-Charge shall determine the amount, if any, is recoverable from the contractor for completion of the part work/ part of any incomplete work risk item(s) taken out of his hands and execute at the cost of the contractor, the liability of contractor on account of loss or damage suffered by Client because of action under this clause shall not exceed 10% of the tendered value of the work.

In determining the amount, credit shall be given to the contractor with the value of work done in all respect in the same manner and at the same rate as if it had been carried out by the original contractor under the terms of his contract, the value of contractor's materials taken over and incorporated in the work and use of plant and machinery belonging to the contractor. The certificate of the Engineer-in-Charge as to the value of work done shall be final and conclusive against the contractor provided always that action under this clause shall only be taken after giving notice in writing to the contractor. Provided also that if the expenses incurred by the Client are less than the amount payable to the contractor at his agreement rates, the difference shall not be payable to the contractor.

Any excess expenditure incurred or to be incurred by Client in completing the part work/ part incomplete work of any item(s) or the excess loss of damages suffered or may be suffered by Client as aforesaid after allowing such credit shall without prejudice to any other right or remedy available to Client in law or as per agreement be recovered from any money due to the contractor on any account, and if such money is insufficient, the contractor shall be called upon in writing and shall be liable to pay the same within 30 days.

If the contractor fails to pay the required sum within the aforesaid period of 30 days, the Engineer-in-Charge shall have the right to sell any or all of the contractors' unused materials, constructional plant, implements, temporary building at site etc. and adjust the proceeds of sale thereof towards the dues recoverable from the contractor under the contract and if thereafter there remains any balance outstanding, it shall be recovered from the contractor in accordance with the provisions of the contract.

In the event of above course being adopted by the Engineer-in-Charge, the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any engagements or made any advance on any account or with a view to the execution of the work or the performance of the contract.

14.0 SUSPENSION OF WORKS

a) The contractor shall, on receipt of the order in writing of the Engineer-in-charge (whose decision shall be final and binding on the contractor), suspend the progress of the works or any part thereof for such time and in such manner as the Engineer-in-charge may consider necessary for any of the following reasons:

   i) On account of any default on part of the contractor, or

   ii) For proper execution of the works or part thereof for reason other than the default of the contractor, or

   iii) For safety of the works or part thereof.

The contractor shall, during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given in that behalf by the Engineer-in-charge.

(b) If the suspension is ordered for reasons (ii) and (iii) in sub-Para (a) above.

   i) The contractor shall be entitled to an extension of the time equal to the period of every such suspension PLUS 25%, for completion period. No adjustment in contract price will be allowed for reasons of such suspension.

   ii) In the event of the Contractor treating the suspension as an abandonment of the Contract by Client, he shall have no claim to payment of any compensation on account of any profit or advantage which he may have derived from the execution of the work in full.

15.0 TERMINATION OF CONTRACT ON DEATH OF CONTRACTOR

Without prejudice to any of the right or remedies under this contract if the contractor dies, the Engineer in-charge shall have the option of terminating the contract without compensation to the contractor.

16.0 TIME & EXTENSION FOR DELAY

16.1 The time allowed for execution of the Works as specified or the extended time in accordance with these conditions shall be the essence of the Contract. The execution of the work shall commence from such time period as mentioned or from the date of handing over of the site, notified by the Engineer-in-Charge, whichever is later. If the Contractor commits default in commencing the execution of the work as aforesaid, the performance guarantee shall be forfeited by the Engineer-in-Charge and shall be absolutely at the disposal of the Engineer in charge without prejudice to any other right or remedy available in law.

16.2 As soon as possible but within 7 (seven) working days of award of work;

i. The Contractor shall submit a Time and Progress Chart for each milestone. The Engineer-in-Charge may within 15 (fifteen) working days thereafter, if required modify, and communicate the program approved to the contractor failing which the program submitted by the contractor shall be deemed to be approved by the Engineer-in-Charge. The work programme shall include all details of balance drawings and decisions required to complete the contract with specific dates by which these details are required by contractor without causing any delay in execution of the work. The Chart shall be prepared in direct relation to the time stated in the Contract documents for completion of items of the works. It shall indicate the forecast of the dates of commencement and completion of various activities of the work and may be amended as necessary by agreement between the Engineer-in-Charge and the Contractor within the limitations of time imposed in the Contract documents.

ii. In case of non-submission of construction programme by the contractor, the program approved by the Engineer-in-Charge shall be deemed to be final.

iii. The approval by the Engineer-in-Charge of such programme shall not relieve the contractor of any of the obligations under the contract.

iv. The contractor shall submit the Time and Progress Chart using the mutually agreed software or in other format decided by Engineer-in-Charge.

16.3 If the work(s) be delayed by -

- force majeure, or
- abnormally bad weather, or
- serious loss or damage by fire, or
- civil commotion, local commotion of workmen, strike or lockout, affecting any of the trades employed on the work, or
- delay on the part of other contractors or tradesmen engaged by Engineer-in-Charge in executing work not forming part of the Contract, or
- any other cause like above which, in the reasoned opinion of the Engineer-in-Charge is beyond the Contractor's control.

then upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the Engineer-in-Charge but shall nevertheless use constantly his best endeavors to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the Engineer-in-Charge to proceed with the works.

The contractor shall have no claim of damages for extension of time granted or

rescheduling of milestone/s for events listed in sub clause 16.3.

16.4 In case the work is hindered by the Client ~~or~~ for any reason/event, for which the Client is responsible, the Engineer in charge shall, if justified, give a fair and reasonable extension of time and reschedule the mile stones for completion of work Such extension of time or rescheduling of milestone/s shall be without prejudice to any other right or remedy of the parties in contract or in law; provided further that for concurrent delays under this sub clause and sub clause 16.3 to the extent the delay is covered under sub clause 16.3 the contractor shall be entitled to only extension of time and no damages.

16.5 Request for rescheduling of Mile stones or extension of time, to be eligible for consideration, shall be made by the Contractor in writing within fourteen days of the happening of the event causing delay. The Contractor shall indicate in such a request the period by which rescheduling of milestone/s or extension of time is desired.

16.6 In case the work is delayed by any reasons, in the opinion of the Engineer-in-Charge, by the contractor for reasons beyond the events mentioned in clause 16.3 or clause 16.4 or clause 16.5 and beyond the justified extended date; without prejudice to right to take action, the Engineer-in-Charge may grant extension of time required for completion of work without rescheduling of milestones. The contractor shall be liable for levy of compensation for delay for such extension of time.

17.0 MONTHLY PROGRESS REPORT

Contractor shall submit (as directed by Engineer-in-Charge) progress reports highlighting status of various activities and physical completion of work. The contractor shall send completion report with as built drawings to the office of Engineer-in-Charge, within a periodof 30 days of completion of work.

The photographs of the project taken on last day of every month indicating progress of work shall be attached along with the physical Monthly progress reports to be submitted to Engineer-in-charge.

18.0 TAXES AND DUTIES

18.1 The contract price is inclusive of all taxes, duties, cess and statutory levies payable under any law (as applicable on the date of submission of bid~~)~~ by the contractor in connection with execution of the contract) but excluding the GST.

The contract price shall be adjusted for any increase/decrease in the rate of GST on works contract as notified by Government of India.

18.2 Notwithstanding anything contained in clause 18.1, the contractor shall ensure payment of appropriate tax on the supplies made under the contract. The contractor shall take registration under the applicable enactment levying tax on supply of goods or services under the contract and issue invoice having all the particulars prescribed under the applicable provisions of the law, including description of goods/services, rate and amount of tax paid or payable on the supplies made under the contract, so that Engineer-in-charge can avail credit of such tax, wherever applicable. The contractor shall comply with all applicable provision of Goods and Service Tax (GST) levied by Union Government and State Governments (CGST, UTGST, SGST and IGST). The contractor shall get himself registered and discharge his obligations for payment of taxes, filing of returns etc. under the appropriate provisions of law in respect of all the taxes, duties, levies, cess, etc. Client would have right to seek necessary evidence that the contractor is registered under the law and duly discharging its obligations under the tax law, enabling Client to avail input tax credit.

Whenever interest is payable on reversal of Input Tax Credit (ITC) for non-and tax of payment of value supply under GST Act, due to any default on contractor's part (i.e due to poor performance/quality or non-fulfilment of terms of contract), the amount of interest so levied on Client shall be recovered from the contractor.

18.3 In case any law requires Engineer in charge to pay tax on the charge price on reverse

charges basis, the amount of tax deposited by Engineer in charge would be considered as paid to the contractor and, accordingly, the price payable to the contractor would stand reduced to that extent.

18.4 In case the contractor does not deposit the tax payable on execution of the contract, or has not provided the tax invoice to Engineer-in-charge showing the amount of tax, leading to non- availability of inputs credit of the tax to Client, the amount equivalent to such tax shall be deducted from the contract price.

18.5 Stamp duty and registration charges, if any, payable on the executed contract document, shall be borne by the contractor.

18.6 Tax deduction at source, if any, shall be made by Client as per law applicable from time to time from the amount payable to the contractor.

19.0 INCOME TAX DEDUCTION (TDS)

Income tax deductions shall be made from all payments made to the contractor including advances, in respect of the work/ project undertaken by the contractor, in accordance with the provisions of the Income Tax Act and Rules made thereunder prevailing and in force from time to time.

20.0 ROYALTY ON MATERIALS

The contractor shall deposit royalty and obtain necessary permit for supply of bajri, stone, kankar, sand and other materials etc. from the local authorities and quoted rates shall be inclusive of royalty.

The contractor shall be deemed to have inspected the site, its surrounding and acquainted himself with the nature of the ground, accessibility of the site and full extent and nature of all operations necessary for the full and proper execution of the contract, space for storage of materials, constructional plant, temporary works, restrictions on the plying of heavy vehicles in the area, supply and use of labour, materials, plant, equipment and laws, rules and regulations, if any, imposed by the local authorities.

The rates and prices to be tendered in the bill of quantities are for completed and finished items of works and complete in all respects. It will be deemed to include all constructional plant, labour, contractor's supervision, materials, transport, all temporary works, erection, maintenance, contractor's profit and establishment/overheads & profits, together with preparation of designs & drawings pertaining to casting yard, shop drawing, fabrication drawings (if required), staging, form work, stacking yard, risk, all taxes, royalty, duties, cess, octroi ~~and other~~ etc. all general levies, insurance liabilities and obligations set out or implied in the tender documents and contract.

If any temporary/permanent structure is encountered or safety of such structure in the vicinity is endangered due to execution of the project, the contractor has to protect the structures by any means as per direction of Engineer-in-Charge. If any damage is caused to any temporary or permanent structure(s) in the vicinity due to execution of the project, the contractor has to make good the same by any means as per direction of Engineer-in-Charge. The contractor should inspect the site of work from this point of view. The cost to be incurred in this regard shall be deemed to be included in his quoted rates ~~of BOQ items~~ and the contractor shall not be entitled for any extra payment in this regard.

21.0 INSURANCE OF WORKS ETC

21.1 Contractor is required to take Contractor's All Risk policy or erection all risk policy (as the case may be) from an approved insurance company in the joint name with first name of Client and bear all costs towards the same for the full period of execution of works including the defect liability period for the full amount of contract against all loss of damage from whatever cause arising other than excepted risks for which he is responsible under the terms of the contract and in such manner that the Client and his authorized representatives and the contractor are covered during the period of construction of works

and/or also covered during the period of defect liability for loss or damage.

a. The work and the temporary works to the full value of such works.
b. The materials, constructional plant, centering, shuttering and scaffolding materials and other things brought to the site for their full value.

The contractor is required to submit the original policy document and the receipt for payment of the current premium to Client.

21.2 Insurance under workmen compensation act

Contractor is required to take insurance cover under the Workman Compensation Act, 1923 amended from time to time from an approved insurance company and pay premium charges thereof.

The contractor is required to submit the original policy document and the receipt for payment of the current premium to Client.

21.3 THIRD PARTY INSURANCE

Contractor is required to take third party insurance cover for an amount of 5% (five percent) of contract value from an approved insurance company for insurance against any damage, injury or loss which may occur to any person or property including that of Client, arising out of the execution of the works or temporary works.

The contractor is required to submit the original policy document and the receipt for payment of the current premium to Client.

Engineer-In charge to ensure that Insurance policies are submitted by the contractor within 30 days from the date of issue of LOA. In case of failure of the contractor to obtain contractors all risk policy, insurance under workman compensation act and third party insurance as described above, Client reserves the right of forfeiture of the Performance Bank Guarantee.

If the Contractor could not effect a comprehensive insurance cover against risks which he may be required to effect under the terms of the contract, then he shall give his attention and even in case to get the best insurance cover available of effecting a wider insurance cover than the one which the subsidiary of the General Insurance Company could offer, such an insurance is ought to be done after the Client's approval, by or through the subsidiary of the General Insurance Company.

21.4 The contractor shall at all times indemnify Client against all claims, damages or compensation under the provision of Payment of wages act 1936, Minimum Wages Act 1948, Employer's liability Act 1938, the workmen's compensation Act 1947, Industrial Disputes Act 1947 and Maternity Benefit Act 1961 or any modifications thereof or any other law in force or as consequence of any accident or injury to any workman or other persons in or about the works, whether in the employment of the contractor or not, against all costs, charges and expenses of any suit, action or proceedings arising out of such incident or injury and against all sum or sums which may with the consent of the contractor be paid to compromise or compound any such claim. Without limiting his obligations and liabilities as above provided, the contractor shall insure against all claims, damages or compensation payable under the Workmen's Compensation Act 1923 or any modification thereof or any other law relating thereto.

22.0 PAYMENTS

All running payments shall be regarded as payments by way of advance against the final payment only and not as payments for work actually done and completed and/or accepted by Client and shall not preclude the recovery for bad, unsound and imperfect or unskilled work to be removed and reconstructed or re-erected. The final bill shall be submitted by the contractor within three months of the completion of work otherwise Client's certificate of the total measurement shall be binding on the contractor. Each Running Bills should be accompanied by two sets of at-least 20 (twenty) photographs taken from various points depicting status of work as on Report/ Bill date and Monthly Progress Report for the concerned month in the pro-forma given/ approved by Engineer-in-Charge and tax invoices as per applicable tax laws.

Intermittent progress Photographs as and when required shall also be provided by the Contractor at his own cost as per the direction of Engineer-in-Charge. No payment of running account bill shall be released unless it is accompanied by photographs, Monthly Progress Report and tax invoices as stated above.

It may be noted that GST shall be recoverable as extra on all applicable recoveries e.g. Workmen recovery, LD etc. made from the bills of contractor.

All payments shall be released by way of e-transfer through RTGS in India directly at their Bank account by Client.

No Running Account Bill shall be paid for the work till the ~~applicable~~ labour licenses, registration with EPFO, ESIC and BOCW Welfare Board, whatever applicable is submitted by the contractor to the Engineer-in-Charge.

PAYMENT OF FINAL BILL

The final bill shall be submitted by the contractor in the same manner as specified in interim bills within three months of physical completion of the work or within one month of the date of the final certificate of completion furnished by the Engineer-in-Charge whichever is earlier.

No further claims shall be made by the contractor after submission of the final bill and these shall be deemed to have been waived and extinguished. Payments of those items of the bill in respect of which there is no dispute and of items in dispute, for quantities and rates as approved by Engineer-in-Charge, will, as far as possible be made within 3 months of submission of final bill.

23.0 MEASUREMENTS OF WORKS

Engineer-in-charge shall, except as otherwise provided, ascertain and determine by measurement, the value of work done in accordance with the contract. Except where any general or detailed description of the work expressly shows to the contrary, measurement shall be taken in accordance with the procedure set forth in the CPWD Specifications. In the case of items which are not covered by specifications, mode of measurement as specified in the Technical Specifications of the contract and if for any item no such technical specification is available, then a relevant standard method of measurement issued by the Bureau of Indian Standard shall be followed.

Provided further that, In case of Cancellation/Determination of Contract in Full or in Part in accordance with clause 11.0 (and its sub-clauses), following methodology shall be adopted in respect of measurements in addition to what has been mentioned in foregoing;

- All measurements and levels shall be taken jointly by the Engineer-in- Charge or his authorized representative and by the contractor or his authorized representative from time to time during the progress of the work and such measurements shall be

signed and dated by the Engineer-in-Charge and the contractor or their representatives as token of their acceptance. If the contractor objects to any of the measurements recorded, a note shall be made to that effect with reason and signed by Engineer in charge & contractor.

- If for any reason, the contractor or his authorized representative is not available and the work of recording measurements is suspended by the Engineer-in-Charge or his representative, the Engineer-in-Charge shall not entertain any claim from contractor for any loss or damages on this account. If the contractor or his authorized representative does not remain present at the time of such measurements after the contractor or his authorized representative has been given a notice in writing three (3) days in advance or fails to countersign or to record objection within a week from the date of the measurement, then such measurements recorded in his absence by the Engineer-in-Charge or his representative shall be deemed to be accepted by the Contractor. The contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for recording the measurements.

24.0 COMPUTERISED MEASUREMENT BOOKS

Engineer-in-Charge shall, except as otherwise provided, ascertain and determine by measurement the value of work done in accordance with the contract. All measurements of all items having financial value shall be entered by the contractor and compiled in the shape of the Computerized Measurement Book as per the format provided by Engineer-In-Charge so that a complete record is obtained of all the items of works performed under the contract. All such measurements and levels recorded by the contractor or his authorized representative from time to time, during the progress of the work, shall be got checked by the contractor from the Engineer-in-Charge or his authorized representative as per interval or program fixed in consultation with Engineer-in-Charge or his authorized representative.

After the necessary corrections made by the Engineer-in-Charge, the measurement sheets shall be returned to the contractor for incorporating the corrections and for resubmission to the Engineer-in-charge for the dated signatures by the Engineer-in-Charge and the contractor or their representatives in token of their acceptance.

Whenever Running Account bill is due for payment, the contractor would initially submit draft computerized measurement sheets and these measurements would be got checked/test checked from the Engineer-in-Charge and/or his authorized representative. The contractor will, thereafter, incorporate such changes as may be done during these checks/test checks in his draft computerized measurements, and submit it to Engineer-In-Charge in both Soft and Hard copies.

All the required documents viz. measurement sheets, quality test reports, ESIC/EPF challans, Tax invoice, theoretical v/s actual consumption of material etc. shall also be submitted alongwith the RA bill. No payment of RA bill shall be released until all obligations and documents as stated above submitted by the Contractor to Engineer-In-Charge.

The contractor shall give not less than seven days' notice to the Engineer-in-Charge or his authorized representative before covering up or otherwise placing beyond the reach of checking and/or test checking the measurement of any work in order that the same may be checked and/or test checked and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of checking and/or test checking measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or his authorized representative who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of checking and/or test checking measurements without such notice having been given or the Engineer-in- Charge's consent being obtained in writing the same shall be uncovered at the Contractor's expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.

It is also a term of this contract that checking and/or test checking the measurements of any

item of work in the measurement book and/or its payment in the interim, on account of final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the contractor from liabilities from any over measurement or defects noticed till completion of the defect's liability period.

25.0 WITHHOLDING & LIEN IN RESPECT OF SUMS DUE FROM CONTRACTOR

Whenever any claim or claims for payment of a sum of money arises out of or under the contract or against the contractor, Client shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from the security deposit by the contractor and for the purpose aforesaid, Client shall be entitled to withhold the security deposit, if any, furnished as the case may be and also have a lien over the same pending finalization or adjudication of any such claim. In the event of the security being insufficient to cover the claimed amount or amounts or if no security has been taken from the contractor, Client shall be entitled to withhold and have a lien to retain to the extent of such claimed amount or amounts referred to above, from any sum or sums found payable or which may at any time thereafter become payable to the contractor under the same contract or any other contract pending finalization of adjudication of any such claim.

It is an agreed term of the contract that the sum of money or moneys so withheld or retained under the lien referred to above by Engineer-In-Charge or Client will be kept withheld or retained till the claim arising out of or under the contract is determined by the competent authority and that the contractor will have no claim for interest or damages whatsoever on any account in respect of such withholding or retention under the lien referred to above and duly notified as such to the contractor. For the purpose of this clause, where the contractor is a partnership firm or a limited company, the Engineer-in-Charge or the Client shall be entitled to withhold and also have a lien to retain towards such claimed amount or amounts in whole or in part from any sum found payable to any partner/limited company, be whether in his individual capacity or otherwise, as the case may. Client shall have the right to cause an audit and technical examination of the works and the final bills of the contractor including all supporting vouchers, abstract etc. to be made after payment of the final bill and if as a result of such audit and technical examination any sum is found to have been overpaid in respect of any work done by the contractor under the contract or any work claimed to have been done by him under the contract and found not to have been executed, the contractor shall be liable to refund the amount of over-payment and it shall be lawful for Client to recover the same from him in the manner prescribed in clause 26.1 or in any other manner legally permissible; and if it is found that the contractor was paid less than what was due to him under the contract in respect of any work executed by him under it, the amount of such under payment shall be duly paid by Client to the contractor, without any interest thereon whatsoever.

LIEN IN RESPECT OF CLAIMS IN OTHER CONTRACTS

Any sum of money due and payable to the contractor (including the security deposit returnable to him) under the contract may be withheld or retained by way of lien by the Engineer-in-Charge or by Client against any claim of Engineer-in-Charge or Client in respect of payment of a sum of money arising out of or under any other contract made by the contractor with the Engineer-in-Charge or the Client. It is an agreed term of the contract that the sum of money so withheld or retained under this clause by the Engineer-in-Charge or the Client will be kept withheld or retained till his claim arising out of the same contract or any other contract is either mutually settled or determined by the Competent Authority, as the case may be, and that the contractor shall have no claim for interest or damages whatsoever on this account or on any other ground in respect of any sum of money withheld or retained under this clause and duly notified as such to the contractor.

26.0 WORK TO BE EXECUTED IN ACCORDANCE WITH SPECIFICATIONS, DRAWINGS, AND ORDERS ETC.

All items of work in the bill of quantities/ schedule of quantities shall be carried out as per the CPWD/MORTH (as the case may be) specifications, drawings and instructions of the Engineer-in-Charge and the rates shall include for supply of required materials including

proper storage, consumables, skilled & unskilled labour, supervision and tools, tackles, plant & machinery complete as called for in the detailed specifications and conditions of the contract. Latest updated CPWD specifications shall be followed for execution of work.

The contractor shall execute the whole and every part of the work in the most substantial and workman like manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also confirm exactly, fully and faithfully to the design, drawings and instructions in writing in respect of the work assigned by the Engineer-in-Charge.

The contractor shall comply with the provisions of the contract and execute the works with care and diligence and maintain the works and provide all labour and materials, tools and plants including for measurements and supervision of all works, structural plans and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these, is specified or is reasonably inferred from the contract. The contractor shall take full responsibility for adequacy, suitability and safety of all the works and methods of construction.

27.0 MATERIALS TO BE PROVIDED BY THE CONTRACTOR

The contractor shall, at his own expense, provide all materials, required for the works. The contractor at his own expense and without delay shall supply to the Engineer-in-Charge samples of materials to be used on the work and shall get the same approved in advance. All such materials to be provided by the Contractor shall be in conformity with the specifications laid down or referred to in the contract. The contractor shall, if requested by the Engineer-in-Charge furnish proof, to the satisfaction of the Engineer-in-Charge regarding the material so comply. The contractor shall submit the samples of materials to be tested or analysed and bear all charges and cost of testing unless specifically provided for otherwise elsewhere in the contract or specifications.

The Engineer-in-Charge or his authorized representative shall at all times have access to the works and to all workshops and places where work is being prepared or from where materials, manufactured articles or machinery are being obtained for the works and the contractor shall afford every facility and every assistance and cost in obtaining the right and visit to such access. The Engineer-in-Charge shall have full powers to require the removal from the premises of all materials which in his opinion are not in accordance with the specifications and in case of default, the Engineer-in-Charge shall be at liberty to employ at the expense of the contractor, other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. The Engineer-in-Charge shall also have full power to require other proper materials to be substituted thereof and in case of default, the Engineer-in-Charge may cause the same to the supplies and all costs which may require such removal and substitution shall be borne by the contractor.

The contractor shall ensure that the materials are brought to site in original sealed containers (except where the or packing bearing manufacturer's markings and brands quantity required is a fraction of the smallest packing). Materials not complying with this requirement shall be rejected. The empty containers of such materials shall not be destroyed/disposed-off without the permission of Engineer-In-Charge.

The contractor shall produce receipt vouchers showing quantity of materials to satisfy Engineer-In-Charge that the materials comply with the specifications. These vouchers shall be endorsed, dated and signed by the contractor. A certified copy of each such voucher signed both by Engineer-In-Charge and the Contractor shall be kept on record.

28.0 MATERIALS AND SAMPLES

The materials/products used on the works shall be one of the approved make/ brands out of list of approved manufacturers/brands/makes given in the tender documents. The contractor shall submit samples/specimens out of approved makes to the Engineer-in-Charge for prior approval.

In case single brand/ make are mentioned, other equivalent makes/ brands may be considered by the Engineer-in-Charge on the request of the contractor. In case of variance in CPWD/IS/BIS specifications from approved products/makes specification, the specification of approvedproduct/make shall prevail for which nothing shall be paid extra to the Contractor. In case no make or brand of any materials, articles, fittings and accessories etc. is specified, the same shall comply with the relevant Indian Standard Specifications and shall bear the ISI/BIS mark. The Engineer-in-charge shall have the discretion to check quality of materials and equipments to be incorporated in the work, at source of supply or site of work and even after incorporation in the work. The contractor shall provide the necessary facilities and assistance for this purpose.

The above provisions shall not absolve the contractor from the quality of final product and in getting the material and workmanship quality checked and approved from the Engineer-in-Charge.

The contractor shall well in advance, produce samples of all materials, articles, fittings, accessories etc. that he proposes to use and get them approved in writing by Engineer-In-Charge. The materials, articles etc. as approved shall be labelled as such and shall be signed by Engineer-In-Charge and the Contractor's representative.

The approved samples shall be kept in the custody of the Engineer-in-Charge till completion of the work. Thereafter the samples except those destroyed during testing shall be returned to the contractor. No payment will be made to the contractor for the samples or samples destroyed in testing.

The contractor shall set up and maintain at his cost, a field-testing laboratory for all day-to-day tests at his own cost to the satisfaction of the Engineer-in-Charge. This field-testing laboratory shall be provided with equipment and facilities to carry out all mandatory field tests as per MORTH/CPWD (as the case may be) specifications. The Field testing laboratory shall be constructed and installed with the appropriate facilities. Temperature and humidity controls shall be available wherever necessary during testing of sample. All equipments shall be provided by the contractor so as to be compatible with the testing requirements specified.

The contractor shall maintain all the equipments in good working condition for the duration of the contract. The Contractor shall provide approved qualified personnel to run the laboratory for the duration of the Contract. The number of staff and equipment available must at all times be sufficient to keep pace with the sampling and testing programme as required by the Engineer-in-charge. The Contractor shall fully service the site laboratory and shall supply everything necessary for its proper functioning, including all transport needed to move equipment and samples to and from sampling points on the site, etc. All measuring devices/equipments shall be calibrated and contractor shall keep the records of valid calibration certificates of devices/equipments at the field laboratory for inspection by Engineer in charge at all times. All field test shall be carried out in the presence of Client's representative.

All costs towards samples, materials, collection, transport, manpower, testing etc. shall be borne by the Contractor and are deemed to be included in the rates quoted by him in the bill of quantities.

29.0 MATERIALS PROCURED WITH THE ASSISTANCE OF ENGINEER-IN-CHARGE

If any material for the execution of this contract is procured with the assistance of Engineer in charge by issue from its stores, the contractor shall and use the said

materials solely for the purpose of contract and shall not dispose them without the permission of Engineer-in-charge. The rate for these materials shall be as per the mutual agreement between the Client and the contractor. The Contractor shall deploy security personnel for safeguarding of materials procured at site.

30.0 CONTRACTOR TO SUPPLY TOOLS & PLANTS

The contractor shall provide at his own cost all materials, machinery, tools & plants as required for execution of the work. In addition to this, appliances, implements, other plants, ladders, cordage, tackle, scaffolding and temporary works required for the proper execution of the work, whether original, altered or substituted and whether included in the specifications or other documents forming part of the contract or referred to in these conditions or not, or which may be necessary for the purpose of completion of the work. The contractor shall also supply without any charge the requisite number of persons with the means and materials, necessary for the purpose of setting out works, and counting, weighing and assisting the measurement or examination at any time and from time to time of the work or materials. Failing his so doing, the same may be provided by the Engineer-in-Charge at the expense of the contractor and the expenses shall be deducted, from any money due to the contractor under this contract or otherwise and/or from his security deposit.

31.0 MOBILIZATION OF MEN, MATERIALS AND MACHINERY

All expenses towards mobilization at site and de-mobilization including bringing in equipment, work force, materials, dismantling the equipments, clearing the site etc. shall be deemed to be included in prices quoted and no separate payment on account of such expenses shall be entertained.

It shall be entirely the Contractor's responsibility to provide, operate and maintain all necessary construction equipments, scaffoldings and safety, gadget, lifting tackles, tools and appliances to perform the work in a workman like and efficient manner and complete all jobs as per the specifications and within the scheduled time of completion of work. Contractor shall also be responsible for obtaining temporary electric and water connection for all purposes. The contractor shall also make standby arrangement for water & electricity to ensure un-interrupted supply.

The procurement and supply in sequence and at the appropriate time of all materials and consumable shall be entirely the contractor's responsibility and his rates for execution of work shall be inclusive of supply of all these items.

It is mandatory for the contractor to provide safety equipments and gadgets to his all workers, supervisory and technical staff engaged in the execution of the work while working. The minimum requirement (but not limited to) shall be gum boots, safety helmets, Rubber hand gloves, face masks, safety nets, safety belts, goggles, hand sanitizers etc. as per work requirements. Sufficient numbers of these equipments and gadgets shall also be provided to Client by the contractor at his own cost. No staff/ worker shall be allowed to enter the site without these equipments/ gadgets.

The cost of the above equipments/ gadgets is deemed to be included in the rates quoted by the contractor and contractor shall not be entitled for any extra payment in this regard. The above norm is to be strictly complied with at the site. In case the contractor is found to be deficient in providing Safety Equipments/ Gadgets in the opinion of Engineer-in-charge, the Engineer-in-charge shall procure the same at the risk & cost of contractor and provide the same for the use of workers at site and shall make the recoveries from contractor for the same. The contractor shall abide regulations pertaining to Health, Safety and Environment.

All designs, drawings, bill of quantities, etc. except Bar Bending Schedule, Shop & Fabrication drawings for all works shall be supplied to the contractor for his scope of work Engineer-in-charge in phased manner as the works progresses. However, it shall be the duty and responsibility of the contractor to bring to the notice of the Engineer-in-charge as to any variation, discrepancy or any other changes required and to obtain revised

drawings and designs and / or approval of the Engineer-in-charge in writing for the same.

One copy of contract documents including drawings furnished to the contractor shall be kept at the site and the same shall at all reasonable times be available for inspection of Engineer-in-charge.

All materials, construction plants and equipments etc. once brought by the contractor within the project area will not be allowed to be removed from the premises without the written permission of the Engineer-in-charge. Similarly, all enabling works built by the contractor for the main construction undertaken by him, shall not be dismantled and removed without written permission of the Engineer-in-charge.

The Contractor shall need to furnish list of equipment/machinery/plants available with the contractor along with the details/capacities and manufacturing year of each equipment/ machinery/plant.

Contractor shall prepare the Bar Bending Schedule, shop and fabrication drawings free of cost, if required for any of the items of work. Five copies of these drawings and documents will be submitted to Engineer-in-charge for approval prior to execution of the works related to these documents and drawings.

All contractor's plant, machinery and equipment shall be kept in perfect condition during currency of the contract.

32.0 QUALITY ASSURANCEE PROGRAMME

To ensure that the services under the scope of this contract are in accordance with the specifications, the Contractor shall adopt Quality Assurance Programme to control such activities at the necessary points. The contractor shall prepare and finalize such Quality Assurance Programme within 15 days from date of issue Letter of Award. Engineer-in-charge shall also carryout quality audit and quality surveillance of systems and procedures of Contractor's quality control activities. A Quality Assurance Programme of Contractor shall generally cover the following;

a) His organization structure for the management and implementation of the proposed Quality Assurance Program.
b) Documentation control system.
c) The procedure for materials and source inspection.
d) System for site controls including process controls.
e) Control of non-conforming items and systems for corrective actions.
f) Inspection and test procedure for site activities.
g) System for indication and appraisal of inspection status.
h) System for maintenance of records.
i) System for handling, storage and delivery.
j) A quality plan detailing out quality practices and procedures, relevant acceptance levels for all types of work under the scope of this contract.

All the quality reports (i.e. checklists & registers) shall be maintained by the Contractor. Checklists & Registers enclosed in the QA-QC manual shall be followed while carrying out Construction activities (items). If any item is not covered by the Checklist/Register, the Format for the same may be developed and submitted to Engineer-in-Charge for approval and the same shall be adopted. These filled in reports shall be duly signed by representatives of contractor and Engineer-in-charge. All the costs associated with Printing of Formats and testing of materials required as per technical specifications or as per instructions of Engineer-in-charge shall be included in the Contractor's quoted rates in the Schedule/ Bill of quantities. Nothing extra shall be paid to the contractor on this account.

33.0 CONTRACT COORDINATION PROCEDURES, COORDINATION MEETINGS AND PROGRESS REPORTING

The Contractor shall prepare and finalize in consultation with Engineer-in-charge, a detailed contract coordination procedure within 15 days from the date of issue of Letter of Award for the purpose of execution of the Contract. The Contractor shall have to attend all the meetings at any place in India at his own cost with representatives of Client, PMC, TPIA and their representatives during the currency of the Contract, as and when required and fully cooperate with such personal and agencies involved during these discussions. The Contractor shall not deal in any way directly with the Client's or their representatives and any dealing/correspondence if required at any time with Clients/Consultants shall be done through Engineer-in-charge only.

34.0 COMPLETION CERTIFICATE AND COMPLETION PLANS

Within ten days of the completion of the work, the contractor shall give notice of such completion to the Engineer-in-Charge and of the receipt of such notice, the Engineer-in-Charge shall within thirty days inspect the work and if there is no defect in the work, shall furnish the contractor with a final certificate of completion, otherwise a provisional certificate of physical completion indicating defects (a) to be rectified by the contractor and/or (b) for which payment will be made at reduced rates, shall be issued. But no final certificate of completion shall be issued, nor shall the work be considered to be complete until the contractor shall have removed from the premises on which the work executed, all scaffolding, surplus materials, rubbish and all huts and sanitary arrangements required for his/their work, people on the site in connection with the execution of the works and cleaned off the dirt from all wood work, doors, windows, walls, floor or other parts of the building, in, upon, or about which the work is to be executed or of which he may have had possession

for the purpose of the execution; thereof, and not until the work shall have been measured by the Engineer-in-Charge. If the contractor shall fail to comply with the requirements of this clause as to removal of scaffolding, surplus materials and rubbish and all huts and sanitary arrangements as aforesaid and cleaning off dirt on or before the date fixed for the completion of work, the Engineer-in-Charge may at the expense of the contractor remove such scaffolding, surplus materials and rubbish etc., and dispose of the same as he thinks fit and clean off such dirt as aforesaid, and the contractor shall have no claim in respect of scaffolding or surplus materials as aforesaid except for any sum actually realized by the sale thereof less actual cost incurred on removal of materials / debris / malba etc.

The Contractor shall be responsible for handing over of the completed works including signing of inventories by the Engineer-in-charge. No payment of final bill shall be released to the contractor until final work completion certificate is obtained from Client.

35.0 PROHIBITION OF UNAUTHORISED CONSTRUCTION & OCCUPATION

No unauthorized buildings, construction of structures should be put up by the contractor anywhere on the project site, neither any building built by him shall be occupied in un-authorized manner by him or his staff.

It shall be the responsibility of the contractor to see that the building under construction is not occupied by anybody in un-authorized manner during construction, and is handed over to the Engineer-in-Charge with vacant possession of complete building. If such building though completed is occupied illegally, then the Engineer-in-Charge shall have the option to refuse to accept the said building/buildings in that position. Any delay in acceptance on this account will be treated as the delay in completion and for such delay, a levy of compensation may be imposed in line with Clause 8.0 of GCC.

36.0 FORECLOSURE OF CONTRACT

If at any time after acceptance of the tender or during the progress of work, the purpose or object for which the work is being done changes due to any supervening cause and as a result of which the work has to be abandoned or reduced in scope, the Engineer-in-Charge shall give notice in writing to that effect to the contractor stating the decision as well as the cause for such decision and the contractor shall act accordingly in the matter. The contractor shall have no claim of any compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the works in full but which he did not derive in consequence of the foreclosure of the whole or part of the works.

The contractor shall be paid at contract rates, full amount for works executed at site and, in addition, a reasonable amount as certified by the Engineer-in-Charge for the items hereunder mentioned which could not be utilized on the work to the full extent in view of the foreclosure;

i. Any expenditure incurred on preliminary site work, e.g. temporary access roads, temporary labour huts, staff quarters and site office; storage accommodation and water storage tanks.

ii. Engineer-in-charge shall have the option to take over contractor's materials or any part thereof either brought to site or of which the contractor is legally bound to accept delivery from suppliers (for incorporation in or incidental to the work) provided, however Client shall be bound to take over the materials or such portions thereof as the contractor does not desire to retain. For materials taken over or to be taken over by Client, cost of such materials as detailed out by Engineer-in-Charge shall be paid. The cost shall, however, take into account purchase price, cost of transportation and deterioration or damage which may have been caused to materials whilst in the custody of the contractor.

iii. Reasonable compensation for transfer of T & P from site to contractor's permanent stores or to his other works, whichever is less. If T & P are not transported to either of the said places, no cost of transportation shall be payable.

iv. Reasonable compensation for repatriation of contractor's site staff and imported labour to the extent necessary.

The contractor shall, if required by the Engineer- in-Charge, furnish to him, books of account, wage books, time sheets and other relevant documents and evidence as may be necessary to enable him to certify the reasonable amount payable under this condition. The reasonable amount of items on (i), (iii) and (iv) above shall not be in excess of 2% of the cost of the work remaining incomplete on the date of closure, i.e. total stipulated cost of the work as per accepted tender less the cost of work actually executed under the contract and less the cost of contractor's materials at site taken over by the Engineer in charge as per item (ii) above. Provided always that against any payments due to the contractor on this account or otherwise, the Engineer-in-Charge shall be entitled to recover or be credited with any outstanding balances due from the contractor for advance paid in respect of any tool, plants and materials and any other sums which at the date of termination were recoverable by the Client from the contractor under the terms of the contract. In the event of action being taken under Clause 37.0 to reduce the scope of work, the contractor may furnish fresh Performance Guarantee on the same conditions, in the same manner and at the same rate for the balance tendered amount and initially valid up to the extended date of completion or stipulated date of completion if no extension has been granted plus minimum 60 days beyond that. Wherever such a fresh Performance Guarantee is furnished by the contractor the Engineer-in-Charge may return the previous Performance Guarantee.

37.0 DEFECTS LIABILITY PERIOD

The contractor shall be responsible for the rectification of defects in the works for a period 5 (Five) years from the date of taking over of the works by the Engineer in charge. Any defects discovered and brought to the notice of the contractor forthwith shall be attended to and rectified by him at his own cost and expense. In case the contractor fails to carry out these rectifications, the same may without prejudice to any other right or remedy available, be got rectified by Engineer-in-charge at the risk and cost of the contractor.

38.0 SUBLETTING / SUB-CONTRACTING

No subletting of whole work or part shall be allowed. However, the contractor may engage the subcontractor for specialized works like Electrical, HVAC, Lifts, Building Management System, Water Proofing, and Data & Communication networking, interiors, landscaping etc. after obtaining approval from Engineer-in-charge based on assessing and satisfying itself of the capability, experience and equipment resources of the sub-contractor.

Payments to be made to such sub-contractors will be deemed to have been included in the contract price of the Contractor.

The sub-contractor should fulfill the qualifying criteria for contractor for subcontract proposed value of sub-contract similarly provided in the NIT of the project.

Notwithstanding any consent to sub-contract given by the Engineer-in-Charge,if in his opinion it is considered necessary, the Engineer-in-Charge shall have full authority to order the removal of any sub-contractor from the site.

39.0 FORCE MAJEURE

Any delay in or failure to perform of either party, shall not constitute default so as to give rise to any claim for damages, to the extent such delay or failure to perform is caused by an act of God, due to Pandemic, or by fire, explosion, flood or other natural

catastrophe, governmental legislation, orders or regulation etc. Failure of the Client to hand over the entire site and / or release funds for the project shall also constitute force majeure. The time for performance of the obligation by the parties shall be deemed to be extended for a period equal to the duration of the force majeure event. Both parties shall make their best efforts to minimize the delay caused by the force majeure event. If the failure / delay of the Client in handing over the entire site and / or in releasing the funds continues even on the expiry of the stipulated date of completion, Engineer-in-charge, may, at the request of the contractor, foreclose the contract without any liability to either party. In the event of such foreclosure, the contractor shall not be entitled to any compensation whatsoever. If prior to such foreclosure the contractor has brought any have the option materials to the site, the Engineer-in-Charge shall always have the option of taking over of all such materials at their purchase price or at the local current rates, whichever is lower.

The contractor shall have no claim of damages for extension of time granted or rescheduling of milestone/s for events listed in this clause.

40.0 NO COMPENSATION

The contractor shall have no claim whatsoever for compensation or idle charges against Client or his authorized representative on any ground or for any reason, whatsoever.

41.0 DIRECTION FOR WORKS

All works under the contract shall be executed under the direction and subject to approval in all respect of the Engineer-in-Charge.

The Engineer-in-Charge and his authorized representative shall communicate or confirm their instructions to the contractor in respect of the execution of work during their site inspection in a 'Works Site Order Book' maintained at the site office of Engineer-in-Charge. The contractor or his authorized representative shall confirm receipt such instructions by signing against the relevant orders in of the book.

42.0 WORK IN MONSOON AND RAIN

The execution of the work may entail working in the monsoon also. The contractor must maintain labour force as may be required for the work and plan and execute the construction and erection according to the prescribed schedule. No special/ extra rate will be considered for such work in monsoon. The contractors' rate shall be considered inclusive of cost of dewatering due to rains required if any and no extra rate shall be payable on this account. The stipulated period for completion of project includes the monsoon period, holidays & festivals.

43.0 WORK ON SUNDAYS, HOLIDAYS AND DURING NIGHT

For carrying out work on Sunday and Holidays or during night, the contractor shall make arrangements to carry out the works at no extra cost to Client.

44.0 WATER AND ELECTRICITY

The contractor shall make his own arrangement for Water fit for construction use & Electrical Power for construction and other purposes at his own cost. The contractor shall also make standby arrangement for water & electricity to ensure un-interrupted supply of water and electricity for smooth progress of works.

45.0 LAND FOR LABOUR HUTS/ SITE OFFICE AND STORAGE ACCOMMODATION

The contractor may construct temporary office, storage, accommodation and labour huts within the site premises with prior approval of Engineer in charge. In case, where surplus land is not available within the site and/or not permitted by the client, the contractor shall arrange the land for temporary office, storage, accommodation and labour huts at his own cost and is responsible for taking the clearance of local authorities, if required, for setting up/construction of labour camp and same is deemed to be included in the rates quoted by the contractor for the works. The contractor shall check the availability of land before tendering and no claim whatsoever in this regard shall be entertained.

The contractor shall ensure that the labour huts are kept clean and in hygienic Conditions. The land for the above purposes shall be so placed that it does not hinder the progress of work or access to the worksite. The vacant possession of the land used, for the purpose shall be given back by contractor to Client/authority after completion of the work.

The security deposit of the contractor shall be released only after contractor demolishes all temporary structures and clear the site to the satisfaction of Engineer in charge.

In the event, the contractor has to shift his labour campus at any time during execution of the work on the instructions of local authorities or as per the requirement of the work progress or as may be required by Engineer in charge, he shall comply with such instructions at his risk and cost and no claim whatsoever shall be entertained on this account.

46.0 WATCH, WARD AND LIGHTING OF WORK PLACE

The contractor shall at his own cost take all precautions to ensure safety of life and property by providing necessary barriers, obstruction, lights, watchmen etc. during the progress of work as directed by Engineer-in- charge.

47.0 WORKS TO BE OPEN TO INSPECTION

All works executed or under the course of execution in pursuance of this contract shall at all times be open to inspection of the Engineer-in-charge.

48.0 SET-OFF OF CONTRACTOR'S LIABILITIES

Engineer-in-charge shall have the right to deduct or set off the expenses incurred or likely to be incurred by it in rectifying the defects and/or any claim under this agreement against the Contractor from any or against any amount payable to the contractor under this agreement including security deposit and proceeds of performance guarantee.

49.0 POSSESSION PRIOR TO COMPLETION

Engineer-in-charge shall have the right to take possession of any completed or use partially completed work or part of the work. Such possession or use shall not be deemed to be any acceptance of any work not completed in accordance with the contract agreement. If such prior possession or use by Engineer-in-charge delays the progress of work, an equitable adjustment in the time of completion will be made and the contract agreement shall be deemed to be modified accordingly. The decision of Engineer-in-charge in such case shall be final binding and conclusive on the contractor.

The contractor shall during the course of execution prepare and keep updated a complete set of 'as built' drawings to show each and every change from the contract drawings, changes recorded shall be countersigned by the Engineer- in-Charge and the contractor. Four copies of 'as built' drawings shall be submitted to Engineer-in-charge by the contractor within 30 days of the completion of the work. All costs incurred in this respect shall be borne by the contractor.

50.0 EMPLOYMENT OF PERSONNEL

The contractor shall employ only Indian Nationals as his representatives, servants and workmen after verifying their antecedents and loyalty. He shall ensure that no personnel of doubtful antecedents and any other nationality in any way is associated with the works.

In case Engineer-in-charge observes misconduct, negligence or incompetence etc. on the part of any representative, agent, servant and workmen or employees etc. of the contractor, the Engineer-in-charge shall have full power and without giving any reason to the contractor, instruct the contractor to remove such engineer / staff / worker from site and provide suitable replacements. The decision of the Engineer-in-charge shall be final and binding on the contractor. The contractor shall not be allowed any compensation on this account.

51.0 TECHNICAL STAFF FOR WORK

The contractor shall employ at his cost the adequate number of technical staff during the execution of this work depending upon the requirement of work. For this purpose, the numbers to be deployed, their qualification, experience as decided by Engineer-in-charge shall be final and binding on contractor. The contractor shall not be entitled for any extra payment in this regard.

The technical staff should be available at site to take instructions from Engineer-in-charge.

Within 15 days of Letter of Award, the contractor shall submit a site organizational chart and resume including details of experience of the Project- in-Charge and other staff proposed to be deputed by him and the technical team shall be deputed by them on the Project after getting approval from Engineer-in-Charge. If desired by the contractor at later date, the Project-in-Charge and other staff whose resume is approved by Engineer-in-charge can be replaced with prior written approval of Engineer-in-charge and replacement shall be with equivalent or superior candidate only. The decision of Engineer-in-Charge shall be final and binding on the contractor in this regard.

Even after approving the site organizational chart, the Engineer-in-Charge due to technical reasons and exigency of work can direct the contractor to depute such additional staff as in view of Engineer-in-Charge is necessary and having qualification and experience as approved by the Engineer-in-Charge. The contractor shall not be paid anything extra whatsoever on account of deployment of additional staff.

In case the contractor fails to employ the staff as aforesaid he shall be liable to pay a reasonable amount not exceeding a sum of Rs.50,000 (Rupees Fifty Thousand only) for each month of default in the case of each person. The decision of the Engineer-in-charge as to number of Technical Staff to be adequate for the project and the period for which the desired strength of technical staff was not employed by the contractor and as to the reasonableness of the amount to be deducted on this account shall be final and binding on the contractor.

52.0 VALUABLE ARTICLES FOUND AT SITE

All gold, silver and other minerals of any description and all precious stones, coins, treasure, relics, antiques and all other similar things which shall be found in, under or upon the site shall be the property of the Client.

53.0 LABOUR LAWS

LABOUR LAWS TO BE COMPLIED BY THE CONTRACTOR

The contractor shall obtain a valid license under the contract labour (Regulation &

Abolition) Act 1970 and the contract labour Act (Regulation & Abolition) Central Rules 1971 and amended from time to time, and continue to have a valid license until the completion of the work including defect liability period.

The contractor shall also comply with the provisions of the building and other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1996 and the building and other Construction Workers Welfare Cess Act, 1996.

The contractor shall also comply with provisions of the Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979.

The contractor shall not engage any labour below the age of 18 under any circumstances. The provisions under Child Labour (Prohibition and Regulation) Amendment Act. 2016 should be strictly adhered to. In case of any non- compliance to the requirements of Labour laws, the contractor shall be liable for all consequences or any penalty imposed in this regard.

Payment of wages:

The contractor shall pay to labour employed by him either directly or through subcontractors, wages not less than fair wages as defined in the Contractor's Labour Regulations or as per the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 and the contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.

The contractor shall, notwithstanding the provisions of any contract to the contrary, cause to be paid fair wage to labour indirectly engaged on the work, including any labour engaged by his sub-contractors in connection with the said work, as if the labour had been immediately employed by him.

The contractor shall transfer/credit the wages/salary of all labourer/workers preferably in their bank accounts. He shall be responsible for opening of bank accounts of all labourer/workers employed by the contractor at work site in this regard.

In respect of all labour directly or indirectly employed in the works for performance of the contractor's part of this contract, the contractor shall comply with Labour Regulations in regard to payment of wages, wage period, maintenance of wage books or wage slips, publication of scale of wages and other terms of employment, inspection and submission of periodical returns and all other matters of the like nature or as per the provisions of the Contract Labour (Regulation and Abolition) Act, 1970, and the Contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.

The Engineer-in-Charge shall have the right to deduct from the moneys due to the contractor any sum required/estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfilment of the conditions of the contract for the benefit of the workers, non-payment of wages or of deductions made from his or their wages which are not justified by their terms of the contract or non- observance of the Regulations.

Under the provision of labour rules, the contractor is bound to allow to the labourer directly or indirectly employed in the works one-day rest for 6 days continuous work and pay wages at the same rate as for duty. In the event of default, the Engineer-in-Charge shall have the right to deduct the sum or sums not paid on account of wages for weekly holidays to any labourer and pay the same to the persons entitled thereto from any money due to the contractor.

The contractor shall comply with the provisions of the Payment of Wages Act, 1936, Minimum Wages Act, 1948, Employees Liability Act, 1938, Workmen's Compensation Act, 1923, Industrial Disputes Act, 1947, Maternity Benefits Act, 1961, and the Contractor's Labour (Regulation and Abolition) Act 1970, or the modifications thereof or any other laws

relating thereto and the rules made there under from time to time.

The contractor shall indemnify and keep indemnified Client against payments to be made under and for the observance of the laws aforesaid and the Labour Regulations without prejudice to his right to claim indemnity from his sub-contractors.

The laws aforesaid shall be deemed to be a part of this contract and any breach thereof shall be deemed to be a breach of this contract.

LABOUR SAFETY PROVISION

The contractor shall be fully responsible to observe the labour safety provisions. The contractor shall at his own cost take all precautions to ensure safety of life and property by providing necessary barriers, lights, watchmen etc. during the progress of work.

In case of all labour directly or indirectly employed in work for the performance on the contractor's part of this contract, the contractor shall comply with all rules framed by Government from time to time for the protection of health and sanitary arrangements for workers.

OBSERVANCE OF LABOUR LAWS

The contractor shall be fully responsible for observance of all labour laws applicable including local laws and other laws applicable in this matter and shall indemnify and keep indemnified Client against effect or non-observance of any such laws. The contractor shall be liable to make payment to all its employees, workers and sub-contractors and make compliance with labour laws. If Client or his authorized representative is held liable as "Principal Employer" to pay contributions etc. under legislation of Government or Court decision in respect of the employees of the contractor, then the contractor would reimburse the amount of such payments, contribution etc. to Client and/ or same shall be deducted from the payments, security deposit etc. of the contractor.

The Contractor shall submit proof of having valid EPF registration certificate. He shall within 7 days of the close of every month, submit to Client a statement showing the recoveries of contributions in respect of each employee employed by or through him and shall furnish to Client such information as the Client is required to furnish under the provisions of para 36B of the EPF scheme 1952 to the EPF authorities and other information required by EPFO authorities from time to time. He shall also submit a copy of challan every month in token of proof of having deposited the subscription and contribution of workers engaged on the project.

The contractor shall also ensure the compliance of EPF Act, 1952 by the sub-contractors, if any, engaged by the contractor for the above said work.

The contractor shall submit affidavit to indemnify and save harmless the Client from and against all actions, suits, proceedings, losses, costs, damages, charges, claims and demands of every nature and description brought or recovered against the Client by reasons of any act or omission of the Contractor, his agents or employees in connection with complying the provisions of the Employees Provident Fund & Miscellaneous Provisions Act, 1952 as amended from time to time. All sums payable by way of compensation / penalty / damages / interest on the outstanding amounts payable by the Contractor shall be considered as reasonable and be payable by the Contractor to the Client immediately and if the Contractor does not pay the amount immediately the same will be deducted from the security deposit or earnest money or any other amount available with the Client or any money payable to the Contractor by the Client.

MINIMUM WAGES ACT

The contractor shall comply with all the provisions of the minimum wages Act, 1948, contract labour Act (Regulation & Abolition) 1970, and rules framed there under and other labour laws/local laws affecting contract labour that may be brought into force from time to time.

LABOUR RECORDS

The contractor shall submit by the 4th & 19th of every month to the Engineer-in-Charge a true statement showing in respect of the second half of the preceding month and the first half of the current month, respectively, of the following data:

a) The number of the labourer employed by him (category-wise).

b) Their working hours.

c) The wages paid to them.

d) The accidents that occurred during the said fortnight showing the circumstances under which they happened and the extent of damage and injury caused.

e) The number of female workers who have been allowed Maternity Benefits and the amount paid to them.

f) Any other information required by Engineer-in-Charge

Failing which the contractor shall be liable to pay to Client, a sum not exceeding Rs.200/- for each default or materially incorrect statement. The decision of the Engineer-In-Charge shall be final and ~~is~~ binding on the contractor.

In the event of the contractor(s) committing a default or breach of any of the provisions of the Labour Regulations and Model Rules for the protection of health and sanitary arrangements for the workers as amended from time to time or furnishing any information or submitting or filing any statement under the provisions of the above Regulations and Rules which is materially incorrect, he shall, without prejudice to any other liability, pay to Client not exceeding 200/- for every default, breach or furnishing, making, submitting, filing such materially incorrect statements and in the event of the contractor defaulting continuously in this respect, the penalty may be enhanced to Rs.200/- per day for each day of default subject to a maximum of 5% of the estimated cost of the work put to tender. The decision of the Engineer-in-Charge shall be final and binding on the contractor.

Should it appear to the Engineer-in-Charge that the contractor is not properly observing and complying with the provisions of the Contractor's Labour Regulations and Model Rules and the provisions of the Contract Labour (Regulation and Abolition) Act 1970, and the Contract Labour (R&A) Central Rules 1971, for the protection of health and sanitary arrangements for workers employed by the contractor(s) (hereinafter referred as "the said Rules") the Engineer-in-Charge shall have power to give notice in writing to the contractor requiring that the said Rules be complied with the amenities prescribed therein and shall be provided to the workers within a reasonable time to be specified in the notice. If the contractor(s) fail within the period specified shall in the notice to comply with and/observe the said Rules and to provide the amenities to the work- people as aforesaid, the Engineer-in-Charge shall have the power to provide the amenities hereinbefore mentioned at the cost of the contractor(s). The contractor(s) shall erect, make and maintain at his/their own expense and to approved standards all necessary huts and sanitary arrangements required for his/their work-people on the site in connection with the execution of the works, and if the same shall not have been erected or constructed, according to approved standards, the Engineer-in-Charge shall have power to give notice in writing to the contractor(s) requiring that the said huts and sanitary arrangements be remodeled and/or reconstructed according to approved standards, and if the contractor(s) shall fail to remodel or reconstruct such huts and sanitary arrangements according to approved standards within the period specified in the notice, the Engineer-in-Charge shall have the power to remodel or reconstruct such huts and sanitary arrangements according to approved standards at the cost of the contractor(s).

The contractor at his own cost provide his labourer with a sufficient number of huts (hereinafter referred to as the camp) of the following specifications on a suitable plot of land.

(a) The minimum height of each hut at the eave's level shall be 2.10 m. (7 ft.) and the

floor area to be provided will be at the rate of 2.70 S qm. (30 Sqft.) for each member of the worker's family staying with the labourer.

(b) The contractor shall in addition construct suitable cooking places having a minimum area of 1.80m x 1.50m (6'x5') adjacent to the hut for each family.

(c) The contractor shall also construct temporary latrines and urinals for the use of the labourer each, on the scale of not less than four per each one hundred of the total strength, separate latrines and urinals being provided for women.

(d) The contractor(s) shall construct sufficient number of bathing and washing places, one unit for every 25 persons residing in the camp. These bathing and washing places shall be suitably screened.

All the huts shall have walls of sun-dried or burnt-bricks laid in mud mortar or other suitable local materials as may be approved by the Engineer-in-Charge. In case of sun-dried bricks, the walls should be plastered with mud gobri on both sides. The floor may be kutcha but plastered with mud gobri and shall be at least 15 cm (6") above the surrounding ground. The roofs shall be laid with thatch or any other materials as may be approved by the Engineer-in-Charge and the contractor shall ensure that throughout the period of their occupation, the roofs remain water-tight.

The contractor(s) shall provide each hut with proper ventilation.

All doors, windows, and ventilators shall be provided with suitable leaves for security purposes.

There shall be kept an open space of at least 7.2 m. between the rows of huts which may be reduced to 6 m. according to the availability of site with the approval of the Engineer-in-Charge. Back to back construction will be allowed.

Water Supply - The contractor(s) shall provide adequate supply of water for the use of labourer. The provisions shall not be less than two gallons of pure and wholesome water per head per day for drinking purposes and three gallons of clean water per head per day for bathing and washing purposes. Where piped water supply is available, supply shall be at stand posts and where the supply is from wells or river, tanks which may be of metal or masonry, shall be provided. The contractor(s) shall also at his/ their own cost make arrangements for laying pipe lines for water supply to his/ their labour camp from the existing mains wherever available, and shall pay all fees and charges thereof.

Disposal of Excreta- The contractor shall make necessary arrangements for the disposal of excreta from the latrines by trenching or incineration which shall be according to the requirements laid down by the Local Health Authorities. If trenching or incineration is not allowed, the contractor shall make arrangements for the removal of the excreta through the Municipal Committee/authority and inform it about the number of labourer employed so that arrangements may be made by such Committee/authority for the removal of the excreta. All charges on this account shall be borne by the contractor and paid directly by him to the Municipality/authority. The contractor shall provide one sweeper for every eight seats in case of dry system.

Drainage - The contractor shall provide efficient arrangements for drainage away sullage water so as to keep the camp neat and tidy.

The contractor shall make necessary arrangements for keeping the camp area sufficiently lighted to avoid accidents to the workers.

Sanitation - The contractor shall make arrangements for conservancy and sanitation in the labour camps according to the Public Health and Medical Authorities.

54.0 RECOVERY OF COMPENSATION PAID TO WORKMEN

In every case in which by virtue of the provisions of the Workmen's Compensation Act, 1923, Client is obliged to pay compensation to a workman employed by the contractor, in execution of the works, Client will recover from the contractor, the amount of the compensation so paid from any sum due to the contractor whether under this contract or otherwise.

55.0 ENSURING PAYMENT AND AMENITIES TO WORKERS IF CONTRACTOR FAILS

In every case in which by virtue of the provisions of the Contract Labour (Regulation and Abolition) Act, 1970, and of the Contract Labour (Regulation & Abolition) Central Rules 1971, Client is obliged to pay any amounts of wages to workman employed by the contractor in execution of the works, or to incur any expenditure in providing welfare and health amenities required to be provided under the above said Act or under the Labour Regulations, or under the Rules framed by Government from time to time for the protection of health and sanitary arrangements for workers employed by Contractors, Client will recover from the contractor, the amount of wages so paid or the amount of expenditure so incurred from any sum due by CLIENT to the contractor whether under this contract or otherwise.

56.0 CHANGE IN FIRM'S CONSTITUTION TO BE INTIMATED

Where the contractor is a partnership firm, the prior approval in writing of the Engineer-in-Charge shall be obtained before any change is made in the constitution of the firm. Where the contractor is an individual or a Hindu undivided family business concern such approval as aforesaid shall likewise be obtained before the contractor enters into any partnership under agreement where the partnership firm would have the right to carry out the works hereby undertaken by the contractor.

57.0 INDEMNITY AGAINST PATENT RIGHTS

The contractor shall fully indemnify the Client and his authorized representatives from and against all claims and proceedings for or on account of any infringement of any patent rights, design, trademark or name or other protected rights in respect of any construction plant, machine, work or material used for in connection with the works or temporary works.

58.0 LAW COVERING THE CONTRACT

This contract shall be governed by the Indian laws for the time being in force.

59.0 LAWS, BYE-LAWS RELATING TO THE WORK

The contractor shall strictly adhere by the provisions for the time being in force, of law relating to works or any regulations and bylaws made by any local authority or any water & lighting agencies or any undertakings within the limits of the jurisdiction of which the work is proposed to be executed. The contractor shall be bound to give to the authorities concerned such notices and take all approvals as may be provided in the law, regulations or bylaws as aforesaid, and to pay all fees and taxes payable to such authorities in respect thereof.

60.0 JURISDICTION

The agreement shall be executed at Delhi on non-judicial stamp paper purchased in Delhi and the courts in Delhi alone will have jurisdiction to deal with matters arising there from, to the exclusion of all other courts.

61.0 CONTRACTOR LIABLE FOR DAMAGES, DEFECTS DURING DEFECT LIABILITY PERIOD

If the contractor or his working people or servants shall break, deface, injure, or destroy any part of building in which they may be working, or any building, road, road kerb, fence, enclosure, water pipe, cables, drains, electric or telephone post or wires, trees, grass or grassland, or cultivated ground contiguous to the premises on which the work or any part is being executed, or if any damage shall happen to the work while in progress, from any cause whatever or if any defect, shrinkage or other faults appear in the work, shall upon receipt of a notice in writing from Engineer In charge on that behalf make the same good at his own expense or in default, the Engineer-in-Charge cause the same to be made good by other workmen and deduct the expense from any sums that may be due or at any time thereafter may become due to the contractor, or from his security deposit or the proceeds of sale thereof or of a sufficient portion thereof.

62.0 LIFE CYCLE COST

The contractor shall be responsible for safety, quality and soundness of the buildings including structural elements beyond maintenance period. The contractor shall have obligation to rectify such defects minimum up to 5 (five) years from the date of completion of work. The defects have to be rectified within a reasonable time not exceeding forty-five days after issue of notice by Engineer- in- Charge. If contractor does not take corrective action within 45 days, then action for debarring of the agency shall be taken by the appropriate authority.

63.0 SETTLEMENT OF DISPUTES & ARBITRATION

Except where otherwise provided in the contract, all questions and disputes relating to the meaning of the specifications, design, drawings and instructions here-in before mentioned and as to the quality of workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works or the execution or failure to execute the same whether arising during the progress of the work or after the cancellation, termination, completion or abandonment thereof shall be dealt with as mentioned hereinafter:

(i) If the contractor considers any work demanded of him to be outside the requirements of the contract, or disputes any drawings, record or decision given in writing by the Engineer-in-Charge or if the Engineer-in-Charge considers any act or decision of the contractor on any matter in connection with or arising out of the contract or carrying out of the work, to be unacceptable and is disputed, such party shall promptly within 15 days of the arising of the disputes request for appointment of arbitrator under intimation to the other party.

Wherever the Arbitral Tribunal consists of three Arbitrators, the contractor shall appoint one arbitrator within 30 days of making request for arbitration or of receipt of request by Engineer-in-charge for appointment of arbitrator, as the case may be, and two appointed arbitrators shall appoint the third arbitrator who shall act as the Presiding Arbitrator. In the event of -

(a) A party fails to appoint the second Arbitrator, or

(b) The two appointed Arbitrators fail to appoint the Presiding Arbitrator, then the Engineer-in-charge shall appoint the second or Presiding Arbitrator as the case may be.

(ii) It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed, if any, in respect of each such dispute along with the notice for appointment of arbitrator.

This fee shall be shared equally by parties. In case there is no finalization of place of arbitration, the arbitral tribunal shall determine the place of arbitration. The venue of the arbitration shall be such place as may be fixed by the Arbitral Tribunal in consultation with both the parties. Failing any such agreement, then the Arbitral Tribunal shall decide the venue.

64.0 ACTION WHERE NO SPECIFICATIONS ARE SPECIFIED

In the case of any class of work for which there is no such specifications, such work shall be carried out in accordance with the Bureau of Indian Standards Specifications. In case there are no such specifications in Bureau of Indian Standards, the work shall be carried out as per manufacturers' specifications, if not available then as per state/ District Specifications. In case there are no such specifications as required above, the work shall be carried out in all respects in accordance with the instructions and requirements of the Engineer-in-Charge.

SECTION-2
LABOUR LAWS

CONTRACTOR'S LABOUR REGULATIONS

1.0 SHORT TITLE

These regulations may be called the Contractor "Labour Regulations".

2.0 Definitions

2.1 "Workman" means any person employed by the Client/PMC or its Contractor directly or indirectly through a sub-contractor, with or without the knowledge, of the Client to do any skilled, semi-skilled, un-skilled, manual, supervisory, technical or clerical work for hire or reward, whether, the terms of employment are expressed or implied but does not include any person-

a)	Who is employed mainly in a managerial or administrative capacity; or
b)	Who being employed in a supervisory capacity draws wages exceeding Rupees Two Thousand Five hundred per person or exercises either by the nature of the duties attached to the officeor by reason of powers vested to him, functions mainly of managerial nature.
c)	Who is an out worker, that is to say, a person to whom any articles or materials are given out by or on behalf of the principal employer to be made up cleaned, washed, altered, ornamental finished, repaired, adopted or otherwise processed for salefor the purpose of the trade or business of the principal employer and the process is to be carried out either in the home of the out worker or in some other premises, not being premises under the control and management of the principal employer.

2.2 "Fair Wages" means wages whether for time or piece work fixed and notifiedunder the provisions of the minimum Wages Act from time to time.

2.3 "Contractor" shall include every person who undertake to produce a given result other than a mere supply of goods or articles of manufacture throughlabour or who supplies labour for any work and includes a sub-contractor.

2.4 "Wages" shall have the same meaning as defined in the Payment of Wages Act.

2.4.1 Normally working hours of an adult employee should not exceed 9 hours a day. The working day shall be so arranged that inclusive of interval for rest, if any, it shall not spread over more than 12 hours on any day.

2.4.2 When an adult worker is made to work for more than 9 hours on any day or for more than 48 hours in any week he shall be paid overtime for the extra hours put in by him at double the ordinary rate of wages.

2.4.3.1 Every worker shall be given a weekly holiday on a Sunday, in accordance with the provisions of the Minimum Wages (Central) Rules 1960 as amended from time to time, irrespective of whether such worker is governed by the Minimum Wages Act or not.

2.4.3.2 Whether the Minimum Wages prescribed by the Government under the Minimum Wages Act are not inclusive of the wages for the weekly day of rest, the worker shall be entitled to rest day wages at the rate applicable to the next preceding day, provided he has worked under the same contractor for a continuous period of not less than 6 days.

2.4.3.3 Where a contractor is permitted by the Engineer-in-Charge to allow a workerto work on a normal weekly holiday, he shall grant a substitute holiday to him for the whole day on one of the five days immediately before or after the normal weekly holidays and pay wages to such worker for the work performed on the normal weekly holiday at overtime rate.

3.0 DISPLAY OF NOTICE REGARDING-WAGES, ETC.

The contractor shall before he commences his work on contract, display and correctly maintain and continue to display and correctly maintain in a clean and legible condition in conspicuous places on the work, notices in English and in the local Indian languages spoken by the majority of the workers, giving the minimum rates of wages fixed under the Minimum Wages Act, the actual wagesbeing paid, the hours of work for which such wages are earned, wage period,dates of payment of wages and other relevant information as per Appendix 'A'.

4.0 PAYMENT OF WAGES

4.1 The contractor shall fix wage periods in respect of which wages shall be payable.

4.2 No wage period shall exceed one month.

4.3 The wages of every person employed as labour in an establishment or by acontractor where less than one thousand, such persons are employed shall be paid before the expiry of the seventh day and in other cases before the expiry of tenth day after the last day of the wage period in respect of which the wages are payable.

4.4 Where the employment of any worker is terminated by or on behalf of the contractor the wages earned by him shall be paid before the expiry of the second working day from the date on which his employment is terminated.

4.5 All payments of wages shall be made on a working day at the work premises and during the working time and on a date notified in advance and in casethe work is completed before the expiry of the wage period, final payment shall be made within 48 hours of the last working day.

4.6 Wages due to every worker shall be paid to him direct or to other person authorized by him in this behalf.

4.7 All wages shall be paid in current coin or currency or in both.

4.8 Wages shall be paid without any deductions of any kind except those specified by the Central Government by general or special order in this behalf or permissible under the Payment of Wages Act 1956.

4.9 A notice showing the wage period and the place and time of disbursement of wages shall be displayed at the place of work and a copy sent by the contractor to the Engineer-in-Charge under acknowledgment.

4.10 It shall be the duty of the contractor to ensure the disbursement of wages in the presence of the Engineer or any other authorized representatives of the Engineer-in-Charge who will be required to be present at the place and time of disbursement of wages by the contractor to workmen.

4.11 The contractor shall obtain from the Engineer or any representative of the Engineer-in-Charge as the case may other authorized be, a certificate under his signature at the end of the entries in the "Register of Wages" or the "Wage-cum-Muster Roll" as the case may be in the following form:

"Certified that the amount shown in column No. 14(net Amount paid) has beenpaid to the workmen concerned in my presence on..... at ..... ".

5.0 FINES AND DEDUCTIONS, WHICH MAY BE MADE FROM WAGES

5.1 The wages of a worker shall be paid to him without any kind deduction of any except the following –

a)	Fines
b)	Deductions for absence from duty i.e. from the place or the places where by the terms of his employment he is required to work. The amount of deduction shall be in proportion to the period for which he was absent.
c)	Deduction for damage to or loss of goods expressly entrusted to the employed persons for custody, or from loss of money or any other deduction which he is required to account where such damage or loss is directly attributable to his neglect or default.
d)	Deduction for recovery of advances or for adjustment of over payment of wages, advances granted shall be entered in a register.
e)	Any other deduction, which the Central Government may from time to time allow.

5.2 No fines should be imposed on any worker save in respect of such acts and omissions on his part as have been approved by the Chief Labour commissioner.

5.3 No fine shall be imposed on a worker and no deduction for damage or loss shall be made from his wages until the worker has opportunity of been given an showing cause against such fines or deductions.

5.4 The total amount of fine which may be imposed in any one wage period on a worker shall not exceed an amount equal to three paisa in a Rupee of thetotal wages, payable to him in respect of that wage period.

5.5 No fine imposed on any worker shall be recovered from him in installment,or after the expiry of sixty days from the date on which it was imposed.

5.6 Every fine shall be deemed to have been imposed on the day of the act or omission in respect of which it was imposed.

6.0 LABOUR RECORDS

6.1 The contractor shall maintain a "Register of persons employed" on work oncontract in form XIII of the CL (R&A) Central Rules 1971 (Appendix-B).

6.2 The contractor shall maintain a "Muster Roll" register in respect of all workmen employed by him on the work under contract in from XVI of the CL (R&A) Rules 1971 (Appendix-C).

6.3 The contractor shall maintain a "Wage Register" in respect of all workmenemployed by him on the work in form (Appendix-D).

6.4 Register of accidents - The contractor shall maintain a register of accidents in such form as may be convenient at the work place but the same shall include the following particulars:

a) Full particulars of the labourers who met with accident.

b) Rate of wages

c) Sex

d) Age

e) Nature of accident and cause of accident.

f) Time and date of accident.

g) Date and time when he/she admitted in Hospital

h) Date of discharge from the Hospital

i) Period of treatment and result of treatment

j) Percentage of loss of earning capacity and disability Medical Officer.

k) Claim required to be paid under Workmen's Compensation Act.

l) Date of payment of compensation.

m) Amount paid with details of the person to whom the same was paid.

n) Authority by whom the compensation was assessed.

o) Remarks

6.5 Register of Fines - The contractor shall maintain a "Register of Fines" in the form (Appendix-H).

The contractor shall display in a good condition and in a conspicuous place of work the approved list of Acts and Omission for which fines can be imposed(Appendix-I).

6.6 Register of Deductions – The contractor shall maintainDeductions" a "Register of a for damage or loss in form (Appendix-J).

6.7 Register of Advances – The contractor shall maintain "Register of a Advances" in form (Appendix-K).

6.8 Register of Overtime - The contractor shall maintain "Register of Overtime" in form (Appendix-L).

7.0 ATTENDANCE CARD-CUM WAGE SLIP:

7.1 The contractor shall issue an attendance card-cum-wage slip to each workman employed by him in the specimen form at (Appendix-E).

7.2 The card shall be valid for each wage period.

7.3 The contractor shall mark the attendance of each workman on the card twice each day, once at the commencement of the day and again after therest interval, before he actually starts work.

7.4 The card shall remain in possession of the worker during under the wage period reference.

7.5 The contractor shall complete the wage slip portion on the reverse of the card at least a day prior to the disbursement of wages in respect of the period under reference.

7.6 The contractor shall obtain the signature or thump impression of the worker on the wage slip at the time of disbursement of wages and retain the card with himself.

8.0 EMPLOYMENT CARD

The contractor shall issue an Employment Card in form to each worker within three days of the employment of the worker (Appendix-F).

9.0 SERVICE CERTIFICATE

On termination of Employment for any reason whatsoever the contractorworkman shall issue to the whose services have been terminated, a service Certificate in from Appendix-G.

10.0 PRESERVATION OF LABOUR RECORDS

All records required to be maintained under Regulations Nos. 6 and 7 shall be preserved in original for a period of three years from the date of last entries made in them and shall be made available for inspection by theEngineer-in-Charge, Labour Officer.

11.0 POWER OF LABOUR OFFICERS TO MAKE INVESTIGATIONS INQUIRY

The Labour Officer or any other person authorized by CLIENT on its behalf shall have power to make inquire with a view to ascertaining and enforcing due and proper observance of the Fair Wage Clauses and the Provisions of Regulations. He shall investigate into any complaint regarding the default made by the contractor or sub-contractor in regard to such provision.

12.0 INSPECTION OF BOOK AND SLIPS

The contractor shall allow inspection of all the prescribed labour records to any of his workers or to his agent at a convenient time and place after due notice is received or to the Labour officer or any other person, authorized bythe Central Government on his behalf.

13.0 SUBMISSION OF RETURNS

The contractor shall submit periodical returns as may be specified from timeto time.

14.0 AMENDMENTS

The CLIENT may from to time, add or amend the regulations and on any question as to the application, interpretation or effect of these regulations, the decision of the Zonal Chief concerned shall be final.

Appendix - 'A'

LABOUR BOARD

Name of work Name of Contractor

Address of Contractor Name and Address of Unit

Name of Labour Enforcement Officer

Address of Labour Enforcement Officer

Date:

S. No.	Category	Minimum wage fixed	Actual wages paid	Number present	Remarks

Weekly HolidayWage Period

Date of Payment of wagesWorking hours

Rest interval

Appendix - 'B'

REGISTER OF WORKMEN EMPLOYED BY CONTRACTOR

Name and Address of Contractor

Name and Address of Establishment inunder which contract is carried on

Nature and location of work

Name & Address of Principal Employer

Sl. No.	Name and surname of workman	Age & sex	Father's Husbands Name	Nature of employment / designation	Permanent home address of the workman village and Tehsil Taluk and District)	Local address
1.	2.	3.	4.	5.	6.	7.

Date of commencement of employment	Signature or thumb impression of the workman	Date of termination of employment	Reasons for termination	Remarks
1.	2.	3.	4.	5.

Appendix - 'C'

MUSTER ROLL

Name and address of contractor

Name and address of establishment in/underWhich contract is carried on

Nature and location of work

Name and Address of Principal Employer

For the month / fortnight

S. No.	Name of the workman	Sex	Father's/ Husband's Name	Dates					Remarks
1.	2.	3.	4.	5.					6.
				1	2	3	4	5	

Appendix - 'D'

REGISTER OF WAGES

Name and address of contractor

Name and address of establishment in/underwhich contract is carried on

Nature and location of work

Name and Address of Principal Employer

Wage period: per month/ fortnightly

S. No.	Name of Workman	Serial No. in the register of workman	Designation nature of work done	Nos. of days worked	Units of work done	Daily rate of wages/ piece rate	Basic Wages
1.	2.	3.	4.	5.	6.	7.	8.

Dearness allowance	Overtime	Other cash payments (Nature of payments to be indicated)	Total	Deduction if any (indicate nature)	NetAmt paid	Signature thumb impression of the workman	Initial contractor or his representative
9.	10.	11.	12.	13.	14.	15.	16.

Appendix - 'E'

WAGE SLIP

Name and address of contractor

Name and Father's/Husband/s Name of workman

Nature and location of work

For the Week/Fortnight/Month ending

1. No. of days worked
2. No. of Units worked in case of piece rate workers
3. Rate of daily wags/piece rate
4. Amount of overtime wages
5. Gross wages payable
6. Deductions if any
7. Net amount of wages paid

Sign of the Contractor

Appendix - 'E'

WAGE CARD

Wage Card No.

Name and address of Contractor | Date of Issue

Nature of work with location | Designation

Name of workman | Month/Fortnight

Rate of Wages

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Morning | Rate

Evening | Amount

Initial

Received from | the sum of Rs.of my wagon. | On account

Signature

The wage card is valid for one month from the date of issue.

Appendix 'F'

EMPLOYMENT CARD

Name and address of contractor

Name and address of establishment under whichThe contract is carried out

Nature and location of work

Name and address of Principal Employer

1. Name of the workman
2. S. Name in the register of workman employed
3. Nature of Employment/Designation
4. Wage rate (with particulars of unit incase of piece work)
5. Wage Period
6. Tenure of employment
7. Remarks

Signature of Contractor

Appendix - 'G'

(SERVICE CERTIFICATE)

Name and address of contractor

Nature and location of work

Name and address of workman

Age or date of birth Identification Marks Father's/Husbands Name

Name and address of establishment in under whichcontract is carried on

Name and address of Principal Employer

	Total period of which employed				
S. No.	From	To	Nature ofwork	Rate of wages (with particulars of unit in case of piece work)	Remarks
1.	2.	3.	4.	5.	6.

Signature

Appendix 'H'

REGISTER OF FINES

Name and address of contractor

Name and address of establishment in/ under whichcontract is carried on

Nature and location of work

Name and address of workman

Name and address of Principal Employer

S. No.	Name of workman	Father's/Husband Name	Designation/nature of employment	Act/Omission for which fine imposed	Date of offence
1.	2.	3.	4.	5.	6.

Whether workman showed cause against fine	Name of person in whose presence employee's explanation was heard	Wage period and wages payable	Amount of fine Imposed	Date on which fine realized	Remarks
7.	8.	9.	10.	11.	12.

Appendix - 'I'

LIST OF ACTS AND OMISSIONS FORWHICH FINES CAN BE IMPOSED

In accordance with rule of Labour Regulations, to be displayed prominently at the siteof work both in English and local language.

1. Willful insubordination or disobedience, whether alone or inother. combination with

2 Theft, fraud or dishonestly in connection with contractors beside a business orproperty of CLIENT

3 Taking or giving bribes or any illegal gratifications

4 Habitual late attendance.

5 Drunk-ness fighting riotous or disorderly or indifferent behaviour.

6 Habitual negligence.

7 Smoking near or around the area where combustible or other materials arelocked.

8 Habitual indiscipline.

9 Causing damage to work in the progress or to property of the CLIENT or of the contractor.

10 Sleeping on duty.

11 Malingering or slowing down work.

12 Giving the false information regarding name, age, fathers name etc.

13 Habitual loss of wage cards supplied by the employer.

14 Unauthorized use of employers properly of manufacturing or making of unauthorized articles at the work place.

15 Bad workmanship in construction and maintenance by skilled workers, which is not approved by the CLIENT for which the contractors are compelled to undertake rectifications.

16 Making false complaints and/or misleading statements.

17 Engaging on trade within the premises of the establishment.

18 Any unauthorized divulgence of business affairs of the employees.

19 Collection or canvassing for the collection of any money within the premises of an establishment unless authorized by the employer.

20 Holding meeting inside the premises without previous sanction of the employers.

21 Threatening or intimidating any workman or employee during the working hours within the premises

Appendix - 'J'

REGISTER OF DEDUCTION FOR DAMAGES OR LOSS

Name and address of contractor

Name and address of establishment in/ under whichcontract is carried on

Nature and location of work

Name and address of Principal Employer

S. No.	Name of workman	Father's/Husband Name	Designation/ nature of employment	Particulars of damage of loss	Date of damage/loss
1.	2.	3.	4.	5.	6.

				Date of recovery		
Whether workman showed cause against deductions	Name of person in whose presence employee's explanation was heard	Amount of deduction Imposed	No. of installment	First install ment	Last Install ment	Remarks
7.	8.	9.	10.	11.	12.	13.

Appendix - 'K'

REGISTER OF ADVANCES

Name and address of contractor

Name and address of establishment in/ under whichcontract is carried on

Nature and location of work

Name and address of Principal Employer

S. No.	Name of workman	Father's/ Husband's Name	Designation/ nature of employment	Wages period and wages payable	Date and amount of advance given
1.	2.	3.	4.	5.	6.

Purpose / for which advance made	No. of installments by which advance isto be paid	Date and amount of each installment repaid	Date on which last installment was repaid	Remarks
7.	8.	9.	10.	11.

Appendix - 'L'

REGISTER OF OVERTIME

Name and address of contractor

Name and address of establishment in/ under whichcontract is carried on

Nature and location of work

Name and address of Principal Employer

S. No.	Name of workman	Father's/ Husband's Name	Sex	Designation/ nature of employment	Date on which overtime worked
1.	2.	3.	4.	5.	6.

Total overtime worked or production in case of piece rated	Normal rateof wages	Overtime rate of wages	Overtime earning	Rate on which overtime wages paid	Remarks
7	8	9	10	11	12

SECTION 3

FORMS AND FORMATS

DECLARATION BY THE BIDDER REGARDING BIDDING DOCUMENT

We_____(Name of the Bidder) hereby represent that we have gone through and

Understood the Bidding Documents (including but not limited to) the Commercial & Technical Requirements/ Specifications and that our Bid has been prepared accordingly in compliance with the requirements stipulated in the said documents.

We are submitting the **Table of Contents of Bidding Documents and amendments, if any**,as part of our Bid duly signed and stamped on each page in token of our acceptance. We are not submitting the total Bidding Document as part of our Bid but undertake that said Bidding Document shall be deemed to form part of our Bid and in the event of award of work to us,all the parts shall be considered for constitution of Contract Agreement. Further, we shall sign and stamp each page of these documents as a token of Acceptance and as a part of the Contract in the event of award of Contract to us.

SIGNED FOR AND ON BEHALF OF

(BIDDER'S NAME .....)

LETTER OF WAIVER (ON LETTER HEAD OF BIDDER)

We ..... (Bidder's Name) hereby agree to fully comply with, abide by and accept without variation, deviation or reservation, all technical, commercial and other conditions whatsoever of the Bidding Document including any Addenda if any.

We further hereby waive, withdraw and abandon any and all deviations, variations, objections or reservations whatsoever thereto here to-before set out, given or indicated in our offer, clarifications, correspondence, communications, or otherwise, with a view that the price bid submitted shall be treated to conform in all respects, with the terms and conditions of the said Bidding Documents including all Addenda.

We further hereby confirm that the price quoted in the price bid are as per the provisions of the Bidding Document and there is no deviation in the price bid.

For & on behalf of Authorized signatory of Bidder

(BIDDERS'S NAME)

COMPLIANCE TO BIDDING DOCUMENT REQUIREMENT

(TO BE SUBMITTED ON THE LETTERHEAD OF BIDDER)

We.....(Bidder's Name) hereby agree to fully comply with, abide by and accept without variation, deviation or reservation all technical, commercial and other conditions of the Bidding Document and its Technical & Commercial Amendments, issued by CLIENT on behalf of Unitech.

We further hereby waive, withdraw and abandon any and all assumptions, deviations, variations, objections or reservations whatsoever hereto set out, given or indicated in our offer, clarifications, correspondence, communications, or otherwise with a view that the price bid and price implication (if any) submitted may be treated to conform to, in all respects, withthe terms and conditions of the said Bidding Document including all Technical and Commercial Amendments.

(SIGNATURE OF BIDDER'S AUTHORIZED REPRESENTATIVE)

UNDERTAKING FOR NON-ENGAGEMENT OF CHILD LABOUR

I/ We hereby declare that:

a) We are committed to elimination of child labour in all its forms.

b) Neither we nor any of our nominated sub-contractor(s) are engaging Child Labour in any of our work(s) in terms of the provisions of The Child Labour (Prohibition and Regulation) Act, 1986 and other applicable laws.

c) We as well as our nominated sub-contractor(s) undertake to fully comply with provisions of The Child Labour (Prohibition and Regulation) Act, 1986 and otherapplicable labour laws, in case the work is awarded to us.

d) It is understood that if I/We, either before award or during execution of Contract, commit a transgression through a violation of Article b /c above or in any other form, such as to put my/our reliability or credibility in question, the Owner is entitled to disqualify us from the Tender process or terminate the Contract, if already executed or exclude me / us from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Owner. Such exclusion may be for a period of 1 year to 3 years as per the procedure prescribed in the guidelines for holiday listing of the Owner.

e) I/We accept and undertake to respect and uphold the Owner's absolute right to resort to and impose such exclusion.

Place: Signature of Bidder:

Date: Name of Signatory

FORM FOR SUBMISSION OF PRE BID BIDDERS QUERIES

BIDDER'S QUERIES					FORM	
Sl. No.	REFERENCE OF BIDDING DOCUMENT				BIDDER'S QUERIES	REPLY
	PART/ SECTION	PAGE NUMBER	CLAUSE NUMBER	SUBJECT		
1	2	3	4	5	6	7

(SIGNATURE OF BIDDER)

APLICATION FOR EXTENSION OF TIME

(To be filled by the Contractor)

P A R T –I

1. Name of Contractor

2. Name of the work as given in the Agreement

3. Agreement No.

4. Estimated amount put to tender

5. Date of commencement work as per agreement

6. Period allowed for completion of work as per agreement

7. Date of completion stipulated as per agreement

8. Period for which extension of time has
   Been given previously

   Extension granted

a)	First extension vide Engineer-in-charge letter No… ……date	Months	Days
b)	2nd extension vide Engineer-in-charge letter No…… date	Months	Days
c)	3rd extension vide Engineer-in-charge letter No date	Months	Days
d)	4th extension vide engineer-in-charge letter No date	Months	Days

   Total extension previously given

9. Reasons for which extension have been previously given (copies of the previousapplication should be attached)

   Period for which extension is applied for:

10. Hindrances on account of which extension is applied for with dates on which hindrances occurred, and the period for which these are likely to last.
    a) Serial No.
    b) Nature of hindrance
    b) Date of Occurrence
    c) Period for which it is likely to last
    e) Period for which extension required for this particular hindrance.
    f) Over lapping period, if any, with reference to item

g) Net extension applied for

h) Remarks, if any

Total period for which extension is now applied for on account of hindrancesmentioned above..... Month/ days.

12. Extension of time required for extra work.

13. Details of extra work and on the amount involved:

a) Total value of extra work

b) Proportionate period of extension of time based on estimated amountput to tender on account of extra work.

14. Total extension of time required for 11 & 12

Submitted to the Engineer-in-Charges office.

SIGNATURE OF CONTRACTOR

DATE -

APPLICATION FOR EXTENSION OF TIME

(PART – II)

1. Date of receipt of application from Contractorfor the work in the Engineer-in-charge office.

2. Acknowledgement issued by Engineer-in-charge videhis letter No. dated

3. Engineer-in-charge remarks regarding hindrances mentioned bythe Contractor.

   i) Serial No.

   ii) Nature of hindrance

   iii) Date of occurrence of hindrance

   iv) Period for which hindrance, is likely to last

   v) Extension of time period applied for by the contractor

   vi) Over lapping period, if any, giving reference to itemswhich over lap

   vii) Net period for which extension is recommended.

   viii) Remarks as to why the hindrance occurred andjustification for extension recommended.

4. Engineer-in-charge recommendations.

The present progress of the work should be stated and whether the work is likely to be Completed by the date up to which extension has been applied for.
If extension of time is not recommended, what compensation is proposed to be levied under the agreement

SIGNATURTE OF ENGINEER-IN-CHARGE

APPROVAL OF ZONAL HEAD

PROFORMA FOR EXTENSION OF TIME

P A R T –III

To

NAME

ADDRESS OF THE CONTRACTOR

SUBJECT:

Dear Sir(s)

Reference your letter No_____ dated_____, in connection with the grant of extension of time for completion of the work…..

The date of completion for the above-mentioned work, is ..... as Stipulated in the agreement, dated .....

Extension of time for Completion of the above mentioned Work is granted Up to_____, without prejudice to the right of the CLIENT to recover compensation for delay in accordance with the provision made in Clause of the said agreement dated the ___/___/____. It is also clearly understood that the CLIENT shall not consider any revision in contract price or any other compensation whatsoever due to grant of this extension.

Provided that notwithstanding the extension hereby granted, time continue is and shall still to be the essence of the said agreement.

Yours faithfully,

FOR CLIENT

PROFORMA OF BANK GUARANTEEIN LIEU OF EMD (TENDER BOND)

(Judicial Stamp paper of appropriate value as per stamp Act-of respective state)

CLIENT,

In consideration of CLIENT, having its Registered Office at ... ... (Hereinafter called "CLIENT" which expression shall unless repugnant to the subject or context include its successorsand assigns) having issued Notice Inviting Tender No..... and M/s..... having its Registered Head Office at..... (Herein after called the "TENDERER") is to participate in the said tender for..... Whereas CLIENT, as a special case, has agreed to accept an irrevocable and unconditional Tender Bond Guarantee for an amount of Rs..... valid upto from the tenderer in lieu of made Cash Deposit of Rs required to be by the tenderer, as a condition precedent for participation in the said tender. We the (hereinafter called the "BANK") having its Registered, Office at..... and branch office at..... do hereby unconditionally and irrevocably undertake to pay to CLIENT immediately on demand in writing without demur/protest any amount but not exceeding Rs..... and Any such demand of made by CLIENT shall be conclusive and binding on us irrespective any dispute or differences that may be raised by the tenderer. Any change in the constitution of the tenderer or the Bank shall not discharge our liability under the guarantee.

We, the..... Bank, lastly undertake not to revoke this guarantee during its currency without the prior consent of CLIENT in writing and this guarantee shall remain valid upto. upon expiry of which, we shall be relieved of our liability under this guarantee thereafter.

PLACE: FOR AND ON BEHALF OF BANK

DATED:

WITNESS.

1.

2.

PROFORMA OF BANK GUARANTEE (PERFORMANCE)

(Judicial Stamp paper of appropriate value as per stamp Act-of respective state)

CLIENT,

Whereas the CLIENT, having its Registered Office at .... (hereinafter called "CLIENT" which expression shall assigns) include its successors and having awarded a work order/contract / supply(hereinafter called order No..... dated the contract) to M/s. (hereinafter called the contractor / supplier) at a total price of Rs..... subject to the terms and conditions contained in the contract.

WHEREAS, the terms and conditions of the contract require the contractor to furnish a bank guarantee for Rs..... (Rupees.....) being.....% of the total value of the contract for proper execution and due fulfillment of the terms and conditions contained in the contract.

We, the Bank, (hereinafter called the "Bank") do hereby unconditionally and irrevocably undertake to pay to CLIENT immediately on demand in writing and without protest/or demur all moneys payable by the contractor/supplier to CLIENT in connection with the execution/supply of and performance of the works/equipment, inclusive of any loss, damages, charges, expenses and costs caused to or suffered by or which would be caused to or suffered by CLIENT by reason of any breach by the contractor/supplier of any of the terms and conditions contained in the contract as specified in the notice of demand made by CLIENT to the bank. Any such demand made by CLIENT on the bank shall be conclusive evidence of the amount due and payable

(i) This guarantee shall be a continuing guarantee and irrevocable for all claims of CLIENT as specified above and shall be valid during the period specified for the performance of the contract.

(ii) We, the said bank further agree with CLIENT that CLIENT shall have the fullest liberty without our consent and without affecting in any manner our obligations and liabilities hereunder to vary any of the terms and conditions of the said contract or to extend time for performance of contract by the contractor from time to time or to postpone for any time or from time to time any of the powers exercisable by CLIENT against the contractor/supplier under the contract and forbear or enforce any of the terms and conditions relating to the said contract and we shall not be relieved from our liability by reason of any such variations or extension being granted to the contractor or for any forbearance, act or omission on the part of CLIENT or any indulgence by CLIENT to the contractor or by any such matter or thing whatsoever, which under the law relating to the sureties would, but for this provision, have effect of so relieving us.

(iii) This guarantee/undertaking shall be in addition to any other guarantee or security whatsoever CLIENT may now or at any time have in relation to the performance of the works/equipment and the company shall have full re-course to or enforce this security in performance to any other security or guarantee which the CLIENT may have or obtained and there shall be no forbearance on the part of the company in enforcing or requiring enforcement of any other security which shall have the effect of releasing the Bank from its full liability. It shall not be necessary for CLIENT to proceed against the said contractor/supplier before proceeding against the Bank.

(iv) This guarantee/ undertaking shall not be determined or affected by the liquidationor winding up, dissolution or change of constitution or insolvency of the supplier/ contractor, but shall in all respects and for all purposes operative until be binding and payment of all moneys payable to CLIENT in paid by the Bank.

(v) The Bank hereby waives all rights at any time inconsistent with the terms of this Guarantee and the otherwise effected or of the bank in terms hereof, shall not be otherwise effected or suspended by reasons of any dispute or disputes having been raised by the supplier/contractor (whether or not pending before any Arbitrator, Tribunal or Court) or any denial of liability by the supplier/contractor stopping or preventing or purporting to stop or prevent any payment by the Bank to CLIENT in terms hereof.

We, the said Bank, lastly undertake not to revoke this guarantee during its currency except with the previous consent of CLIENT in writing upon expiry of which, we shall be relieved from all liabilities under this guarantee thereafter.

Signed this ..... day of ..... at.....

For and on behalf of Bank

WITNESS.

1._____

2._____

PROFORMA OF BANK GUARANTEE
(FOR MOBILIZATION ADVANCE)

(Judicial Stamp paper of appropriate value as per stamp Act-of respective state)

CLIENT,

1.0 In consideration of the CLIENT, having its Registered Office at..... ..... (hereinafter called "CLIENT"which expression shall unless repugnant to the subject or context include his successor and assigns) having agreed under the terms and conditions of Contract No.....dated. made between..... and CLIENT in connection with..... (hereinafter called "the said contract") to make at the request of the Contractor a Mobilization Advance of Rs for utilizing it for the purpose of the Contract on his furnishing a guarantee acceptable to CLIENT, we the..... Bank Ltd., (hereinafter referred to the "the said Bank") and having our registered office at..... do hereby guarantee the due recovery by CLIENT of the said advance as provided according to the terms and conditions of the Contract. We. do hereby undertake to pay the amount due and payable under this Guarantee without any demur, merely on a demand from CLIENT stating that the amount claimed is due to CLIENT under the said Agreement. Any such demand made on the.....shall be conclusive as regards the amount due and payable by the.....under this guarantee and..... agree that the liability of the .....to pay CLIENT the amount so demanded shall be absolute and unconditional notwithstanding any dispute or disputes raised by the Contractor and notwithstanding any legal proceeding pending in any court or Tribunal relating thereto. However, our liability under this Guarantee shall be restricted to an amount not exceeding Rs..... which shall be valid up to .....

2.0 We ..... Bank further agree that CLIENT shall be the sole judge of and as to whether the amount claimed has fallen due to CLIENT under the said agreement or whether the said Contractor has not utilized the said advance or any part thereof for the purpose of the Contract and the extent of loss or damage caused to or suffered by CLIENT on account of the said advance together with interest not being recovered in full and the decision of CLIENT that the amount has fallen due from contractor or the said Contractor has not utilized the said advance or any part thereto for the purpose of the contract and as to the amount or amounts of loss or damage caused to or suffered by CLIENT shall be final and binding on us.

3.0 We, the said Bank, further agree that the Guarantee herein contained shall remain in full force and effect till the said advance has been fully recovered and its claims satisfied or discharged and till CLIENT certify that the said advance has been fully recovered from the said contractor and accordingly discharges this Guarantee subject, however, that CLIENT shall have no claims under this Guarantee after the said advance has been fully recovered, unless a notice of the claims under this Guarantee has been served on the bank before the expiry of the said Bank Guarantee in which case the same shall be enforceable against the Bank.

4.0 CLIENT shall have the fullest liberty without affecting in any way the liability of the Bank under this Guarantee or indemnity from time to time to vary any of the terms and conditions of the said Contract or the advance or to extend time of performance by the said Contractor or to postpone for any time and from time to time of the powers exercisable by it against the said Contractor and either to enforce or forbear from enforcing any of terms and conditions governing the said Contract or the advance or securities available to CLIENT and the said Bank shall not be released from its liability under these presents by any exercise by CLIENT of the liberty with reference to the matters aforesaid or by reasons of time being given to the said Contractor or any other forbearance, act or omission on the part of CLIENT or any indulgence by CLIENT to the said Contractor the law relating to or of any other matter or thing whatsoever which under sureties would but for this provision have the effect of so releasing the bank from its such liability.

PROFORMA OF BANK GUARANTEE

5.0 It shall not be necessary for CLIENT to proceed against the Contractor before proceeding against the Bank and the Guarantee herein contained shall be enforceable against the Bank notwithstanding any security which CLIENT may have obtained or obtain from the Contractor or shall at the time when proceedings are taken against the Bank hereunder be outstanding or unrealized.

6.0 We, the said Bank, lastly undertake not to revoke this Guarantee during its currency except with the previous consent of CLIENT in writing and agree that any change in the constitution of the said Contractor or the said Bank shall not discharge our liability hereunder.

Dated this .....day of.....

For and on behalf of Bank

(NAME AND DESIGNATION)

Dated:

PROFORMA OF BANK GUARANTEE

(IN LIEU OF SECURITY DEPOSIT)

(Judicial Stamp paper of appropriate value as per stamp Act-of respective state)

CLIENT,

In consideration of the CLIENT, having its Registered Office at ..... (hereinafter called "CLIENT") which upon the condition of the Supplier/Contractor furnishing Security forthe performance of the Supplier's obligations and/or discharge of the contractor's/supplier's liability under and/or in connection with the said supply contract upto a sum of Rs..... (Rupees only) We,..... ((hereinafter called "The Bank") which expression shall include its successors and assigns) hereby undertake and guarantee payment to CLIENT forthwith on the same day on demand in writing and without protest or demur of any and all moneys payable by the supplier/contractor to CLIENT under, in respect or in connection with the said contract inclusive of all the losses, damages, costs, charges and expenses and other moneys payable in respect of the above as specified in any notice of demand made by CLIENT to the Bank with reference to this guarantee upto and aggregate limit of Rs…....(Rupees ..... only) and the bank hereby agree with CLIENT that:

1. This Guarantee shall be continuing guarantee and shall ..... remain valid and Irrevocable for all claims of CLIENT and liabilities of Supplier/Cont actor arising up toand until midnight of.....

2. This Guarantee shall be in addition to any other Guarantee or Security whatsoever that CLIENT now or at any time have in relation to the Supplier's obligations/liabilities under and/or in connection with the said supply/contract, and CLIENT shall have full authority to take recourse or to enforce this Security inpreference to any other Guarantee or Security which CLIENT may have or obtain and no forbearance on the part of CLIENT in enforcing or requiring enforcement of any other Security shall have the effect of releasing the Bank from its liability hereunder.

3. CLIENT shall be at liberty without reference to the Bank and without affecting the full liability of the Bank hereunder to take any other security in respect of the Supplier's/Contractor's obligations and/ or liabilities under or in connection with the said supply/contract or to grant time and / or indulgence to the supplier / contractor or to increase or otherwise vary the prices or the total contract value or to release or to forbear from enforcement of all or any of the conditions under the said supply / contract and / or the remedies of CLIENT under any other security/ securities now or hereafter held by CLIENT and no such dealings, increase(s) or other indulgence(s) or arrangement(s) with the supplier / contractor or releasing or forbearance whatsoever shall have the effect of releasing the Bank from its full liability to CLIENT hereunder or prejudicing rights of CLIENT against the Bank.

4. This Guarantee shall not be determined or affected by the liquidation or windingup, dissolution or change of constitution or insolvency of the supplier / contractor but shall in all respects and for all purposes be binding and operative until payment of all moneys payable to CLIENT in terms thereof.

5. The Bank hereby waives all rights at any time inconsistent with the terms of this Guarantee and the obligations of the Bank in terms hereof shall not be otherwise affected or suspended by reason of any dispute or disputes having been raised by the supplier / contractor (whether or not pending before any Arbitrator, Tribunal or Court) or any denial or liability by the supplier/ contractor stopping/ preventing or purporting to stop or prevent any payment by the Bank to CLIENT in terms thereof.

PROFORMA OF BANK GUARANTEE

6. The amount stated in any notice of demand addressed by CLIENT to the Guarantor as liable to be paid to CLIENT by the supplier/contractor or as suffered or incurred by CLIENT on account of any losses or damages, costs, charges and / or expenses shall as between the Bank and CLIENT be conclusive of the amount so liable to be paid to CLIENT or suffered or incurred by CLIENT as the case may be and payable by the Guarantor to CLIENT in terms hereof subject to a maximum of Rs..... (Rupees .....only),

7. Unless demand or claim under this Guarantee is made on the Guarantor in writingwithin three months from the date of expiry of the Guarantee i.e. upto ..... the Guarantor shall be discharged from all liabilities under this Guarantee there under.

Notwithstanding anything contained herein before our liability under this guarantee isrestricted to Rs.. . . . . (Rupees..... only).

This guarantee will expire on..... Any claim under this Guarantee must be received by us within three months from the date of expiry.

For and on behalf of the Bank

Place Date

WITNESS:

1. 2.

PROFORMA OF BANK GUARANTEE
(FOR MOBILIZATION ADVANCE WITH INTEREST BEARING)

(Judicial Stamp per Stamp Act - paper of appropriate value as respective state)

CLIENT,

1. In consideration of the CLIENT, having its Registered Office at ..... (Herein after called "CLIENT" which expression shall unless repugnant to the subject: or context Include his successor and assigns) having agreed under the terms and conditions of Contract No. dated made between (name of the contractor) and CLIENT in connection with (name of work) (hereinafter called "the said contract") to make at the request of the Contractor a Mobilization Advance of Rs._____ carrying interest @ ... % p.a. for utilizing it for the purpose of the Contract on his furnishing a guarantee acceptable to CLIENT, we the Bank (hereinafter referred to the "the said Bank") andhaving our registered office at do hereby guarantee the due recovery by CLIENT of the said advance along with interest as provided according to the terms and conditions of the contract. We ... do hereby undertake to pay the amount due and payable under this Guarantee without any demur, merely, on a demand from CLIENT stating that the amount claimed is due to CLIENT under the said Agreement. Any such demand made on the said bank shall be conclusive as regards the amount due and payable by the said contractor under this guarantee and agree that the liability of the said bank to pay CLIENT the amount so demanded shall be absolute and unconditional notwithstanding any dispute or disputes raised by the Contractor and notwithstanding any legal proceeding pending in any court or Tribunal relating thereto. However, our liability under this Guarantee shall be restricted to an amount not exceeding Rs ..... Inclusive of interest @ ..... % p.a.

2. We the said bank further agree that CLIENT shall be the sole judge of and as to whether the amount claimed has fallen due to CLIENT under the said agreement or whether the said Contractor has not utilized the said advance or any part thereof for the purpose of the Contract and the extent of loss or damage caused to or suffered by CLIENT on account of the said advance together with interest not being recovered in full and the decision of CLIENT that the amount has fallen due from' contractor or the said Contractor has not utilized the said advance or any part thereto for the purpose of the contract and as to the amount or amounts of loss ordamage caused to or suffered by CLIENT shall be final and binding on us.

3. We, the said Bank, further agree that the Guarantee herein contained shall remainin full force and effect till the said advance has been fully recovered and its claims satisfied or discharged and till CLIENT certify Contractor, and accordingly discharges this Guarantee subject, however, that CLIENT shall have no claims under this Guarantee unless a notice of the claims under this Guarantee has been served on the Bank before the expiry of the said Bank Guarantee in which case the same shall be enforceable against the Bank.

4. CLIENT shall have the fullest liberty without affecting in any way the liability of the Bank under this Guarantee or indemnity from time to time to vary any of the terms and conditions of the said Contract or the advance or to extend time of performance by the said Contractor or to postpone for any time and from time to time of the powers exercisable by it against the said Contractor and either to enforce or forbear from enforcing any of terms and conditions governing the said Contract or the advance or securities available to CLIENT and the said Bank shall not be released from its liability under these presents by any exercise by CLIENT of the liberty with reference to the matters aforesaid or by reasons of time being given to the said Contractor or any other forbearance, act or omission on the part of CLIENT or any indulgence by CLIENT to the said 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 bank from its such liability.

5. It shall not be necessary for CLIENT to proceed against the Contractor before proceeding against the Bank and Guarantee herein contained shall be enforceable against the Bank notwithstanding any security which CLIENT may have obtained or obtain from the Contractor or shall at the time when proceedings are taken against the Bank hereunder be outstanding or unrealized.

6. We, the said Bank, lastly undertake not to revoke this Guarantee during its currency except with the previous consent of CLIENT in writing and agree that any change in the constitution of the said Contractor or the said Bank shall not discharge our liability hereunder.

Dated this…..…… day of……..……

Place:

Date:

Witness:

1.

FORM FOR GUARANTEE BOND

FOR ANTI-TERMITE TREATMENT

THIS AGREEMENT made this_____day of Two thousand _____between M/s_____(hereinafter called the guarantor of the one part and M/s CLIENT , hereinafter called the CLIENT hereinafter called theother part.

Whereas this agreement is supplementary to the contract hereinafter called the made contract dated_____ between the guarantor of the one part and CLIENT of the other part whereby the contractor inter-alia, understood to render the buildings and structures in the said contract recited, completed, termite proof. And whereas the guarantor agreed to give a guarantee to the effect that the said structure will remain termite proof for TEN YEARS to be so reckoned from the date after the maintenance period prescribed in the contract expires.

During this period of guarantee the guarantor shall make good all defects and for that matter shall replace at his risk and cost such wooden member as may be damaged by termite and in case of any other defect being found, he shall render the building termite proof at his cost to the satisfaction of the Engineer-in-charge and shall commence the works of such rectification within seven days from date of issuing notice from the Engineer-in-Charge calling upon him to rectify the defects falling which the work shall be got done by CLIENT by some other contractor at the guarantor's cost and risk and in the later case the decision of the Engineer-in-chargeas to the cost recoverable from the guarantor shall be final and binding.

That if the Guarantor fails to execute the Anti-Termite treatment or commits breaches hereunder then the Guarantor will indemnify CLIENT against all losses damages, cost expenses or otherwise which may be incurred by him by reasons of any default on the part of the guarantor in performance and observance of this supplemental Agreement. As to the amount of loss and or damage and/or cost incurred by CLIENT decision of the Engineer-in-charge will be final and binding on the parties.

In witness where of these presents have been executed by the Guarantor and by for and on behalf of CLIENT onthe day of month and year first above written.

Signed sealed and delivered by (Guarantor)

IN THE PRESENCE OF:
1.

2.

Signed for and on behalf of CLIENT by/ in presence of:

1.
2.

GUARANTEE TO BE EXECUTED BY CONTRACTOR FOR REMOVALOF DEFECTS AFTER COMPLETION IN RESPECT OF WATER PROOFING WORKS

The agreement made this ……..day of ……..Two thousand ….and ……..
between ..... (hereinafter called Guarantor of the one part) and the CLIENT (hereinafter called the Execution Agency of the other part).

WHEREAS this agreement is supplementary to a contract(hereinafter called theContract), dated .....and made between the GUARANTOR OF THE ONE part and the CLIENT of the other part, whereby the Contractor, inter-alia, undertook to render thebuildings and structures in the said contract recited completely water and leak proof.

AND WHEREAS the Guarantor agreed to give a guarantee to the effect that the said structures will remain water and leak proof for ten years from the date of handing over of the structure of water proofing treatment.

NOW THE GUARANTOR hereby guarantees that water proofing treatment given by himwill render the structures completely leak proof and the minimum life of such water proofing treatment shall be ten years to be reckoned from the date after the maintenance period prescribed in the contract.

Provided that the Guarantor will not be responsible for leakage caused by earthquakeor structural defects or misuse of roof or alteration and for such purpose.

a) Misuse of roof shall mean any operation, which will damage proofing treatment, like chopping of fire wood and things of the same nature which might cause damage to the roof.

b) Alternation shall mean construction of an additional storey or a part of the roof or construction adjoining to existing roof whereby proofing treatment is removed in parts

c) The decision of the Engineer-in-Charge with regard to cause of leakage shall be final

During this period of guarantee, the Guarantor shall make good all defects and in case of any defect being found render the building water proof to the satisfaction of the Engineer-in-Charge at his cost and shall commence the work for such rectification within seven days from the date of issue of notice from the Engineer-in-Charge calling upon him to rectify the defects failing which the work shall be got done by the CLIENT by some other Contractor at the guarantor's cost and risk. The decision of Engineer- in-Charge as to the cost, payable by the Guarantor shall be final and binding.

That if the Guarantor fails to execute the water proofing or commits breach there- under, then the Guarantor will indemnify the principal and his successors against all laws damage, cost, expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and / or damage and/ or cost incurred by the CLIENT, the decision of the Engineer-in-Charge will final and binding on the parties.

IN WITNESS WHEREOF these presents have been executed by the Obligator, ,,… and by ..... And for and on behalf of the CLIENT on the day, month and year first above written.

Signed, sealed and delivered by Obligator in the presence of-

1.

2.

Signed for and on behalf of the CLIENT by _____

In presence of:1.

2.

PROFORMA OF INDENTURE FOR SECURED ADVANCE OR CREDIT

THIS INDENTURE made this day of_____ Between _____ (hereinafter called the contractor) which expression shall where the Context as admits or implies be deemed to include his executor/administrators and assign of the one part and CLIENT, having its Registered Office at ..... (hereinafter called the Engineer) which expression shall where the context so admits or implies be deemed to include its successors and assignof the other part.

Whereas by an agreement dated (hereinafter called the saidContractor has agreement). The agreed to construct.....

And whereas the Contractor has applied to the Engineer that he may be or be given credited for materials brought by him to the site of the work subject to the said agreement for use in construction of the work.

NOW THIS INDENTURE WITNESSETH that in pursuance of the said agreement and in consideration of the sum of Rs._____ (Rupees_____ only) paid to the contractor by the Engineer. The receipt where the Contractor hereby acknowledges and of such advance or credited (if any) as may be made to him as aforesaid the Contractor hereby covenants and agrees with The Engineer and declaresas follows:

1. That all sums given as advance or credit by The Engineer to the Contractor as aforesaid shall be employed by the Constructor in or toward the execution of the said works and for no other purpose whatsoever.

2. That the material for which the advance or credit is given are offered to and accepted by The Engineer as security and are absolutely the Contractor's own property and free from encumbrances of any kind the Contractor will not make any application for or receives further advance or credit on the security or material which are not absolutely his own property and free from encumbrances of any kind and the Contractor shall indemnify The Engineer against any claims to any material in respect of which advance or credit has been made to him as aforesaid.

3. That the said material and all other material on the security of which any further advance or advances or credit may be given as aforesaid (hereinafter called the said materials) shall be used by the Contractor s solely in the execution of the said works in accordance with the direction of the Engineer and in terms of said agreement.

4. That the Contractor shall make at his own cost all necessary and adequate arrangement for the proper safe custody and protection against all risks of the said material and that until used in the construction as aforesaid the material shall remain at the site of the said works in Contractor's custody and on his responsibility and shall at all times be open to inspection by The Engineer. In the events of the materials or any part thereof being stolen, destroyed or damaged or becoming deteriorated in greater degree than in due to reasonable use and wear thereof the Contractor will replace the same with other materials of like quality of repair and make good the same as required by The Engineer. That said material shall not on any account be removed from the site of work expect with the written permission of The Engineer.

5. That the advance shall be repayable in full when or before Contractor receives payment from The Engineer of the price payable to him for the said work under the term and provisions of the said agreement. Provided that if any intermediate payments are made to the Contractor on account of work done then on the occasion of each payment The Engineer will be at liberty to make a recovery from the Contractor's bill from such payments by deducting there from the value of the said materials than actually used in the contraction and in respect of which recovery has not been made previously. The value of this purpose being determined in respect of each description of materials at the rates at which the amounts of the advance as made under these presents was calculated.

6. That if the Contractor shall at any time make at any default in the performance of observance in respect of any of the terms and provisions of the said agreement or of that provisions the total amount of the advance or advances that may still be owing to The Engineer, shall immediately on the happening of such default be repayable by the Contractor to The Engineer together with interest thereon at 12% p.a. from the date of respective dated to such advance or advances to the date of payment and with all costs. Damages and expenses incurred by The Engineer in or for recovery hereof or the Contractor hereby covenants and agrees with The Engineer to repay and pay the same respective to him accordingly.

7. That the Contractor hereby charges all the said materials with the repayment to The Engineer of all sums advances or credit as aforesaid and all costs. Charges, damages and expenses payable under these presents PROVIDED ALWAYS it is hereby agreed and declared that notwithstanding anything in the said agreement and without prejudice to the powers contained therein if and wherever the covenant for payment and repayment herein before contained shall be become enforceable and the money owing shall not be paid in accordance therewith. The Engineer may at any time thereafter adopt all or any of the following courses he may deem best:

   a. Seize the utilize the said material or any part thereof in the completion of the said works in accordance with the provision in that behalf contained in the said agreement debating the Contractor with the actual cost of effecting suchcompletion and the amount due in respect of advance or credit under these presents and crediting the Contractor with value of work done as if he has carried it out in accordance with the said agreement and the rates thereby provided if the balance is against the Contractor is to pay the same to the engineer on demand.
   b. Remove and sell by public action the seized materials or any part thereof and out of the money arising from the sale repay the engineer under these presents and pay over the surplus (if any) to the Contractor.
   c. Deduct all or any part of the moneys owing from any sums due to the contractor under said agreement.

8. Expect in the event of such default on the part of contractor as aforesaid,interest or the said advance shall not be payable.
9. That in the event of conflict between the provisions of these presents and the said agreements, the provision of these presents shall prevail and in the event of any dispute or difference arising over the construction or effect of these presents, the settlement of which has not been hereinbefore expressly provided for the same shall so far as is lawful be subject to jurisdiction of Delhi courts only.

IN WITNESS whereof the said the engineer and the contractor hereunto set their respective hands and seals the day year first above written. Signed

Sealed and delivered by

Contractor The Engineers

AGREEMENT FORM

This agreement made this day of (Month) (Year), between .....**,** a company incorporated under the Companies Act, 1956 having its Registered Office at ..... (hereinafter) referred to as the "CLIENT" which expression shall include its administrators, successors, executors and assigns) of the one part and M/s (NAME OF CONTRACTOR) (hereinafter referred to as the 'Contractor' expression shall which unless the context requires otherwise include its administrators, successors, executors and permitted assigns) of the other part.

WHEREAS, CLIENT, has desirous of construction of **(NAME OF WORK)** (hereinafter referred to as the "PROJECT") had invited tenders as per Tender documents vide NIT No.__.

AND WHEREAS **(NAME OF CONTRACTOR)** had participated in the above referred tender vide their tender dated_____and CLIENT has accepted their aforesaid tender and award the contract for (NAME OF PROJECT) on the terms and conditions contained in its Letter of Intent No.___and the documents referred to therein, which have been unequivocally accepted by **(NAME OF CONTRACTOR)** vide their acceptance letter dated _____resulting into a contract.

NOW THEREFORE THIS DEED WITNESSETH AS UNDER:

ARTICLE 1.0 – AWARD OF CONTRACT

1.1 SCOPE OF WORK

CLIENT has awarded the contract to (NAME OF CONTRACTOR) for the work of **(NAME OF WORK)** on the terms and conditions in its letter of intent No. ……. dated__and the documents referred to therein. The award has taken effect from **(DATE)** i.e. the date of issue of aforesaid letter of intent. The terms and expressions used in this agreement shall have the same meanings as are assigned to them in the "Contract Documents" referred to in the succeeding Article.

ARTICLE 2.0 – CONTRACT DOCUMENTS

a) The Contract document is comprised of following;
   i) Notice inviting tender (NIT)
   ii) Instructions to bidders (ITB)
   iii) General Conditions of Contract (GCC)
   iv) Special Conditions of Contract (SCC)
   v) Bill of Quantities
   vi) Technical specifications
   vii) Tender drawings
   viii) Amendments/Addendums, if any

b) **(NAME OF CONTRACTOR)** letter proposal dated_____and their subsequent communication:

i) Letter of Acceptance of Tender Conditions dated _____

ii) _____

iii) _____

2.2 CLIENT's detailed Letter of Intent No._____ dated_____including Bill of Quantities. Agreed time schedule, Contractor's Organisation Plant Chart and list of and Equipments submitted by Contractor.

2.3 All the aforesaid contract documents referred to in Para 2.1 and 2.2 above shall form an integral part of this Agreement, in so far as the same or any part thereof column, to the tender documents and what has been specifically agreed to by CLIENT in its Letter of Intent. Any matter inconsistent therewith, contrary or repugnant thereto or deviations taken by the Contractor in its "TENDER" but not agreed to specifically by CLIENT in its Letter of Intent, shall be deemed to have been withdrawn by the Contractor without any cost implication to CLIENT. For the sake of brevity, this Agreement alongwith its aforesaid contract documents and Letter of Intent shall be referred to as the "Contract".

ARTICLE 3.0 – CONDITIONS & CONVENANTS

3.1 The scope of Contract, Consideration, terms of payments, advance, security deposits, taxes wherever applicable, insurance, agreed time schedule, compensation for delay and all other terms and conditions contained in CLIENT's Letter of Intent No._____ dated_____are to be read in conjunction withother aforesaid contract documents. The contract shall be duly performed by thecontractor strictly and faithfully in accordance with the terms of this contract.

3.2 The scope of work shall also include all such items which are not specifically mentioned in the Contract Documents but which are reasonably implied for the satisfactory completion of the entire scope of work envisaged under this contract unless otherwise specifically excluded from the scope of work in the Letter of Intent.

3.3 Contractor shall adhere to all requirements stipulated in the Contract documents.

3.4 Time is the essence of the Contract and it shall be strictly adhered to. The progress of work shall conform to agreed works schedule/contract documentsand Letter of Intent.

3.5 This agreement constitutes full and complete understanding between the parties and terms of the presents. It shall supersede all prior correspondence to the extent of inconsistency or repugnancy to the terms and conditions contained in Agreement. Any modification of the Agreement shall be effected only by a written instrument signed by the authorized representative of both the parties.

3.6 The total contract price for the entire scope of this contract as detailed in Letterof Intent is Rs._____(Rupees _____ only), which shall be governed by the stipulations of the contract documents.

ARTICLE 4.0 – NO WAIVER OF RIGHTS

4.1 Neither the inspection by CLIENT or the Engineer-in-Charge or any of their officials, employees or agents nor order by CLIENT or the Engineer-in- Charge for payment of money or any payment for or acceptance of, the whole or any part of the work by CLIENT or the Engineer-in-Charge nor any extension of time nor any possession taken by the Engineer-in- Charge shall operate as waiver of any provisions of the contract, or of any power herein reserved to CLIENT, or any right to damage herein provided, nor shall any waiver of any breach in the contract be held to be a waiver or any other or subsequentbreach.

ARTICLE 5.0 – GOVERNING LAW AND JURISDICTION

5.1 The Laws applicable to this contract shall be the laws in force in India and jurisdiction of Delhi Court (s) only.

5.2 Notice of Default

Notice of default given by either party to the other party under the Agreement shall be in writing and shall be deemed to have been duly and properly served upon the parties hereto, if delivered against acknowledgment due or by FAX or by registered mail duly addressed to the signatories at the address mentioned herein above.

IN WITNESS WHEREOF, the parties through their duly authorized representatives have executed these presents (execution whereof has been approved by the Competent Authorities of both the parties) on the day, month and year first above mentioned at New Delhi.

For and on behalf of:	For and on behalf of:
(NAME OF CONTRACTOR)	M/s CLIENT
WITNESS:	WITNESS:
1.	1.

UNDERTAKING FOR FINANCIAL ASSISTANCE

(To be submitted by the contractor on non-judicial stamp paper of Rs. 100/- (Rupees Hundred only) purchased in Delhi & duly attested by Notary Public at Delhi)

CLIENT has awarded the (Name of the Project)..... vide LoA No. ..... Dated..... and Agreement dated.....…..., to M/s ....., having its Regd. Office/ Head Office at ....., hereinafter referred to as "contractor".

I, ... S/o, ... R/o ....., Working as....., duly authorized by the Company Resolution dated..... or on behalf of the Partnership (as the case may be), do hereby undertake and affirm that;

1. I am the Sole Proprietor/Authorized signatory of the contractor.

2. In terms of the Clause 24.2 of the General Conditions of Contract the contractor isentitled for payment only when CLIENT receives the corresponding payment against the bill from the client of the project. However, since no corresponding payment against the bill has been released by the client, on the contractor's specific request for financial assistance under Clause 24.4 of the General Conditions of Contract, CLIENT has shown its willingness to extend financialassistance amounting to Rs. ..... (Rs.....) to the contractor for use in execution of the aforementioned work(s).

3. The sum(s) released under the said Clause 24.4 as financial assistance by CLIENT shall be utilised by the contractor in or toward the execution of the said works andfor no other purpose whatsoever.

4. In consideration of CLIENT agreeing to pay Rs. ..... (Rs .....) I undertake that CLIENT shall be entitled to adjust/recover the said sum(s) released as financial assistance along with simple interest @. .....% p.a. on the said financial assistance from the contractor.

5. The sum(s) released under the said Clause 24.4 as financial assistance along with interest thereon shall be adjusted/recovered by CLIENT from the corresponding payment received from the client as stipulated in the said Clause 24.4 or at CLIENT's sole discretion from any other dues at any stage of the contract or from any other work(s) being executed by contractor on behalf of CLIENT.

Verified at .....this.....day of .....

Signature of the Authorized Person

ATTESTED BY (NOTARY PUBLIC) AT DELHI

Undertaking by the Contractor to have complied with the provisions of Contract Labour Regulation & Abolition) Act & Rules, EPF and ESI Obligations.

(To be submitted along with each RA/Final Bill)

I.....S/o Sh.....
.....authorised representative of M/s.....
....., do hereby declare and undertake as under:

2. That in the capacity of independent Contractor for M/s CLIENT at ---
---

---------- I and the sub-contractor engaged by me for the above said work, if any, have complied with the provisions of Contract Labour (Regulation & Abolition) Act, 1970 by holding a valid license under the Act andRules thereto. I have paid the wages **for the month of ----------**

These wagesare not less than the minimum rates applicable to all the employees and no other dues are payable to any employee.

3. That I and the sub-contractor engaged by me for the above said work, if any, have covered all the eligible employees under Employees Provident Funds and Miscellaneous Provisions Act, 1952 and the Employees State Insurance Act, 1948 and deposited the Contributions **for the months up to ----------**
-------and as suchno amount towards EPF/ESI contributions, whatsoever is payable, is pending.

4. I, further declare and undertake that in case any liability pertaining to my employees or towards employees of the sub-contractor engaged by me for theabove said work, if any, arises in future, I shall be fully responsible for all consequences. In case any liability is discharged by CLIENT due to my/ my sub-contractor's lapse, I undertake to reimburse the same or CLIENT is authorised to deduct the same from my dues at this Project orat any other Project.

Authorised Signatory
(Name & Seal of Company)

Date:_____

Witness:

1.

2.

QAP MODEL FOR RESTORATION OF DAMAGES FOR EXTERNAL SERVICES

AT

GLOBAL GATEWAY M.G ROAD GURUGRAM

CLIENT

UNITECH LTD
8th & 13th Floor, Tower-B
Signature Tower, South City-1,
Gurugram

PMC

REPL®
The Power of Knowledge

Rudrabhishek Enterprises ltd
A-6, Sector-58, Noida,
U.P - 201301

QUALITY ASSURANCE PLAN

To ensure the requisite quality of construction, the materials and work shall be subjected to quality control tests as described below. Executing Agency shall carry out the testing required as per agreement/ CPWD /MORTH and as per relevant IS codes. In addition to this, TPIA (Third Party Inspection Agency) will carry out regular tests as per the frequency stated below. Testing by TPIA shall be carried out in External/Field laboratory at the cost of Executing agency.

S. No.	Item	Test to be carried out	Relevant Code for Test Procedure	Testing Frequency (By Contractor / PMC.)	Testing (By TPIA)	Code of Conformity
1.	Cement	- Physical & Chemical Test	IS 4031	- Submission of MTC, - Each batch of cement (week wise as mentioned on cement bags)	- Once for every Source - Review of test reports and MTC's.	IS:1489 / IS:269
2.	Coarse Aggregate	- Percentage of soft or deleterious Material	IS 2386	Each Source	- Once for each source - Review of test reports	IS:383 (2016)
		- Particle Size		For every 45 cum or part thereof		
		- Surface Moisture - Crushing strength/ 10% fines value - Specific Gravity - Bulk Density - Impact Value		For every 40 cum or part thereof		
3.	Fine Aggregate/ Sand	- Organic Impurities	IS 2386	Every 20 cum or part thereof	- Once for each source Review of test reports	IS:383 (2016)
		- Particle Size		Every 40 cum or part thereof		
		- Silt Content	CPWD spec.	Every 20 cum or part thereof		
		- Bulking of sand		Every 20 cum or part thereof		

		- Surface Moisture		Before every concrete		
4.	Reinforcement Steel	Physical Test& chemical test	IS: 1608(1972) IS : 1599(1974)	- Submission of MTC - Under 10mm bars: • One sample (dia. wise) for each 25 MT (or part thereof) for consignment below 100 MT. • One sample (dia. wise) for each 40 MT (or part thereof) for consignment above 100 MT - 10mm -16mm bars: • One sample (dia. wise) for each 35 MT (or part thereof) for consignment below 100 MT. • One sample (dia. wise) for each 45 MT (or part thereof) for consignment above 100 MT. - Over 16mm bars: • One sample (dia. wise) for each 45 MT (or part thereof) for consignment below 100 MT. • One sample (dia. wise) for each 50 MT (or part thereof) for consignment above 100 MT.	• Review of MTC's • One test (for dia. where quantity exceed 50 MT) • Review of test reports	IS:1786 (2008)

5.	Reinforced Cement Concrete (Design Mix/ Ready Mix)	- Compressive Strength (cube test) - Slump test	IS-516 CPWD spec.	Every 50 cum for R.C.C. work (or part thereof) including in all other small location.	1. Random/Minimum one sets per 250 cum. 2. Review of test reports	IS:456
6.	Bricks	- Dimensional Tolerance	IS: - 3495 (1976)	- Per Source Lot Nos. of Bricks 2001 - 10000 40 10001 - 35000 60 35001 - 50000 80	Review of Test reports, Random Witness	IS:1077 (1992)
		- Water Absorption - Crushing Strength - Efflorescence		- Per Source Lot Nos. of Bricks 2001 - 10000 5 10001 - 35000 10 35001 - 50000 15		
7.	Water (Construction purpose)	- pH value - Limits of Acidity - Limits of Alkality - Percentage of solids a. Chlorides b. Suspended matters c. Sulphates d. Inorganic Solids e. Organic Solids	IS – 3025	- Per Source - Every 3 Month	Review of Test reports	IS : 456
8.	Earthwork (filling)	- OMC & MDD	IS 2720	- Each per source	Review of Test reports	CPWD Spec.
		- Field Dry density	IS 2720	- 1 test per 500 sqm for each layer		
9.	Anti-Termite	All tests as per IS : 8944	IS – 6313	Submission of MTC	Review MTC	IS: 8944
10.	Admixture	- Relative Density - PH	IS- 9103	- Submission of MTC - Once per 5 MT	Review MTC, test	IS: 9103

		- Ash Content - Chloride Content - Dry Material Content			reports	
11.	Structural Steel	- Tensile Strength - Bend Test - Flattening test (on tubes only)	IS : 1599 IS: 1608 IS: 2329 IS: 2328	- Submission of MTC - For each category/size of structural steel procured, one sample for every 50 MT or part thereof	Review MTC/ test reports	IS : 2062 IS : 4923 IS : 1161
12.	Flush Door	- End Immersion - Knife test - Adhesion test	IS : 2202	Submission of MTC - 1 sample for lot upto 26-50 nos. - 2 sample for lot upto 51-100 nos. - 2 sample for lot upto 101-150 nos. - 3 sample for lot upto 151-300 nos. - 4 sample for lot upto 301-500 nos - 5 sample for lot 501 and above.	Review of MTC/ test reports	IS : 2202
13.	AAC Block	- Oven dry density - Compressive Strength - Thermal conductivity in air dry condition	IS6441 IS 3346	- Submission of MTC. - 1 Sample for each 10000 blocks	Review MTC/ test reports	IS: 2185 Part-3
14.	Granite/Marble	- Moisture absorption - Specific Gravity	IS 1122 IS 1124	100 sqm or part thereof	Review of test reports	CPWD Spec.
15.	Timber	- Moisture content	CPWD Spec	Every one cum or part thereof.	Review of test reports	CPWD Spec.
16.	Vitrified/Ceramic Tiles	- Dimensions and surface quality - Physical properties - Chemical properties	IS 13630	3000 nos. or part thereof	Review MTC/ test reports	IS 15622
17.	EPDM	- Thickness	ASTM: D412	- Submission of MTC	Review of test	ASTM: D412

		- Unit Weight - Tensile Strength - Elongation % - Water Absorption - Tearing resistance - UV Resistance - Minimum service temperature - Maximum service temperature	ASTM: D471 ASTM: D624 ASTM: D1204 ASTM: D2240 ASTM: E154		reports	ASTM: D471 ASTM: D624 ASTM: D1204 ASTM: D2240 ASTM: E154
18.	Concrete Paver Blocks	- Dimension - Water absorption - Compressive strength - Abrasion resistance	IS: 15658-2006	- Per Brand - Per 10000 nos.	Review of test reports	IS: 15658-2006
19.	Aluminum Section	- Thickness of anodic / powder coating - 0.2% proof stress, - Tensile strength - Elongation - Chemical Composition	IS:504-1963 IS:1608-2005	- Per Brand - Per 5 MT	Review of test reports	IS: 733-1983 IS: 1285-2002 IS: 6477-1983 IS: 2673-2002
20.	Stainless steel	- Tensile Strength - Yield Stress - Elongation - Mass per meter - Chemical Composition	IS: 1663 IS: 228	- Submission of MTC - Per brand - Per 5 MT.	Review MTC & test reports	IS: 6911:1992
21	Fly ash	a) Total Chloride in percent by mass, max. b) Loss of Ignition in percent by mass, max. c) Fineness, specific surface in m2/kg. d) Compressive strength at 28 days in N/mm2, min.	a) IS: 12423 b) IS: 1727 c) Blaine's Permeability method	As per tender specification	Review of test reports	IS: 3812
22	PVC pipes	a) Hydraulic Test b) Reversion Test c) Vacuum Collapse d) Leakage of Joints	IS: 13592	- Submission of MTC	1. Review of MTC's 2. Review of Test Reports	IS: 13592

		e) Sulphide ash d) Titanium Content e) Vicat softening Temperature f) Impact Strength				
23	Test for WBM					
24	HDPE Paver Block test	- Dimension - Water absorption - Compressive strength - Abrasion resistance				

Note -

- Materials not mentioned above shall be tested as per relevant IS codes/specification as per tender.
- As stated above, testing by TPIA means sampling of materials in presence of Executing Agency/Client/PMC and witness (if required) the testing.
- Executing agency will ensure that all the equipment erected in the field laboratory is calibrated as per manufacturer's specification/ recommendations.
- For all Bought items, Executing agency shall regularly submit the Manufacturer's Test Certificates (Lot wise) for TPIA review.
- All materials shall be sent to laboratories approved by authorized representatives of Unitech Limited for testing. Sampling of materials shall be done by Executing Agency in presence of Client//PMC/TPIA.

S.C.C FOR RESTORATION OF DAMAGES FOR EXTERNAL SERVICES

AT

GLOBAL GATEWAY

M.G ROAD GURUGRAM

CLIENT

UNITECH LTD
8/13 Floor, Tower-B
Signature Tower, South City - 1Gurugram

PMC

Rudrabhishek Enterprises ltd
A-6, Sector-58, Noida, U.P-201301

INDEX

1. GENERAL

1.1. The "Owner" shall mean Unitech Limited, having its office at 13th Floor Tower-B, Signature Tower, South City - 1, Gurugram, Haryana 122001 and shall include its successor and assigns.

1.2. PMC means "Rudrabhishek Enterprises Ltd. (REPL)" having its office at A-6, A Block, Sector 58, Noida, Uttar Pradesh 201301 appointed by Owner for Project Management Consultancy Services.

1.3. TPIA means "Engineers India Limited", a company incorporated in India and having its registered office at 1, Bhikaiji Cama Place, New Delhi- 66 appointed by Owner for Third party inspection services for the works.

1.4. Read in conjunction with other provision: Special Conditions of Contract shall be read in Conjunction with the General conditions of Contract, Schedule of Rates, specification of work, Drawings and any other document forming part of this Contract wherever the context so require.

1.5. Every part Supplementary: Notwithstanding the sub-division of the document into these separate sections and volumes every part of each shall be deemed to be supplementary to and complementary of every other part and shall be read with and into the Contract so far as it may be practicable to do so.

1.6. GCC in variance with SCC: Where any portion of the General Conditions of Contract is repugnant to or at variance with any provisions of the Special Conditions of Contract, then unless a different intention appears, the provision(s) of the special Conditions of Contract shall be deemed to over-ride the provision(s) of the General Conditions of Contract only to the extent that such repugnancy of variations in the Special Conditions of Contract are not possible of being reconciled with the provisions of GCC.

1.7. Cost inclusive without specific provision: Wherever it is stated in this Bidding Document that such and such a supply is to be effected or such and such a work is to be carried out, it shall be understood that the same shall be effected/carried out by the CONTRACTOR at his own cost, unless a different intention is specifically and expressly stated herein or otherwise explicit from the context. Contract value (also referred to as Contract Price) shall be deemed to have included such cost.

1.8. Materials, design and workmanship: The materials, design and workmanship shall satisfy the applicable relevant Indian Standards, the job specifications (technical) contained herein & codes referred to. Where the job specifications stipulate requirements in addition to those contained in the standard codes and specifications, these additional requirements shall also be satisfied. In the absence of any Standard/Specifications/Codes of practice for detailed specifications covering any part of the work covered in this Bidding Document, the instructions/directions of Engineer-in-Charge will be binding on the CONTRACTOR.

1.9. Absence of any Specifications: In the absence of any Specifications covering any material, design or work(s) the same shall be performed/ supplied/ executed in accordance with standard Engineering practice as per the instructions/directions of the Engineer-in-Charge, which will be binding on the CONTRACTOR.

1.10. It will be Contractor's responsibility to bring to the notice of Engineer-In-Charge any irreconcilable conflict in the contract documents before starting the work(s) or making the supply with reference to, which the conflict exists.

1.11. Contractor has to prepare & submit a procurement schedule for all bought out items and schedule for finalization of specialized agencies for carrying out specialized works, if any defined in the contract within 30 days of award of work.

2. SCOPE OF WORK

The scope of work covered in this contract will be as described in **Annexure-I to SCC.**

3. SCOPE OF SUPPLY

The scope of supply covered in this contract will be as described in **Annexure-II to SCC**.

4. TIME SCHEDULE

4.1. The work shall be executed strictly as per time Schedule mentioned in **Annexure-III to SCC**. The period of completion given includes the time required for mobilization & demobilization as well as testing, commissioning, rectifications, if any, retesting and completion in all respects to the entire satisfaction of the Engineer-in-Charge.

4.2. The Contractor will prepare a programme of execution of work. This programme will take into account the time of completion mentioned above. The same shall be reviewed and approved by Engineer In-charge.

4.3. Monthly/weekly construction programme will be drawn up by the Contractor based on availability of work fronts and the construction programme as stated above. The Contractor shall strictly adhere to this Targets/ Programme. Each programme shall be reviewed by Engineer-In-Charge and the changes in the programme as deemed fit by Engineer In charge, shall be incorporated by contractor and shall strictly adhere to the finalized programme.

4.4. Contractor shall give every day report on category wise labour and equipment deployed along with the progress of work done on previous day in the proforma prescribed by the Engineer-in-Charge.

4.5. Contractor shall submit the Monthly Progress Reports. Format for the report shall be finalized in consultation with Engineer-In-Charge.

5. LAND, POWER, WATER AND OTHER FACILITIES

Construction Water and Construction Power shall not be provided to the Contractor by the Owner. The Contractor shall make his own arrangements for construction water and construction power at his own cost. Contractor shall make his own arrangements for establishing distribution network of Construction Power and water within the quoted rates, including compliance with local norms for taking construction power connection from local authorities. Nothing extra shall be paid on this account. The contractor shall make necessary efforts to ensure efficient use of potable water during construction / installation and reduce the use of water by using suitable curing compound/ admixtures and wet jute bags for curing (if applicable). Nothing shall be paid extra on this account. All supply & installations / fixtures & fittings / cabling for construction power shall be in the scope of the contractor without any additional cost to the Owner.

6. SITE CLEANING

6.1. The CONTRACTOR shall clean and keep clean the work site from time to time to the satisfaction of the Engineer In-Charge for easy access to work site and to ensure safe passage, movement and working. All dismantled material shall be shifted /removed by CONTRACTOR at his own cost to designated place.

6.2. If the work involves dismantling of any existing structure in whole or part, any RCC foundation, paved area care shall be taken to limit the dismantling up to the exact point and/ or lines as directed by the Engineer In-Charge and any damage caused to the existing structure beyond the said line or point shall be repaired and restored to the original condition at the cost and risk of CONTRACTOR to the satisfaction of the Engineer in Charge, whose decision shall be final and binding upon the CONTRACTOR.

6.3. Disposal of Debris/Surplus Earth (including contaminated earth) shall be done by Contractor at the designated disposal area(s) within the boundary limit. In case, due to space constraints, if Owner is not in a position to provide disposal area within the boundary limit, the Contractor has to dispose the same outside the boundary limit as per the provisions of the contract. While disposing the Debris/ Surplus Earth (including contaminated Earth) outside the boundary limit, the Contractor has to ensure that the same

are disposed off safely and fulfilling the local statutory regulations including but not limited to the guidelines/stipulations of State Pollution Control Board.

7. LIGHTING ARRANGEMENT AT SITE

The contractor shall provide uninterrupted lighting of the work place and surrounding areas during the night hours. No additional payment shall be made on this account and the cost in this regard is deemed to be included in the quoted rates.

8. INSTALLATION OF SIGN BOARDS

The contractor shall fix/ install Construction/safety sign boards of suitable sizes and in adequate numbers as per the instructions of Engineer in Charge before/during the execution of work. No additional payment shall be made to the contractor on this account.

9. TAXES, DUTIES AND LEVIES:

Clause No. 18 of GCC, as applicable, regarding Taxes & Duties is partially modified to following extent:

9.1. Goods and Services Tax:

9.1.1. "GST" shall mean Goods and Services Tax charged on the supply of material(s) and services. The term "GST" shall be construed to include the Integrated Goods and Services Tax (hereinafter referred to as "IGST") or Central Goods and Services Tax (hereinafter referred to as "CGST") or State Goods and Services Tax (hereinafter referred to as "SGST") or Union Territory Goods and Services Tax (hereinafter referred to as "UTGST") depending upon the import / interstate or intrastate supplies, as the case may be. It also means GST compensation cess, if applicable.

9.1.2. The quoted price for performance of the work & services pursuant to the Contract shall be deemed to be inclusive of all taxes, duties, levies and cess etc. except "Goods and Services Tax" (hereinafter called GST) (i.e. IGST or CGST and SGST/UTGST applicable in case of interstate supply or intra state supply respectively and GST compensation Cess if applicable).

9.1.3. Contractor shall be required to issue tax invoice in accordance with GST Act and/or Rules so that input credit, if available, can be availed by Owner. In the event that the Contractor fails to provide the invoice in the form and manner prescribed under the GST Act read with GST Invoicing Rules there under, Owner shall not be liable to make any payment on account of GST against such invoice.

9.1.4. GST shall be paid to the Contractor against receipt of tax invoice and proof of payment of GST to government (or auto-population of input tax credit on GSTIN portal). In case of nonreceipt of tax invoice or non-payment of GST by the Contractor (or non-auto-population of input tax credit on GSTIN portal), Engineer in charge/Owner shall withhold the payment of GST.

9.1.5. GST payable under reverse charge for specified services or goods under GST act or rules, if any, shall not be paid to the Contractor but will be directly deposited to the government by Engineer in charge/Owner.

9.1.6. Where Owner has the obligation to discharge GST liability under reverse charge mechanism and Owner has paid or is /liable to pay GST to the Government on which interest or penalties including GST thereon becomes payable as per GST laws for any reason which is not attributable to Engineer in charge/Owner or Input Tax credit (ITC) with respect to such payments is not available to Engineer in charge/Owner for any reason which is not attributable to Owner, then Engineer in charge/Owner shall be entitled to deduct/ setoff / recover such amounts against any amounts paid or payable by Engineer in charge/Owner to Contractor/Supplier.

9.1.7. The Contractor shall always comply with the requirements of applicable laws and provide necessary documents as prescribed under the Rules & Regulations, as applicable from time to time. In particular, if any tax credit, refund or any other benefit is denied / delayed to Owner due to any non-compliance / delayed compliance by the Contractor under the Goods & Service Tax Act (including but not limited to failure to submit the details of the sale on the GSTN portal, failure to pay GST to the Government or due to nonfurnishing or furnishing of incorrect or incomplete documents, non-filing of GST return by the Contractor), the Contractor shall be liable to reimburse Owner for all such losses and other consequences including, but not limited to the tax loss, interest and penalty.

9.1.8. Owner shall be entitled to recover such amount from the Contractor by way of adjustment from the next invoice, encashment of PBG or by way of any other means.

9.1.9. The contractor will be under obligation for charging correct rate of tax as prescribed under the respective tax laws. Further the contractor shall avail and pass on benefits of all exemptions/concessions available under tax laws.

9.1.10. The contractor will be liable to ensure to have registered with the respective tax authorities and to submit self-attested copy of such registration certificates and the Contractor will be responsible for procurement of material in its own registration (GSTIN) and also to issue/arrange its own Road Permit/E-way Bill, if applicable, and comply with the statutory Laws of the concerned state.

9.1.11. Any error of interpretation of applicability of taxes/ duties by the contractor shall be to Contractor's account. The classification of goods & services as per GST act and charging of correct rate of tax as prescribed under the respective tax laws should be correctly done by the contractor to ensure that input credit benefit is not lost to Owner on account of any error on the part of the Contractor or its Sub-Contractor / Vendor. Owner will not have any additional liability towards payment of applicable taxes & duties as a result of wrong assessment/interpretation of applicable taxes & duties by the Contractor.

9.1.12. GST shall be applicable on all advance payments as per GST rules.

9.2. STATUTORY VARIATION

No variation on account of taxes and duties, statutory or otherwise, shall be payable to Contractor except for the following:

9.2.1. GST: If after the due date of submission of last price bid and upto the contractual completion period (including extended contractual completion period for the reasons attributable to Owner or due to Force Majeure condition), any increase/decrease occurs in the applicable rate of GST, the variation in such GST shall be to Owner's account and shall be adjusted (increase/decrease) to / from the Contractor's invoices based on the documentary evidence.

9.2.2. Any increase in GST after the contractual completion period (including extended contractual completion period for the reasons attributable to Owner or due to Force Majeure condition) shall be to Contractor's account. However, any decrease in the rate of GST shall be passed on to Owner.

Note: Statutory variations on IGST {included in quoted prices) in case of imported materials from outside India in Contractor’s name {i.e., for Indian Bidders) shall be to Contractor account.

9.3. New Taxes & Duties

9.3.1. All new taxes, duties, cess, levies notified or imposed after the due date of submission of last/ final price bid before the contractual date of completion of work (including extended contractual completion period for the reasons attributable to Owner or due to Force Majeure condition), shall be to Owner’s account. These shall be reimbursed against documentary evidence. However, in case of delay attributable to contractor, any new or additional taxes and duties imposed after time for Completion, as above, shall be to contractor's account.

9.4. ANY OTHER TAXES AND DUTIES AND OTHER LEVIES

9.4.1. Except as herein specified above, the contractor shall be liable for and shall pay any and all fees, cesses, taxes, duties and levies assessable against contractor in respect of or pursuance to the Contract.

9.4.2. In addition, the Contractor shall be responsible for payment of all duties, levies, and taxes assessable against the Contractor or Contractor's employees or Sub-contractor's whether corporate or personal or applicable in respect of property.

9.4.3. The Contractor shall accept full and exclusive liability at his own cost for the payment of any and all taxes, duties, cesses and levies howsoever designated, as are payable to any government, local or statutory authority in any country other than India as are now in force or as are hereafter imposed, increased or modified and as are payable by the Contractor, his agents, Sub-contractors and Suppliers and its/their respective employees for or in relation to the performance of this Contract. The Contractor shall be deemed to have been fully informed with respect to all such liabilities and shall further be deemed to have considered and included the same in his bid and the quoted Price shall not be varied in any way on this account.

9.5. Tax Deduction at Source (TDS), if applicable

9.5.1. TDS under GST, if applicable, shall be deducted from contractor's bill at applicable rate and a certificate as per rules for tax so deducted shall be provided to the Contractor.

9.5.2. The CONTRACTOR shall be exclusively responsible and liable to deduct TDS, if applicable, from the sub-contractors / sub-vendors and remit the same to the Govt. within the due date, as per GST legislation(s).

9.6. INCOME TAX & CORPORATE TAX

9.6.1. The CONTRACTOR shall be exclusively responsible and liable to pay all direct Taxes including income tax, profession tax and wealth tax on any payments arising out of the Contract, whether payable in India or in any other jurisdiction.

9.6.2. The CONTRACTOR shall be responsible for ensuring compliance with all provisions of the direct tax laws of India including, but not limited to, the filing of appropriate Returns and shall promptly provide all information required by the owner for discharging any of its responsibilities under such laws in relation to or arising out of the CONTRACT.

9.6.3. Contractor shall indemnify Owner against any and all liabilities or claims arising out of this contract for such taxes including interest and penalty which any such tax authority may assess or levy against the Owner or its representatives.

9.6.4. Tax shall be deducted at source by Owner from all sums due to an Indian tax resident Contractor in accordance with the provisions of Indian Income Tax Act/Rules as in force at the relevant point of time.

9.6.5. Corporate Tax Liability, if any, shall be to Contractor's account.

9.6.6. Owner shall issue a Tax deduction certificate to the Contractor evidencing the Tax deducted or withheld and deposited by Owner on payments made to the Contractor to enable the Contractor to claim the credit of the Tax deducted by Owner.

9.7. CONSTRUCTION WORKERS CESS / LABOUR CESS

9.7.1. The Contractor shall comply with the Building and Other Construction Workers' Welfare Cess Act, 1996, the Building and other Construction Workers' Rules, 1998 and the Building and Other Construction Workers Welfare Cess Rules, 1998.

9.7.2. Prices quoted by the bidder shall deemed to be inclusive of construction workers cess /labour cess.

9.7.3. Cess as per the prevailing rate, shall be deducted at source from bills of the Contractor and remitted to the "Secretary, Building and Other Construction Workers Welfare Board" of the concerned State by the Owner as per the regulations. The Contractor shall be responsible to submit final assessment return of the cess amount to the assessing officer after adjusting the cess deducted at source.

10. STATUTORY APPROVALS

10.1. Obtaining statutory approvals, required as defined in Contractor's scope under Technical Scope of Work, shall be the responsibility of the Contractor. Contractor shall arrange the inspection of the works by the authorities and necessary co-ordination and liaison work in this respect. The application on behalf of the Owner for submission to relevant authorities along with copies of required certificates complete in all respects shall be prepared and submitted by the Contractor n time so that the actual construction /commissioning of the work is not delayed for want of the approval / inspection by concerned authorities.

10.2. All expenditure related to statutory approvals, i.e., statutory fees, cost for laying of infrastructure as per requirement of concerned authority etc. shall be reimbursed to the contractor as per actual by the Owner on production of documentary evidence.

11. SITE ORGANIZATION AND CONSTRUCTION EQUIPMENT

Provisions of GCC stands modified to the following extent:

11.1. SITE ORGANISATION

11.1.1. In addition to the provisions of relevant clause of General Conditions of Contract (GCC) and subject to the provisions in the contract document and without prejudice to Contractor's liabilities and responsibilities to provide adequate qualified skilled, semiskilled and unskilled personnel on the work, contractor shall deploy the Key Construction Personnel as specified in **Annexure-IV** to this SCC and augment the same as decided by the Engineer-in-Charge depending upon the site requirement & the exigencies of work so as to complete all works within the contracted time schedule and without any additional cost to Engineer in charge/Owner.

11.1.2. Qualification and experience and penalty for non-mobilization of Key Supervisory Personnel to be deployed for this work shall be as per **Annexure-IV** to this SCC**.**

11.2. CONSTRUCTION EQUIPMENT

11.2.1. In addition to the provisions of relevant clause of General Conditions of Contract (GCC) and associated provisions thereof, the Contractor shall without prejudice to his overall responsibility to execute and complete the work as per specifications and time schedule, progressively deploy **Equipments & Machinery** as specified in **Annexure-V to this SCC** as and when required and augment the same as decided by the Engineer-in-Charge depending on the exigencies of the work so as to complete all works within the contracted time schedule and without any additional cost to Owner. No equipment shall be supplied by the Owner.

12. WORK IN MANSOON SEASON

12.1. During monsoon and other periods, it shall be the responsibility of the CONTRACTOR to keep the construction work site free from water, at his own cost by deploying suitable dewatering pumps.

12.2. Contractor must take due cognizance of the presence of rainy season / days in his scheduled completion period and accordingly, shall take all necessary actions to protect, reorganize and progress the work, uninterruptedly during the monsoon period.

12.3. Contractor to collect all meteorological data from the local authority and collect necessary information about the intensity, frequency and period of rainy season.

12.4. No extension of time due to interruption /suspension of work, water logging, reduced /slowing down of progress, non-availability of manpower etc., whatsoever may be the reason, shall be tenable on account of monsoon and further no claim for stand-by of manpower and equipment, other resources etc. shall be paid for.

12.5. Contractor shall procure and stock sufficient quantities of materials viz. coarse and fine aggregates, bricks etc. adequate for the planned volume of the work during the monsoon, well in advance of the onset of same so that progress of work is not affected on this account. Engineer in charge shall be free to inspect such storing arrangement at any appropriate time as deemed fit by them.

12.6. All electrical installations, equipment shall be placed on plinths above ground under proper rain shed to avoid any inundation, short circuit and hazards of electrocution.

12.7. Contractor shall organize his work particularly for the underground activities in foundation, excavation in a way that instead of opening up fronts everywhere and in scattered locations (provided there is no priority concern) only those many structures and /or areas should be worked where concerted and continuous effort and resources could be engaged to bring the work up to the desired level expeditiously to minimize any rework resulting from water accumulation / rain.

12.8. Price shall be including of all costs and expenses including supply of materials required for monsoon protection like tarpaulins, shed, structural, GI sheet etc. for the above provisions and no separate payment shall be made on this account.

13. TERMS OF PAYMENT

13.1. Basis and terms of payment for making "On Account Payment" shall be as set out in **Annexure-VI to SCC**. All payments will be made through EFT.

14. ROUNDING OFF

14.1. All payments to and recoveries from the bill of CONTRACTOR shall be rounded off to the nearest Rupee. Wherever the amount to be paid/ recovered consists of a fraction of a Rupee (Paise), the amount shall be rounded off to the next higher rupee if the fraction consists of 50 (fifty) paise or more and if the fraction of a Rupee is less than 50 (fifty) paise, the same shall be ignored.

15. HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT

15.1. The Contractor, during entire duration of the Contract, shall adhere to HSE requirement as enclosed in the Bidding Document as **Annexure-VII to SCC.**

15.2. Safety Regulations

The Contractor shall abide by all safety regulations and ensure that safety equipment for specific job as stipulated in the factory act/ safety handbook is issued to workers during execution of work, failing which all the works at site shall be suspended.

15.3. Security

The Contractor shall make proper security arrangement at his own cost for the materials at site & the works till handing over of the works to the Owner/Engineer in charge.

16. COMPLETION DOCUMENTS

The following documents shall be submitted in soft copy and hard binder by the Contractor in 4 (Four) sets as a part of completion documents:

i. Test Certificate, Warrantee/Guarantee certificates and copies of Purchase Order (Required for warrantee/Guarantee).

ii. All other documents as specified in the respective specifications.

iii. Complete set of "as-built" drawings showing therein corrections and modifications (if any) made during the course of execution of the Works, signed by the Engineer-in-Charge;

iv. Declaration by the Contractor that it has duly cleared any and all of the dues payable by it to its labourer, employees, piece rate workers (PRWs), and other personnel, Subcontractors, suppliers, vendors, GST income Tax, entry tax, excise, customs duty, provident fund, employees state insurance (ESI) and royalties, or other amounts payable under any Applicable Law (if any) and Certificate towards No claim other than claim in Final bill.

17. COORDINATION WITH OTHER AGENCIES

17.1. Work shall be carried out in such a manner that the work of other agencies operating at the site is not hampered due to any action of the Contractor. Proper coordination with other agencies will be Contractor's responsibility. In case of any dispute, the decision of Engineer-in-charge shall be final and binding on the Contractor.

17.2. If and when required for the coordination of the works with other agencies involved at site, the CONTRACTOR shall within the scope of work, re-route and/or prepare approaches and working areas as may be necessary.

18. EXECUTION OF ELECTRICAL WORKS

18.1. The Contractor shall engage an approved electrical agency for execution of electrical works, holding valid electrical Contractor licence. In case Contractor himself executes electrical works then he shall arrange valid electrical Contractor licence before start of electrical works at site.

19. SUB CONTRACTING

19.1. If the CONTRACTOR is required to engage a Sub-Contractor for any part of work, then such Sub-Contractors shall have prior proven experience of similar work and shall require specific approval by Engineer-in-charge.

19.2. The CONTRACTOR will submit to the Engineer in charge for approval, the details of Sub-Contractors as per the format attached with SCC (**Annexure-VIII to SCC**) for approval. CONTRACTOR shall ensure that very competent and resourceful agencies with proven track record and performance should be proposed for the work to be sub-contracted.

19.3. However, **approval of subcontracting a job to an agency does not and shall not relieve the responsibility of the Contractor from his obligations and liabilities under the Contract including timely completion of the job with desired quality as per terms and conditions of the Contract**. In such event, the Contractor shall take full control of their subcontractors' performance and shall be responsible to provide all technical, financial and infrastructure support as required from time to time for the best interest of the project irrespective of the fact that such provision is within or not in the scope of the Contractor after subcontracting it to their subcontractor. The Engineer-in charge's decision for approving a subcontractor shall be final and binding on the Contractor.

20. MAKE OF MATERIALS

The materials required to be supplied by the Contractor under this contract shall be procured from the list of approved manufacturers enclosed in the contract document. Where the makes of materials are not indicated in the Bidding document, Contractor shall furnish the details of makes and shall obtain prior approval of Engineer-in-Charge before placing order.

21. MATERIALS TO BE SUPPLIED BY THE OWNER

No free issue material will be supplied by Owner to the contractor against the subject works. However, if any material is available in the stores of Owner, the same shall be issued to the contractor at the rates of material mentioned in the **Annexure-IX to SCC.** The contractor shall submit the reconciliation statement of the materials issued by the owner as mentioned above.

22. GENERAL GUIDELINES DURING AND BEFORE ERECTION

22.1. The CONTRACTOR shall be responsible for organizing the lifting of the equipment in the proper sequence for orderly progress of the work and to ensure that access routes for erecting the other equipments are kept open. The installation of machines at different floor levels /terrace and at basement shall be carried out by contractor with due care not to damage the existing finishes of the building and shall augment if required, necessary machineries/lifting crane for installation purpose. The quoted prices shall include the cost towards the same.

22.2. Orientation of all foundations, elevations, lengths and disposition of anchor bolts and diameter of holes in the supports and saddles shall be checked by the CONTRACTOR well in advance of the installation. Rectifications, including chipping of foundations, shall be carried out where necessary in consultation with the Engineer-in-Charge. If a structural member needs to be dismantled to facilitate the equipment erection, this shall be done by the CONTRACTOR after ensuring proper stability of the main structure in consultation with the Engineer-in-Charge. All such dismantled members shall be put back in position to the satisfaction of Engineer-in-Charge after the completion of the equipment erection.

22.3. During the performance of the work the CONTRACTOR shall at his own cost keep structures, materials and equipment adequately braced by guys, struts or other approved means which shall be supplied and installed by the CONTRACTOR as required till the installation work is satisfactorily completed. Such guys, shoring, bracing, strutting, planking supports etc. shall not interfere with the work of other agencies and shall not damage or cause distortion to other works executed by the CONTRACTOR or other agencies.

22.4. The CONTRACTOR shall duly comply with manufacturer(s) recommendations and detailed specifications for the installation of the various equipment and machines. Various tolerances required as marked on the drawings and/or in accordance with the specifications and/or instructions of the Engineer-in-charge shall be maintained. Verticality shall be verified with the Total-station and shall be maintained.

23. REGISTRATION OF THE CONTRACTOR WITH STATUTORY AUTHORITIES

Before submission their first invoice for Running payment, the Contractor shall register themselves and the contract at their own cost with the Reserve Bank of India, Income Tax, GST and such other statutory authorities, as may be required under the rules and regulations governing in India. The Contract Price shall be deemed to include all costs towards the same. A copy of all documents related to all such registration shall be submitted to Owner for record.

24. INSURANCE

24.1. Before commencing the execution of work, the Contractor shall obtain "Contractor's All Risk" (CAR) Policy for the contract value at his own cost & expense in the joint names of Owner & Contractor (Owner shall be the first beneficiary). However, wherever the contractor already has the Insurance policies for their worker/equipments/vehicles etc. proposed to be used at project site, the contractor shall have the option either to get a new Insurance policy in the Joint name of Owner and contractor or get the endorsement of existing policies from Insurers in the Joint name of owner and contractor.

24.2. All other insurance required under Indian Law and Regulations including workmen compensation, employer's liability insurance, Third Party Liability etc. if these are not covered in "CAR" policy shall be taken by Contractor. The Contractor shall keep all the Insurance Policies as mentioned above valid till the Completion of work.

25. SECURITY AND SECURITY ARRANGEMENT

25.1. Contractor shall provide adequate number of watch and ward personnel on round the clock basis with limited/restricted access to the site through gates manned by the Security personnel. The responsibility of safe custody of materials, works in progress, office of Owner/Engineer-in-charge, building and all services etc. lies with Contractor, till handing over of the works to Owner.

25.2. Contractor shall ensure adequate illumination of worksite on a continuous basis to ensure safe working and to avoid pilferage/theft of materials lying in work site. The rates quoted shall be deemed to be inclusive of this scope and the CONTRACTOR is not eligible for any additional payment in this regard. This is to be implemented from start of work till handing over of the works to the owner.

25.3. The project site during execution shall be properly barricaded with Pre-coated sheets/GI/MS sheets of at least 7.0 meters height with proper supports/foundations, to isolate the site from surroundings to avoid any disturbance and to avoid the entry of unauthorized personnel. Expenditure towards this activity is considered to be included in the quoted rates.

25.4. The Contractor for its own interest shall make adequate security arrangement for protection of the work site and to prevent unauthorized entry to protect their materials and equipment at no extra cost to the Owner.

25.5. If at any place/site, entry is restricted by the Owner, the CONTRACTOR shall then arrange to obtain through the Engineer-in-Charge, well in advance, all necessary entry permits/ gate passes for his staffs and labourer and entry and exit of his men and materials shall be subject to vigorous checking by the security staff. The CONTRACTOR shall not be eligible for any claim or extension of time whatsoever on this account.

25.6. The Contractor shall at his own cost construct their centralized store for safe keeping of the materials/equipment and for proper accounting of the material/equipment being used in this project.

26. EMPLOYMENT OF LOCAL RESOURCES

26.1. The Contractor shall ensure that local agencies/labour, skilled and/or unskilled, to the extent available shall be employed in this work. In case of non-availability of suitable labour in any category out of the above persons, labour from outside may be employed.

26.2. The contractor shall not recruit personal of any category from among those who are already employed by the other agencies working at site but shall make maximum use of local labour available.

27. SAMPLES OF MATERIALS

27.1. The contractor shall submit to the Engineer-in-Charge samples of materials as per specifications to be used in the work for approval before bringing bulk supplies and before commencing the particular work. These approved samples shall be preserved and retained in the custody of the Engineer-in-Charge as standard of materials till the completion of the work. The cost of such samples shall be borne by the contractor and nothing shall be payable on this account.

27.2. Sub-standard Material/Work: In case any material/ work is found sub-standard, the same shall be rejected by the Engineer-in-Charge and the same shall be removed from the site of work within 48 hours, failing which the same shall be got removed by the Engineer-in-Charge at the risk and cost of the contractor without giving any further notice and time.

27.3. Testing of Materials: Even ISI marked materials may be subjected to quality test at the discretion of the Engineer-in-Charge besides testing of other materials as per the specifications described for the item/ material. Whenever ISI marked materials are brought to the site of work the contractor shall, if required by the Engineer-in-Charge, furnish manufacturer test certificate or test certificate from approved testing laboratory to establish that the material procured by the contractor for incorporation in the work satisfy the provisions of IS Codes relevant to the material and/ or the work done.

27.4. The contractor shall arrange carrying out of all tests required under the agreement through the laboratory as approved by the Engineer-in-Charge. The cost of tests shall be borne by the contractor. In addition contractor shall establish a laboratory at site of work at his own cost. The laboratory shall be equipped with all necessary equipment as per requirement of specification or as per direction of Engineer-in-Charge. Establishing the laboratory at site shall not absolve the contractor from fulfilling the criteria of getting the test done in independent Lab. The decision of the Engineer-in-Charge of allowing any test in the site laboratory or any other laboratory shall be final.

27.5. Before execution of finishing items like plaster, flooring & painting etc, the contractor shall make samples for finishing items and get the approval well in advance from the Engineer-in-Charge.

28. PROTECTION OF EXISTING FACILITIES

28.1. Contractor shall obtain full details of all existing and planned underground services from client/PMC and shall follow these closely at all times during the performance of work. Contractor shall be responsible for location and protection of all underground lines, structures, power cables, OFC cables etc. at his own cost.

28.2. Despite all precautions, should any damage to any structure / utility etc. occur, the Contractor shall contact Engineer in charge and Contractor shall forthwith carry out repair at his expenses under the direction and to the satisfaction of Engineer-in-Charge. If the same is not attended by the Contractor within the said time period, will be get done at panel rates through other agency at Contractor‘s risk and cost.

28.3. Contractor shall take all precautions to ensure that no damage is caused to the existing pipelines, cables etc. during services.

29. NON WAIVER:

29.1. Failure of Engineer in charge to insist upon strict performance of any of the terms & conditions hereof, or failure or delay to exercise any rights or remedies provided herein or by law or failure to properly notify Contractor in the event of breach or the acceptance of or payment for any services hereunder or approval of interim reports, shall not release

Contractor of any of the warranties or obligations of this order and shall not be deemed a waiver of any right of Engineer in charge/Owner to insist upon strict performance hereof or of any of its rights or remedies as to any such services regardless when received or accepted, nor shall any purported oral modification or rescission of this Order by Engineer in charge operate as a waiver of the terms hereof.

30. PHOTOGRAPHS

The contractor shall take adequate number of photographs of the work as directed by the Engineer-in-Charge and submit the same as part of monthly progress report in the formats approved by Engineer-In-Charge. Nothing extra shall be payable to the contractor on this account.

31. WORK TO BE CARRIED OUT BY SPECIALISED AGENCIES

The contractor, after obtaining approval from Engineer-in-Charge shall engage specialized agencies in respect of the following works at site, in case agency does not have in-house expertise.

- Anti-termite treatment.
- Water proofing works.
- Fire Fighting works
- Electrical / LV Works
- HVAC Works
- BMS works
- Horticulture works
- Tree Transplantation Works, if any
- Any other work as directed by Engineer-in-Charge

Following the Letter of Acceptance, the CONTRACTOR will submit to Engineer in charge/ OWNER for approval the details of Sub-Contractors. CONTRACTOR shall ensure that very competent and resourceful agencies with proven track record and performance should be proposed for the work to be sub-contracted for above specialized works.

32. CEMENT AND CEMENT GODOWN

Cement shall be procured by Contractor in line with the technical specifications and requirement of the contract.

The cement shall be procured directly from the reputed manufacturers/ stockiest as per list of approved makes. Relevant vouchers and test certificates will be produced as and when required by Engineer-in-charge. The cement shall be stored by the contractor in such suitable covered and lockable stores, well protected from climate and atmospheric effects. The cement go-down shall be constructed by the contractor as per the CPWD specifications at his own cost. Cement bags shall be used on first in first out basis. Cement stored for beyond 90 days will not be used in structural works. However, this cement can be used in other works after getting the cement tested and found suitable as per relevant IS codes at contractor's cost and accepted by Engineer-in-charge, before use in works.

33. STEEL & STEEL STOCKYARD

Steel confirming to BIS specifications (latest edition) shall be procured by the contractor directly from reputed manufacturers/producers as per list of approved makes. Relevant vouchers & test certificates will be produced by the contractor. Reinforcement steel,

structural steel shall be stored and stacked in such manner so as to facilitate easy identification, removal etc. The contractor shall take proper care to prevent direct contact between the steel and the ground/water for which he shall provide necessary arrangement at his own cost including ensuring proper drainage of area to prevent water logging as per directions of the Engineer-in-Charge. Steel shall also be protected, by applying a coat of neat cement slurry over the TMT bars for which no extra payment shall be made. Test certificates for each consignment of steel shall be furnished and tests to be got carried out from the authorized NABL accredited laboratory as per the directions of Engineer-in-Charge, before incorporating the materials in the work.

34. BITUMEN WORK

The contractor shall collect the total quantity of tar or bitumen required for the work as per standard formula, before the process of painting started and shall hypothecate it to the Client. Although the materials are hypothecated to Client, the Contractor undertakes the responsibility for their proper watch, safe custody and protection against all risks. The materials shall not be removed from site of work without the written consent of the Engineer-in-charge.

If any bitumen or tar remains unused on completion of the work on account of lesser use of materials in actual execution for reasons other than authorized changes of specifications and abandonment of portion of work, a corresponding deduction equivalent to the cost of unused materials as determined by the Engineer-in-Charge shall be made.

35. SCHEDULE OF QUANTITIES / BILL OF QUANTITIES

The quantities shown against the various items of work are only approximate quantities which may vary as per the actual requirement of work. Any variation in quantities, if occurs during the execution of the works will be dealt as per the provisions of the contract.

36. WATER PROOF TREATMENT

36.1. The water proof treatment shall be of type and specifications as given in the schedule of quantities.

36.2. The water-proofing of basement, roofs, water retaining areas shall be and remain fully effective for a period of not less than 10 (Ten) years to be reckoned from the date of expiring of the Defect Liability period, prescribed in the contract. At any time during the said guarantee period if any defect is found in the said treatment or any evidence of re-infestation, dampness, leakage in any part of buildings or structure and notifies the contractor of the same, the contractor shall be liable to rectify the defect or give re-treatment and shall commence the work or such rectification or re-treatment within seven days from the date of issue of such letter to him. If the contractor fails to commence such work within the stipulated period, the Client may get the same done by deploying another agency at the Contractor's risk & cost.

36.3. Water proofing shall be got done through approved/specialized agencies only with prior approval of Engineer-in-Charge.

36.4. During the execution of work, if any damage occurs to the treatment already done, either due to rain or any other circumstances, the same shall be rectified and made good to the entire satisfaction of Engineer-In-Charge by the contractor at his cost and risk.

36.5. The contractor shall make his own arrangement for all equipments required for the execution of the job. The contractor shall execute a Guarantee Bond in the prescribed form as appended for guaranteeing the water proofing treatment.

37. INDIAN STANDARDS

Wherever any reference is made to any IS in any particular specifications, drawings or bill of quantities, it means the Indian Standards editions with up-to-date amendments issued till last date of receipt of tender documents.

38. CENTERING & SHUTTERING

Plywood or steel plates or any material fit for the use as mentioned elsewhere in the tender document or as approved by Engineer-in-Charge shall be used for formwork. The shuttering plates shall be cleaned and oiled before every repetition and shall be used only after obtaining approval of Engineer-in-charge. The number of repetitions allowed for plywood and steel shuttering shall be at the discretion of Engineer-in-Charge depending upon the condition of shuttering surface after each use and the decision of Engineer-in- Charge in this regard shall be final and binding on the contractor. No claim whatsoever on this account shall be admissible.

39. RECORDS OF CONSUMPTION OF CEMENT & STEEL

For the purpose of keeping a record of cement and steel received at site and consumed in works, the contractor shall maintain a register in the format approved by the Engineer in charge, showing columns like quantity received and used in work and balance in hand etc. This register shall be signed daily by the contractor's representative and representative of Engineer in charge.

The register of cement & steel shall be kept at site in the safe custody of Engineer-in-charge during progress of the work. This provision will not, however, absolve the contractor from the quality of the final product.

40. TESTS AND INSPECTION

The contractor shall carry out the various mandatory tests as per specifications and the technical documents that will be furnished to him during the performance of the work. All the tests on materials, as recommended by CPWD, MORTH and relevant Indian Standard Codes or other standard specifications (including all amendments current at the last date of submission of tender documents) shall be got carried out by the contractor at the field- testing laboratory or any other recognized institution/ laboratory at the direction of the Engineer-in-charge. All testing charges, expenses etc. shall be borne by the contractor.

41. BORROW AREAS

The contractor shall make his own arrangements for borrow pits and borrow disposal areas including their approaches and space for movement of man, machinery, other equipments as required for carrying out the works. The contractor shall be responsible for taking all safety measures, getting approval, making payment of royalties, charges etc. and nothing extra shall be paid to the contractor on this account and unit rates quoted by the contractor for various items of bill of quantities shall deemed to include the same.

42. CARE OF WORKS

From the commencement to the completion of works and handing over, the contractor shall take full responsibility for care thereof all the works and in case of any damage/loss to the works or to any part thereof or to any temporary works due to lack of precautions or due to negligence on part of Contractor, the same shall be made good by the Contractor at no extra cost to Client.

43. SETTING OUT OF THE WORKS

The contractor shall be responsible for the true and proper setting out of the works and for the correctness of the position, levels, dimensions and alignment of all parts of the works. If at any time during the progress of works, shall any error appear or arise in the position, levels, dimensions or alignment of any part of the works, the contractor shall at his own expenses

rectify such error to the satisfaction of Engineer-in-charge. The checking of any setting out or of any line or level by the Engineer-in-charge shall not in any way relieve the contractor of his responsibility for the correctness.

44. SITE CLEARANCE

The contractor shall ensure that the working site is kept clean and free of obstructions for easy access to job site and also from safety point of view. Before handing over the completed work to the Engineer-in-charge, the contractor shall remove all temporary structures like the site offices, cement go-down, stores, labour hutments etc., scaffolding rubbish, debris etc. left-over materials tools and plants, equipments etc., clean the site to the entire satisfaction of the Engineer-in-charge. If this is not done, the same will be got done by Engineer-in-charge at the risk and cost of Contractor.

The contractor shall clean all floors, remove cement/ lime/ paint drops and deposits, clean joinery, glass panes etc., touching all painter's works and carry out all other necessary items of works to make the premises clean and tidy before handing over the completed works, and the rates quoted by the contractor shall be deemed to have included for the same.

45. MATERIALS OBTAINED FROM DISMANTLEMENT TO BE OWNER'S PROPERTY

All materials like stone, boulders and other materials obtained during the work of dismantling, excavation etc. will be considered Client's property and such materials shall be disposed-off to the best advantage of Client according to the instructions in writing issued by the Engineer-in-charge.

46. FURNISHED OFFICE ACCOMMODATION TO BE ARRANGED BY CONTRACTOR FOR ENGINEER IN CHARGE/CLIENT

On acceptance of tender, the contractor at his own cost will preferably construct Pre-engineered/ Porta cabin's office at site suitably equipped with basic facilities like electricity and drinking water supply for the supervisory staff as per the requirement of the project.

The contractor shall maintain the aforesaid facilities including vehicular facility for various site activities including site inspection etc., for intact/operational during the tenancy of the contract or maximum up to 6 months beyond the stipulated contractual completion date if the work is delayed due to any reasons. Operation and maintenance cost on the above facilities shall be borne by the contractor.

The contractor shall also make sufficient arrangement for photography/ videography so that photographs video can be taken of any specific activity at any point of time.

47. OPERATION & MAINTENANCE OF THE WORKS

47.1. An operation & maintenance contract between the contractor and the owner shall be drawn for five (5) years for the works completed and handed over by the contractor to Owner. This will include the following;

- MEP services in all buildings and external areas
- Other works mentioned in the contract.

47.2. Contractor shall prepare and submit Operation & Maintenance manuals as per good engineering practices (and as per OEM guidelines/manuals, wherever applicable) after completion of work, which shall be got approved from Engineer in charge.

47.3. Contractor shall ensure support of OEM's (Original Equipment Manufacturer) for all high side equipment till completion of O & M Period.

47.4. The work under O&M contract includes complete operation, servicing, regular & preventive maintenance and breakdown / Emergency / shutdown maintenance whenever required. This also includes spares and Consumables required for repair or replacement.

47.5. Preventive Maintenance

Once in a year the Owner shall inform the contractor, one month in advance, the planned shutdown dates. This Includes inspection of all hardware and software, fault prediction, inspection of power supply quality, checks on environmental operating conditions, calibration checks, major repairs and replacements, replacement of electronics modules or any other parts likely to fail due to aging, cleaning of each component like electronic modules connectors, etc. flushing of sampling lines and cleaning of all fillers, valves and preparing detailed reports.

47.6. Periodic Maintenance

Site visits, minimum 3 times a year (total days expected 6-9 per year). Schedule of visits shall be discussed and finalized with Owner. Preventive maintenance shall include inspection of general healthiness of the systems, study and advice on daily maintenance, inspection of all hardware and software, running of test programs, on-line servicing and solving reported problems. Checks shall be conducted on running systems/ sub-systems like:

a. Checks on power supplies
b. Checks on all associated accessories.
c. Taking back-up copies of last updated software as applicable

47.7. Software Maintenance and Support

This shall include maintenance of operating and application software to improve upon system performance. This includes application and operating software modification & debugging, supply and fixing of patches released by licensors / manufacturers to remove bugs or upgrading the running version, etc.

A. Emergency Services

i. In the event of any malfunction of any of the systems / items for which the PWCAMC is in force, the PWCAMC Supplier/Agency shall depute the concerned experts to Site so as to rectify the failed system items within 24 hours after receipt of a written intimation or Telephone call from Owner.

ii. The PWCAMC Supplier/Agency shall maintain at his premises or of the other agencies / vendor charged with the maintenance a stock of necessary spares required. In an event of breakdown, repairing or replacement should be possible within 24 hours maximum without any lead time for procurement of spares. The PWCAMC shall include not only the supply of spares for maintenance but shall also include Labour and materials at no additional cost.

iii. The PWCAMC Supplier/Agency's liability to provide maintenance spares shall not, however, be confined in any manner to be requirement of maintenance

Spares estimated by the PWCAMC Supplier/Agency. The PWCAMC Supplier/Agency, shall, within the scope of the Maintenance Contract, be required to fulfil or replenish any shortfall in the maintenance spares without additional cost to OWNER.

iv. During Defects Liability Period and Comprehensive Annual Maintenance Contract (PWCAMC) period, the PWCAMC Supplier/Agency shall arrange and maintain in, Project all the hardware and consumables required for un- interrupted running / calibration / maintenance of the above Items. In the event of any malfunction of the hardware / software, the experienced service engineer shall be made available at Site so as to rectify and put back in service the defective system / item within 24 hours.

v. Owner's personnel shall work on the system on a day-to-day basis and wherever possible, inform the PWCAMC Supplier/Agency about the type of failure of hardware / software, based on diagnostics or other information available. However, PWCAMC Supplier/Agency shall be fully responsible to attend, Identify the root cause and rectify the failure in the shortest possible time.

47.8. The payment towards operation & maintenance shall be made as per the rates mentioned in the Bill of quantities.

47.9. SECURITY DEPOSIT (SD) FOR OPERATION AND MAINTENANCE (O&M)

47.9.1. Contractor, at least 30 days in advance of completion of works, shall furnish Performance Bank guarantee for operation and maintenance (O&M PBG) equivalent to a sum of 2.5% (Two and a half percent) of the Total Contract Value (actual), which shall be returned by the Owner after successful completion of the Operation and Maintenance period. This is in addition to the CPBG/SD submitted earlier for execution of works as. The last 5% milestone payment (in line with terms of payment) shall be released onlyafter submission of CPBG for O&M. In case, the Contractor fails to perform the Operation and Maintenance of the facilities to the satisfaction of Owner, the Bank Guarantee submitted by the contractor for the said purpose shall be revoked partly or fully by the Owner.

47.9.2. The O&M PBG shall be from a Scheduled Bank and valid upto O&M period plus 2 months as claim period. No interest shall be payable by Owner for sum deposited /Bank guarantee submitted in any form whatsoever.

SCOPE OF WORK

[ANNEXURE - I TO SPECIAL CONDITION OF CONTRACT]

SCOPE OF WORK

1. **Civil, Structural & Architectural Works**

- Earthwork
- RCC & PCC
- Brick Work/ Block Work
- Cladding Work
- Structure Steel Work
- Flooring Work
- Finishing Work (Plastering & Painting)
- Dismantling & Demolishing work

2. **Plumbing, Sanitary, Water Supply, Sewerage & Drainage Work**

- Water Supply System
- Sewerage & Drainage around Buildings
- Percolation & Recharge pit
- Rain Water Harvesting & Tube wells

3. **Electrical Work**

- External Lighting.
- Sewerage & Drainage around Buildings.
- Percolation & Recharge pit.

4. **Landscaping & Horticulture Work**

- Roads Work

SCOPE OF SUPPLY

[ANNEXURE - II TO SPECIAL CONDITION OF CONTRACT]

SCOPE OF SUPPLY

1. Scope of Supply shall be as specified in Technical Section of the bidding document.
2. All materials, equipment, consumables etc. required for Successful completion of the works are to be supplied by the Contractor at their sole cost and expense.
3. Owner shall be issuing or supplying any material which are available at site on "Chargeable basis".
4. All materials, equipments, labour & consumables required for successful completion of work as per the description of item in Schedule of Rates shall be supplied by the Contractor and the cost of/such supply shall be deemed to be included in the quoted rates without any additional liability on the part of the Owner except for the material (if any) specifically covered under Owners Scope of Supply.
5. The equipment tools and tackle to facilitate construction and after final commissioning, performance guarantee test run shall be in Contractors scope. The Contractor may arrange it through purchase/hire/lease basis and such equipment, tools, tackles shall remain the property of the Contractor and it shall be removed from site after its requirement is over. No additional payment shall be made for mobilization and/or demobilization of such equipment, tools, tackles etc.

TIME SCHEDULE

[ANNEXURE - III TO SPECIAL CONDITION OF CONTRACT]

TIME SCHEDULE

NAME OF WORK: RESTORATIONOF DAMAGES FOR EXTERNAL SERVICES AT GLOBAL GATEWAY.

SNO.	DESCRIPTION	TIME OF COMPLETION
1	RESTORATIONOF DAMAGES FOR EXTERNAL SERVICES AT GLOBAL GATEWAY.	3 Months

Note:

1. Time of completion shall be as defined in the LIB
2. The time Indicates is for the completing all the works in all respects as per specification, codes, drawings and instruction of Engineer-in –Charge.

QUALIFICATION & EXPERIENCE REQUIREMENT OF KEY CONSTRUCTION PERSONNEL

[ANNEXURE - IV TO SPECIAL CONDITION OF CONTRACT]

NAME OF WORK: RESTORATIONOF DAMAGES FOR EXTERNAL SERVICES AT GLOBAL GATEWAY.

QUALIFICATION & EXPERIENCE REQUIREMENT OF KEY CONSTRUCTION PERSONNEL

CATEGORY	NUMBERS	QUALIFICATION	EXPERIENCE
Project Manager (PM)	1	Engineer having good leadership skills and worked on a project similar in nature and size	12 to 20
Billing & Planning Engineer	1	Engineer QS Billing and Document Control	5 to 8
Asst. Engineers	1	Manager/Engineer must have work on similar Project	2 to 5
Project Supervisors	2	Supervisor must have worked similar projects of at least 50,000 sqft	5 to 8
Safety Officer	1	Relevant qualification and experience of safety norms and requirements	5 to 8
MEP	2	Manager/Engineer must have work on similar Project.	8 to 10
Store Keeper	1	Manager/Engineer must have work on similar Project	5 to 8

Note:

1. The details of manpower required to be, mobilized by the contractor during construction to complete the work within schedule in INDICATIVE only. Contractor is required to augment the above list with additional numbers/categories of personnel as required and/or as directed by Engineer-in-charge to carry out the works in working hours including night shifts, a d: complete the work within the completion time schedule and quoted price.
2. The Key Construction Personnel identified above shall, be well qualified & having adequate relevant experience, as specified in document above. The other manpower shall also be qualified and experienced with their assigned work.
3. CVs of key people proposed to be deployed shall be submitted to Engineer-In-charge prior to their mobilization on at site.
4. The following man power shall be mobilized at site within 7 days of award of the
   A. Project Manager (PM)
   B. Asst. Engineers
   C. MEP
   D. Safety Officer
   E. Project Supervisors
5. Penalty at the rate of Rs 15,000 per day.

DEPLOYMENT OF EQUIPMENT & MACHINERY

[ANNEXURE - V TO SPECIAL CONDITION OF CONTRACT]

NAME OF WORK: RESTORATIONOF DAMAGES FOR EXTERNAL SERVICES AT GLOBAL GATEWAY.

INDICATIVE DEPLOYMENT OF EQUIPMENT & MACHINERY TO BE DEPLOYED.

SNO.	MACHINARY	NUMBERS
1	Excavator cum loader (JCB 3D model or equivalent).	1
2	Concrete pump	1
3	Needle Vibrators	1
4	Screed leveler.	1
5	Plate Vibrator	1
6	Reinforcement bending machine.	1
7	Reinforcement cutting machine.	1
8	Power driven earth rammer (Soil compactor).	1
9	Total station.	1
10	Water tanker (Minimum capacity of 5000 liters)	1
11	Welding machine 400 Ampere	1
12	Screener for coarse sand and fine sand	1
13	Centrifugal mono block water pump minimum capacity 5HP	1
14	Vibratory roller 3T	1
15	Drilling machine	1
16	Shuttering with necessary props	1
17	Good Quality Camera for videos & Photo	1
18	Computers & Laptops for office work	1
19	Air Compressor	1

FIELD TESTING LABORATORY EQUIPMENTS & INSTRUMENTS

Contractor shall establish a field laboratory to carry out regular testing of materials at site or at suitable location near site as approved by Engineer in charge. Laboratory testing and measuring equipments (ISI marked and calibrated) for carrying out the following/field tests shall be mobilized by the contractor and maintained in good working condition till the completion of work. Field testing laboratory- shall be established by the contractor within 01 month of award of work with all requirement equipments for following facilities.

A. Compressive strength of concrete cubes (Automat' computerized cube testing machine).

B. Testing concrete including parameters like slump, temperature etc.

C. Degree of compaction of soil at site during backfilling relative density of sand for sand filling works.

D. Testing water absorption and moisture content of various items like coarse aggregates, sand, bricks etc.

E. Sieve Analysis of coarse and fine aggregates.

Contractor shall submit a list of equipments an• instruments for field laboratory within two weeks of award of work for approval of engine-r-in-charge. The tests mentioned above are INDICATIVE only and the contractor is required to augment the laboratory with additional items/numbers as directed by the Engineer-in-charge at no extra cost.

In addition to the above field tests, Contractor shall carry out testing of materials in outside laboratories as directed by Engineer-in-charge.

NOTES:

A. The details of indicative equipments in good working condition, required to be mobilized by the Contractor, to complete the work within the schedule are shown above. Contractor shall augment the above list with additional numbers/categories of equipments, tools & tackles, as required and as directed by Engineer-In charge to complete the work within the completion time schedule and quoted price. The actual deployment schedule of Construction Equipments shall be submitted by the Contractor and approved by Engineer-in-charge.

B. Contractor to confirm that the above minimum equipments are available with him in good working condition d shall be timely mobilized on this work site. Contractor has the option to hire some of these equipments from equipment-hiring agencies also.

C. Unitech/PMC reserves the right to physically check & verify the availability of these equipments prior to award of work.

D. Contractor shall replace any defective/damaged equipment promptly as directed by the Engineer-in-charge and mobilize equipments in good working condition to complete the work without, any additional time & cost implication.

TERMS OF PAYMENT

[ANNEXURE - VI TO SPECIAL CONDITION OF CONTRACT]

Progressive payments shall be released to Contractor against running account bills duly certified by Engineer-in-charge after affecting the necessary deductions/recovery, if any. The basis for payment against various items shall be as follows:

SL. NO.	NATURE OF WORK	PAYMENT TERMS
	CIVIL & STRUCTURE WORK	
1.1	**Structural Steel Works**	• 05% on finalization of quantities, plan and submission of approved fabrication drawings on pro-rate basis. • 05% on issuance of sub-order and submission of equivalent bank guarantee valid till receipt and acceptance of material at site plus 3 month claim period. • 50% on receipt and acceptance of material at site. • 20 % on fabrication, surface preparation and application of primer coat. • 15% on erection, alignment, welding, grouting etc. • 5. % on completion of all works in all respect and issuance of completion certificate.
1.2	**Reinforcement Steel** ,	• 05% on issuance of sub-order and submission of equivalent bank guarantee valid-ti I receipt and acceptance of material at site plus 03 months claim period • 65% on receipt and acceptance of material at site. • 25% on cutting , laying and acceptance thereof • 5. % on completion of all works in all respect and issuance of completion certificate.
1.3	**Structural Steel Painting Works**	• 95% after completion of touch up/repair of primer and intermediate coat/coats and final coat. • 5% on completion of all works in all respect and issuance of completion certificate. .
1.4	**Composite items.**	Composite items of Reinforced Cement Concrete (RCC) work inclusive of Excavation, shoring, strutting, Plane Cement Concrete (PCC), Centering and shuttering, back filling and disposal of surplus earth in sub-structure: • 35% on completion of earth work in excavation, PCC centering &shuttering • 45% on completion of RCC. • 15% on back filling and removal of surplus earth. • 5 % on completion of all works in all respect and issuance of completion
1.5	**Composite items.**	Composite items of RCC work in non-suspended slabs/pavement slabs including pedestals, ramps etc. • 40% on completion of sand filling, centering, shuttering and PCC • 55% on completion of RCC0 • 5% on completion of all works in all respects andissuance of completion certificate .

1.6	**Composite items.**	Brick work in Sub Structure • 50% on completion of excavation and PCC and receipt of Bricks at site • 25% on completion of. Brick works. • 20% on completion of back filling and/disposal of surplus earth • 5 % on completion of all works in all respect and issuance of completion certificate.
1.7	**Architectural Works**	Steel/Aluminium/ Glazed Glass/PVC etc Door Window & Ventilators/Roofing/ False Ceiling, False Flooring (As Applicable) • 15% on issuance of sub-order and submission of equivalent bank guarantee valid till receipt and acceptance of material at site plus 03 months claim period. • 65% on receipt of material at site • 20% on Installation and acceptance. • 5 % on completion of all works in all respect and issuance of completion certificate.
1.8	**Platform, Ladder**	• 50% on receipt and acceptance of material at site. • 30% on fabrication, surface preparation and application of primer. • 15% on erection, aligning and welding. • 5 % on completion of all works in all respect and issuance of completion certificate.
1.9	**Hand Railing**	• 50% on receipt and acceptance of material at site. • 20% on fabrication, surface preparation and application of primer. • 15% on erection, aligning and welding. • 10% after completion of .completion of final painting. • 5 % on completion of all works in all respect and issuance of completion certificate.
1.10	**Graftings**	• 10% on issuance of sub-order and submission of equivalent bank guarantee valid VI receipt and -acceptance of material at site plus 03 Months claim period • 60% on receipt of finished gratings at site. • 25% on erection, aligning, welding and completion of final painting or touchup as applicable. • 5 % on completion of all works in all respect and issuance of completion certificate.
1.11	**Tree Transplantation**	• 40% after transplantation of tree. • 15% on completion of 1st quarter after transplantation on pro rate basis • 15% on completion of 2nd quarter after transplantation on pro rate basis. • 15% on completion of 3rd quarter after transplantation on pro rate basis. • 10% on completion of 4th quarter after transplantation on pro rate basis • 5 % on completion of all works in all respect and issuance of completion certificate.
1.12	**Other Civil & Structure Work**	• 95% on completion of work as certified in progress bill. • 5% on completion of all work in all respects and acceptance thereof including submission of completion documents.

SL. NO.	NATURE OF WORK	PAYMENT TERMS
2	**ELECTRICAL WORKS**	
2.1	**For Supply Items**	• 10% issuance of sub-order and submission of equivalentbank guarantee valid till erection/installation of material at site plus 03 Months claim period. • 85% on receipt and. acceptance of material at site. • 5% on completion of all works in all respect and issuance of completion certificate.
2.2	**For Erection Items**	• 80% on completion of erection / installation. • 15% on testing and acceptance. • 5% on completion of all works in all respect and issuance of completion certificate.
2.3	**For Items Involving both Supply & Erection**	• 05% issuance of sub-order and submission of equivalentbank guarantee valid till erection/installation of material at site plus 03 Months claim period. • 60% on receipt and. acceptance of material at site. • 20% after Erection/ Installation • 10% after Testing & Acceptance. • 5% on completion of all works in all respect and issuance of completion certificate.

SL. NO.	NATURE OF WORK	PAYMENT TERMS
3	**INSTRUMENTATION / IBMS WORKS**	
3.1	**For Supply Items**	• 10% issuance of sub-order and submission of equivalentbank guarantee valid till erection/installation of material at site plus 03 Months claim period. • 83% on receipt and. acceptance of material at site. • 2% after Mechanical Completion. • 5% on completion of all works in all respect and issuance of completion certificate
3.2	**For Erection Items/ Installation Items** ,	Items not req. loop Checking • 93% on completion of erection / installation. • 2% after Mechanical Completion • 5% on completion of all works in all respect and issuance of completion certificate. Items req. loop Checking • 80% on completion of erection / installation. • 13% on testing and looping Checking. • 2% after Mechanical Completion • 5% on completion of all works in all respect and issuance of completion certificate.

3.3	**For Items with supply & erection & installation**	Items not req. loop Checking • 05% issuance of sub-order and submission of equivalentbank guarantee valid till erection/installation of material at site plus 03 Months claim period. • 60% on receipt and. acceptance of material at site. • 28% Completion of erection • 2% after Mechanical Completion. • 5% on completion of all works in all respect and issuance of completion certificate Items req. loop Checking • 05% issuance of sub-order and submission of equivalentbank guarantee valid till erection/installation of material at site plus 03 Months claim period. • 55% on receipt and. acceptance of material at site. • 25% on completion of erection installation. • 08% on testing and loop checking • 2% after Mechanical Completion. • 5% on completion of all works in all respect and issuance of completion certificate
4	**HVAC , Fire Fighting & Plumbing Items**	• 60% on receipt and acceptance of material at site on Pro Rate Basis • 20% on Installation & aligning on Pro Rate Basis. • 15% after Testing & Commissioning. • 5 % on handing over.
6	**Painting Work**	• 30% on surface Preparation & Primer application. • 65% on final Paint. • 5% on completion of all works in all respect and issuance of completion certificate
7	**Mics Works**	• 95% on completion of work as certified in progress bill. • 5% on completion of all work in all respects and acceptance thereof including submission of completion documents
8	**Lump Sum rate Items**	• 95% on completion of total work in all respects. (For all lump sum item included in Schedule of Rate, Contractor shall furnish price breakup for quoted lump sum prices for the approval of Engineer-in-Charge. Progressive payment for such items shall be made accordingly. In this regard decision of Engineer-in- Charge shall be final and binding to the Contractor) • 5% on completion of all works in all respect and issuance of completion certificate

NOTES-

1. Payments shat be made after necessary deductions on account of income tax, mobilization advance and other deduction s as per the provisions of the Contract and as required under the law.
2. Payment shall be made within 30 days of receipt of bill after due verification/certification.
3. Other term of payment if any, may be mutually discussed and agreed upon in consultation with client after award of Work.
4. Running account Bill: The Contractor shall submit the R.A. Bill(s) in approved pro-forma to the Engineer- in-charge of the work giving abstract and detailed measurement for the various items executed. Running bills shall have reconciliation statements for all the items supplied/received and consumed which shall be updated in each running bill.

5. Final Bill: The final bill shall be submitted by the Contractor within the time frame specified in the .General Conditions of the Contract. No further claims shall be made by the Contactor after submission of the final bill. The Contractor shall submit the final bill complete in all respect with no claim and no dues by Contractor, no objection certificate from labour officer and other completion documents.

6. Part completion certificate whenever essential (in case of job in multi units, offloading case etc.) shall be issued with due concurrence from competent authorities to facilitate release of Final payment.

7. Wherever milestone payment is linked with sub ordering, Engineer-in-charge shall ensure that the total quantity against which the payment is released towards supply shall not exceed the final installed quantity of the item.

HEALTH SAFETY & ENVIRONMENT MANAGEMENT

[ANNEXURE - VII TO SPECIAL CONDITION OF CONTRACT]

1. SCOPE

This specification establishes the Health, Safety and Environment (HSE) management requirement to be complied by Contractors/Vendors including their sub-contractors/sub vendors during construction.

This specification is not intended to replace the necessary professional judgment needed to design & implement an effective HSE system for construction activities and the contractor is expected to fulfill HSE requirements in this specification as a minimum. It is expected that contractor shall implement best HSE practices beyond whatever are mentioned in this specification.

Requirements stipulated in this specification shall supplement the requirements of HSE Management given in relevant Act(s)/ Legislations, General Conditions of Contract (GCC), Special Conditions of Contract (SCC) and Technical Specifications. Where different documents stipulate different requirements, the most stringent shall apply.

2. REFERENCES

The document should be read in conjunction with following:

- General Conditions of Contract (GCC)
- Special Conditions of Contract (SCC)
- Building and other construction workers Act,
- Indian Factories Act
- Technical specifications
- Relevant State & National Statutory requirements.
- Operating Manuals Recommendation of Manufacturer of various constructionMachineries

3. REQUIREMENTS OF HEALTH, SAFETY & ENVIRONMENTAL (HSE)MANAGEMENT SYSTEM TO BE COMPLIED BY CONTRACTORS

3.1 Management Responsibility

3.1.1 HSE Policy & Objectives

The Contractor should have a documented and duly approved HSE policy & objectives to demonstrate commitment of their organization to ensure health, safety and environmental aspects in their line of operations.

3.1.2 Management System

The HSE management system of the Contractor shall cover the HSE requirements & commitments to fulfill them, including but not limited to what have been specified under clauses 1.0 and 2.0 above. The Contractor shall obtain the approval of its site specific HSE Plan from Engineer in charge prior to commencement of any site works. Corporate as well as Site management of the Contractor shall ensure compliance of their HSE Plan at work sites in its entirety in true spirit.

3.1.3 Indemnification

Contractor shall indemnify & hold harmless, Owner/PMC & their representatives, free from liabilities arising out of non-fulfillment of HSE requirements or itsconsequences.

3.1.4 Deployment & Qualifications of Safety Personnel

The Contractor shall designate / deploy various categories of HSE personnel at site as indicated below in sufficient number. The Safety supervisors, Safety stewards/Observer etc. would facilitate the HSE tasks at grass root level for construction sites and shall assist Safety Officer
/Engineers.

Contractor shall appoint safety personnel as given below;

3.1.4.1 Safety Observer/Steward: Contractor shall depute one Safety Observer/Steward.

3.1.4.2 Safety Supervisor: In addition to above, contractor shall depute one Safety Supervisor for every 250workers and additionally thereon.

3.1.4.3 Safety Engineer: In addition to above (i &ii), one safety engineer/ officer for every 1000 workers andadditionally thereon.

a) Safety Steward/Observer

As a minimum, he shall possess class XII pass certificate and should have minimum two year of practical experience in construction work environment and should have adequate knowledge of the local language spoken by majority of the workers at the construction site.

b) Safety Supervisor

As a minimum, he shall possess a recognized graduation Degree or a Diploma in Eng. With minimum two years of practical experience in construction work environment and should possess requisite skills to deal with construction safety related day-to-day issues.

c) Safety Officer / Safety Engineer

Safety Officer/Engineer should possess following qualification & experience:

(i) Recognized degree in any branch of Engg. or Tech. or Architecture with practical experience of working in a building or other construction work in supervisory capacity for a period of not less than two years, or possessing recognized diploma in any branch of Engg. Or Tech with practical experience of working in a building or other construction work in supervisory capacity for a period of not less than five years.

(ii) Recognized degree or one year diploma in Industrial safety (from any reputed Indian Institutes).

(iii) Preferably have adequate knowledge of the language spoken by majority of the workers at the construction site.

Alternately

(i) Person possessing Graduation Degree in Science with Physics & Chemistry and degree or one year diploma in Industrial Safety (from any reputed Indian institutes) with practical experience of working in a building, plant or other construction works (as Safety Officer) for a period of not less than five years, may be considered as Safety Officer.

The Contractor shall verify & authenticate credentials of such safety personnel and furnish Bio-Data/Resume/Curriculum Vitae of the safety personnel as above for approval of Engineer in charge.

Imposition/ Realization of penalty shall not absolve the Contractor from his/her responsibility of deploying competent safety officer at site.

Adequate planning and deployment of safety personnel shall be ensured by the Contractor. So that field activities do not get affected because of non-deployment of competent.

3.1.5 Implementation, Inspection/Monitoring

a) The Contractor shall be fully responsible for planning, reporting, implementing and monitoring all HSE requirements and compliance of all laws & statutory requirements.

b) The Contractor shall also ensure that the HSE requirements are clearly understood & implemented conscientiously by their site personnel at all levels at site.

c) The Contractor shall ensure physical presence of their field engineers / supervisors, during the continuation of their contract works / site activities including all material transportation activities. Physical absence of experienced field engineers / supervisors of Contractor at critical work spot during the course of work may invite halting / stoppage of work.

d) The Contractor shall regularly review inspection report internally and implement all practical steps / actions for improving the status continuously.

e) Contractor skilled workmen like riggers, scaffold erectors, welders, crane operators etc. should have sufficient past experience and skill on the relevant job.

f) The Contractor shall ensure important safety checks right from beginning of works at every work site locations and to this effect format no. HSE-10 “Daily Safety Check List” shall be prepared by field engineer & duly checked by safety personnel for conformance.

g) The Contractor shall carry out inspection to identify various unsafe conditions of work sites/machinery/equipment’s as well as unsafe acts on the part of workmen/supervisor/engineer while carrying out different project related works.

h) Adequate records for all inspections shall be maintained by the Contractor and the same shall be furnished to Engineer in charge, whenever sought.

i) As a general practice lifting tools/tackles, machinery, accessories etc. shall be inspected, tested and examined by competent person (approved by concerned State authorities) before being used at site and also at periodical interval (e.g. during replacement, extension, modification, elongation/reduction of machine/parts, etc.) as per relevant statutes. Hydra, cranes, lifting machinery, mobile equipment’s/ machinery/ vehicles, etc. shall be inspected regularly by only competent / experienced personnel at site and requisite records for such inspections shall be maintained by contractor. Contractor shall also maintain records of maintenance of all other site machinery (e.g. generators, rectifiers, compressors, cutters, etc.) &portable tools/equipment’s being used at project related works (e.g. drills, abrasive wheels, punches, chisels, spanners, etc.).

j) Site facilities /temporary. Installations, e.g. batching plant, cement go down, DG-room, temporary electrical panels/distribution boards, fabrication yards, etc. and site welfare facilities, like labour colonies, canteen/pantry, rest-shelters, motor cycle/bicycle-shed, First-aid centers, urinals/toilets, etc. should be periodically inspected by Contractor.

3.1.6 Awareness and Motivation

a) The Contractor shall promote and develop awareness on Health, Safety and Environmental protection among all personnel working for the Contractor.

b) The contractor shall display safety statistics board at all prominent location .Also shall provide dedicated notice board for displaying of safety alerts or any other safety related notices for awareness site workforces.

c) Regular awareness programs and fabrication shop/work site meetings at least on monthly basis shall be arranged on HSE activities to cover hazards/risks involved in various operations during construction.
d) Contractor to motivate & encourage the workmen & supervisory staff by issuing/ awarding them with tokens/ gifts/ mementos/ monetary incentives/ certificates etc. The motivational program shall be organized on regular basis.

3.1.7 Fire Prevention & First-Aid

a) The Contractor shall arrange suitable First-aid measures such as First Aid Box (Refer Appendix-B for details), stand-by Emergency Vehicle .Additionally separate Ambulance. At least one fire extinguisher shall be placed at each location of DG Set, Hot works, electrical booth etc.

b) The Contractor shall arrange installation of fire protection measures such as adequate number of steel buckets with sand & water and adequate number of appropriate portable fire extinguishers (Refer Appendix-C for details) to the satisfaction of /Owner.

c) The Contractor shall arrange EMERGENCY MOCK DRILL like fire, bomb threat, gas leakage, earth quake, etc. at each site at least once in three months, involving site workmen and site supervisory personnel & engineers.
d) The contractor shall require to tie-up with the hospitals located in the neighborhood for attending medical emergency.

3.1.8 Documentation

The Contractor shall evolve a comprehensive, planned and documented system covering the following as a minimum for implementation and monitoring of the HSE requirements and the same shall be submitted for approval by owner/.

- HSE Organogram
- Site specific HSE Plan
- Safety Procedures, forms and Checklist. Indicative list of HSE procedures is attached as Appendix :H
- Inspections and Test Plan

3.1.9 Audit

The Contractor shall submit an Audit Plan to Engineer in charge indicating the type of audits covering following as minimum:

a) Internal HSE audits regularly on six monthly basis by engaging internal qualified auditors However, minimum two internal HSE audit will have to be conducted irrespective of time period of the contract.

All HSE shortfalls/ non-conformances on HSE matters brought out during review/audit, shall be resolved forthwith (generally within a week) by Contractor& compliance report shall be submitted to Engineer in charge.

In addition to above audits by contractor, the contractor's work shall be subjected to HSE audit by Engineer in charge at any point of time during the pendency of contract. The Contractor shall take all actions required to comply with the findings of the Audit Report and issue regular Compliance Reports for the same to Engineer in charge till all the findings of the Audit Report are fully complied.

Failure to carry-out HSE Audits& its compliance by Contractor, shall invite penalization.

3.1.10 Meetings

i. The Contractor shall ensure participation of his top most executive at site (viz. Resident Construction Manager / Resident Engineer/ Project Manager / Site-in-Charge) in Safety Committee/HSE Committee meetings arranged by Engineer in charge usually on monthly basis or as and when called for. In case Contractor's top most executive at site is not in a position to attend such meeting, he shall inform Engineer in charge in writing before the commencement of such meeting indicating reasons of his absence and nominate his representative – failure to do so may invite very stringent penalization against the specific Contractor, as deemed fit as per Contract. The obligation of compliance of any observations during the meeting shall be always time bound. The Contractor shall always assist Engineer in charge to achieve the targets set by them on HSE management during the project implementation.

ii. In addition, the Contractor shall also arrange internal HSE meetings chaired by his top most
Executive at site on fortnightly basis and maintain records. Such internal HSE meetings shall essentially be attended by field engineers / supervisors including safety personnel of the Contractor and its associates. Records of such internal HSE meetings shall be maintained by the Contractor for review by Engineer in charge or for any HSE Audits.

iii. Agenda of internal HSE meeting should broadly cover: -

a) Confirmation of record notes /minutes of previous meeting
b) Discussion on outstanding subjects of previous points / subjects, if any
c) Incidents / Accidents (of all types) at project site, if any
d) Current topics related to site activities / subjects of discussion
e) House keeping
f) Information / views / deliberations of members / site sub-contractors
g) Report from Owner / Client
h) Status of Safety awareness, Induction programs & Training

programs the time frame for such HSE meeting shall be religiously maintained by

one and all.

3.1.11 Intoxicating drinks & drugs and smoking

a) The Contractor shall ensure that his staff members & workers (permanent as well casual) shall not be in a state of intoxication during working hours and shall abide by any law relating to consumption & possession of intoxicating drinks or drugs in force.

b) The Contractor shall not allow any workman to commence any work at any locations of project activity who is/are influenced / effected with the intake of alcohol, drugs or any other intoxicating items being consumed prior to start of work or working day.

c) Awareness about local laws on this issue shall form part of the Induction Training and compulsory work-site discipline.

d) The Contractor shall ensure that all personnel working for him comply with "No-Smoking" requirements of the Owner as notified from time to time. Cigarettes, lighters, auto ignition tools or appliances as well as intoxicating drugs, dry tobacco powder, etc. shall not be allowed inside the project / plant complex.

e) Smoking shall be permitted only inside smoking booths, if any, exclusively designated & authorized by the Engineer in charge.

3.1.12 Penalty

The Contractor shall adhere consistently to all provisions of HSE requirements. In case of non-compliances and also for repeated failure in implementation of any of the HSE provisions, Engineer in charge may impose stoppage of work without any cost & time implication to the Owner and/or impose a suitable penalty.

The amount of penalty to be levied against defaulted Contractor shall be up to a cumulative limit of 2.0% (Two percent) of the contract value.

This penalty shall be in addition to all other penalties specified elsewhere in the contract. The decision of imposing stop-work-instruction and imposition of penalty shall rest with Engineer incharge. The same shall be binding on the Contractor. Imposition of penalty does not make the Contractor eligible to continue the work in unsafe manner. The amount of penalty applicable for the Contractor on different types of HSE violations is specified below:

Sl. No.	**Violation of HSE Norms**	**Penalty Amount**
1.	For not using personal protective equipment like- Helmet, Safety Shoes, and other safety gadgets as Applicable as per nature of work.	Rs.500/- per day/Item / Person
2.	Execution of work without deployment of requisite field engineer / supervisor at work spot	Rs.5,000/- per violation per day
3.	Unsafe electrical practices (not installing ELCB, using poor joints of cables, using naked wire without top plug into socket, laying wire/cables on the roads, Electrical jobs by incompetent person, etc.)	Rs.5,000/- per item per day
4.	Working at height without full body harness, using non-standard/ rejected scaffolding and not arranging fall protection arrangement as required, like handrails, life-lines, Safety Nets etc.	Rs.10,000/- per case per day
5.	No fencing/barricading of excavated areas / Trenches.	Rs.5,000/- per occasion
6.	Absence of Contractor's RCM/SIC or his nominated representative (prior approval must be taken for each meeting for nomination) from site HSE meetings Whenever called by PMC/Owner& failure to nominate his immediate deputy for such HSE	Rs.10,000/- per meeting

	meetings.	
7.	Poor House Keeping	Rs.5,000 /- per occasion per subject
8.	Failure to report & follow-up accident (including Near Miss) reporting system within specific time frame.	per Rs.20,000/- occasion
9.	Failure to deploy adequately qualified and competent Safety Officer	Rs.10,000/- per day
10.	Any violation not covered above	To be decided by Engineer in charge

Note: Penalty amount deducted from the contractor shall be utilized by Engineer in charge for the promotion of the safety during the currency of the project.

The Contractor shall make his field engineers/supervisors fully aware of the fact that they keep track with the site workmen for their behavior and compliance of various HSE requirements. Safety lapses / defects of project construction site shall be attributable to the concerned job supervisor / engineer of the Contractor, (who remains directly responsible for safely executing field works). For repeated HSE violations, concerned job supervisor / engineer shall be reprimanded or appropriate action, as deemed fit, shall be initiated (with information to Engineer in charge) by the concerned Contractor.

Contractor shall initiate verbal warning shall be given to the worker/employee during his first HSE violation. A written warning shall be issued on second violation and specific training shall be arranged / provided by the Contractor to enhance HSE awareness/skill including feedback on the mistakes/ flaws. Any further violation of HSE stipulations by the erring individuals shall callfor his forthright debar from the specific construction site. A record of warnings for each worker/employee shall be maintained by the Contractor, like by punching their cards / Gate passes or by displaying their names at the Project entry gate. Warnings, penalizations, appreciations etc. shall be discussed in HSE Committee meetings by site Head of the Contractor.

3.1.13 Accident/ Incident investigation

All accidents/incidents shall be informed to Engineer in charge at least telephonically by Contractor immediately and in writing within 24 hours on Format No. HSE-2 as applicable, by Contractor. Thereafter, a Supplementary Accident/Incident investigation Report on Format No.HSE-3 shall be submitted to PMC/Owner within 72 hours. Near Miss incident(s), Dangerous accidents/incident shall also be reported on Format No. HSE-4 within24 hours. The accident/ incident shall be investigated by a team of Contractor's senior Site personnel (involving Site-in- Charge or at least by his deputy) for establishing root-cause and recommending corrective & preventive actions.

Findings shall be documented and suitable actions taken to avoid recurrences shall be communicated to Engineer in charge. Engineer in charge shall have the liberty to independently investigate such occurrences and the Contractor shall extend all necessary help and cooperation in this regard. Engineer in charge shall have the right to share the content of this report with the outside world.

3.2 House Keeping

The Contractor shall ensure that a high degree of housekeeping is maintained and shall ensure inter-alia; the followings:

a) All surplus earth and debris are removed/disposed-off from the working areas to designatedlocation(s).

b) Unused/surplus cables, steel items and steel scrap lying scattered at different places within the working areas are removed to identify location(s).

c) All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from work place to identified location(s).

d) Roads shall be kept clear and materials like pipes, steel, sand, boulders, concrete, chips and bricks etc. shall not be allowed on the roads to obstruct free movement of men & machineries.

e) Fabricated steel structural, pipes & piping materials shall be stacked properly.

f) Water logging on roads shall not be allowed.

g) No parking of trucks/trolleys, cranes and trailers etc. shall be allowed on roads, which mayobstruct the traffic movement.

h) Utmost care shall be taken to ensure over all cleanliness and proper upkeep of the workingareas.

i) Protective measures to be ensured with projected rebar by suitable means.

j) Trucks carrying sand, earth and pulverized materials etc. shall be covered while moving within the plant area/ or these materials shall be transported with top surface wet.

k) The contractor shall ensure that the atmosphere in plant area and on roads is free from particulate matter like dust, sand, etc. by keeping the top surface wet for ease in breathing.

l) At least two exits for any unit area shall be assured at all times – same arrangement is preferable for digging pits/ trench excavation/ elevated work platforms/ confined spaces etc.

m) Welding cables and the power cable must be segregated and properly stored and used. The same shall be laid away from the area of movement and shall be free from obstruction.

n) Schedule for upkeep /cleaning of site to be firmed up and implemented on regular basis.

The Contractor shall carry-out regular checks (minimum one per fortnight) as per format no. HSE-11 for maintaining high standard of housekeeping and maintain records for the same. The Contractor shall provide supervisor for housekeeping exclusively for management of day-to-dayhousekeeping activities.

3.3 HSE Measures

3.3.1 Construction Hazards

The Contractor shall ensure identification of all Occupational Health, Safety & Environmental hazards in the type of work he is going to undertake and enlist mitigation measures specially towards following activities;

a) Working at height (+2.0 M height)
b) Work in confined space,
c) Deep excavations & trench cutting (depth > 2.0 m.)
d) Operation & Maintenance of Batching Plant.
e) Shuttering / concreting (in single or multiple pour) for columns, parapets & roofs.
f) Erection & maintenance of Tower Crane.
g) Erection of structural steel members / roof-trusses / pipes at height more than 2.0 Mts. withor without crane.
h) All lifts using 100T Crane plus mechanical pulling.
i) Any lift exceeding 80% capacity of the lifting equipment's (hydra, crane etc.).

j) Laying of pipes (isolated or fabricated) in deep narrow trenches – manually or mechanically.
k) Maintenance of crane / extension or reduction of crane-boom on roads or in yards.
l) Erection of any item at >2.0 Mts. height using 100T crane or of higher capacity
m) Work in Live Electrical installations / circuits
n) Demolishing/ dismantling activities
o) Welding/ gas cutting jobs at height (+2.0 Mts.)
p) Lifting/placing roof-girders at height (+2.0 Mts.)
q) Working in "Charged/Live" elect. Panels
r) Erection/dismantling of scaffolding

The necessary HSE measures devises shall be put in place, prior to start of an activity & alsoshall be maintained during the course of works, by the Contractor.

3.3.2 Accessibility

e) The Contractor shall provide safe means of access(in sufficient numbers) & efficient exit to any working place including provisions of suitable and sufficient scaffolding at various stages during all operations of the work for the safety of his workmen and PMC/Owner.
f) The Contractor shall implement use of all measures including use of "life line", "fall-arresters", "retractable fall arresters", "safety nets" etc. during the course of using all safe accesses & exits, so that in no case any individual remains at risk of slip & fall during their travel.
g) A ladder or step- ladder must have a level and firm footing, in case of use of fixed ladders, sufficient foot hold and hand hold to be provided.
h) The access to operating plant / project complex shall be strictly regulated. Any person or vehicle entering such complex shall undergo identification check, as per the procedures in force / requirement of Engineer in charge.
i) Accessibility to 'confined space' shall be governed by specific system / regulation, as established at project site.

3.3.3 Personal Protective Equipment (PPEs)

a) The Contractor workmen shall be permitted entry inside the project premises only with proper PPEs.

b) The Contractor shall ensure that all their staff, workers and visitors including their sub- contractor(s) have been issued (records to be kept) & wear appropriate PPEs like nape strap type safety helmets preferably with head &sweat band with ¾" cotton chin strap, High ankle safety shoes with steel toe cap and antiskid sole, full body harness, protective goggles, gloves, ear muffs, respiratory protective devices, etc. All these gadgets shall conform to applicable IS Specifications. The Contractor shall implement a regular regime of inspecting physical conditions of the PPEs

being issued / used by the workmen of their own & also its sub-agencies and the damaged / unserviceable PPEs shall be replaced forthwith.

c) Engineer_in charge may issue a comprehensive color scheme for helmets to be used by various agencies. The Contractor shall follow the scheme issued by the Engineer in charge and shall choose colour other than blue (for Owner and their representatives). All HSE personnel shall preferably wear dark green band on their helmet or green color safety helmet so that workmen can approach them for guidance during emergencies. HSE personnel shall preferably wear such dresses with fluorescent stripes, which are noticeable during night, when light falls on them.
d) Florescent jackets with respective company logo to be worn by the contractor workmen with different color coding for categories like supervisor and workmen.
e) An indicative list of HSE standards/codes is given under **Appendix-A**.
f) Contractor shall ensure procurement & usage of following safety equipment's/ accessories (conforming to applicable IS mark) by their staff, workmen & visitors including their subcontractors all through the span of project construction.

i. PPEs (Helmet with company name/logo, Safety Goggles, Coverall, Ear-muff, Face Shield, Hand Gloves, High Ankle Safety Shoes, and Gum Boot etc.)
ii. Barricading tape / warning signs
iii. Rechargeable Safety torch (flame-proof)
iv. Safety nets (with tie-chords)
v. Fall arresters
vi. Portable ladders (varying lengths)
vii. Life-lines (steel wire-rope, dia. not less than 8.0 mm)
viii. Full body double lanyard Safety harness with Rebar/ladder hook or scaffolding hook.
ix. Retractable fall arresters (various length)
x. Portable fire extinguishers of adequate capacity
xi. Portable Multi Gas detector

3.3.4 Working at height

a) The Contractor shall issue permit for working (PFW) at height after verifying and certifying the checkpoints as specified in the attached permit (Format No. HSE-6). He shall also undertake to ensure compliance to the conditions of the permit during the currency of the permit including adherence of personal protective equipment's. Contractor's Safety Officer shall verify compliance status of the items of permit document after implementation of action is completed by Contractor's execution / field engineers at work site.

b) Such PFW shall be initially issued for one single shift or expected duration of normal work and extended further for balance duration, if required.

c) Contractors are expected to maintain a register for issuance of permit and extensions thereof including preserving the used permits for verification during audits etc.

d) The Contractor shall ensure that Full body harnesses with double lanyards conforming IS Specifications is used by all personnel while working at height. The life lines should have enough tensile strength to take the load of the worker in case of a fall. The harness should be capable of keeping the workman vertical in case of a fall, enabling him to rescue himself.

e) The Contractor shall ensure that a proper Safety Net System is used wherever the

hazard of fall from height is present. The safety net, preferably a knotted one with mesh ropes conforming to relevant IS specifications shall have a border rope & tie cord of minimum 12mm dia. The Safety Net shall be located not more than 6.0 meters below the working surface extending on either side upto sufficient margin to arrest fall of persons working at different heights.

f) In case of accidental fall of person on such Safety Net, the bottom most portion of Safety Net should not touch any structure, object or ground.

g) Beam Clamps may be used for construction of localized temporary working platforms
Sheds for welding booths etc. at height in all types of steel structure due to faster installation and requirement of less scaffolding materials.

h) Hanging Platform, manufactured by Standard HSE equipment vendors must be encouraged for painting of Buildings etc.

i) All the tools used at height (like spanner, screw driver etc.) shall be provided with securing arrangement like back-pack/waist pouch to prevent accidental slippage from worker hand.

j) The Contractor shall install temporary lightening arrester in tall structures during construction to save human life and to avoid damage to equipment's & machineries. During the possibility of a thunderstorm, all the work at height where a person can be exposed to lightning shall be stopped.

3.3.5 Scaffoldings& Barricading

a) Suitable steel scaffoldings only shall be provided to workmen for all works that cannot be safely done from the ground or from solid construction except such short period work that can be safely done using ladders or man-basket. When a ladder is used, an extra workman shall always be engaged for holding the ladder. The ladder shall be inspected before use for cracked or split stiles, missing, broken, looser damaged rungs & splinters. The ladder shall be of adequate length to enable it to extend to at least 1.0m above the landing place or working point. Metallic ladders shall be only used as access.

b) The Contractor shall ensure that the scaffolds used during construction activities shall be strong enough to take the designed load. Only metallic scaffold boards shall be allowed to use. Steel tubes shall be free from cracks, splits, Surface flaws & other defects. All couplers& fittings shall be properly oiled and maintained.

c) All scaffolds shall be inspected by a safety officer. He shall paste a GREEN tag on each scaffold found safe and a RED tag on each scaffold found unsafe. Scaffolds with GREEN tag only shall be permitted to be used and Scaffolds with RED ones shall immediately be made inaccessible.

d) The Contractor shall ensure positive barricading (indicative as well as protective) of the excavated, radiography, heavy lift, high pressure hydrostatic & pneumatic testing and other such areas. Sufficient warning signs shall be displayed along the barricading areas.

e) Scaffolding shall be constructed using foot seals or base plates only. Base plates shall be used below each standard on surface .Sole plate of timber shall be used beneath the base plate to achieve greater load distribution.

3.3.6 Electrical installations

a) All electrical installations/ connections shall be carried out as per the provisions of latest Indian codes/standard.

b) All temporary electrical installations / facilities shall be regularly checked by the

licensed/competent electricians of the Contractor.

The Contractor shall meet the following requirements:

a. Ensure that electrical systems and equipment including tools & tackles used during construction phase are properly selected, installed, used and maintained as per provisions of the latest revision of the Indian Electrical/ applicable international regulations.

b. Shall deploy qualified & licensed electricians.

c. All switchboards / welding machines shall be kept in well-ventilated & covered shed/ with rain shed protection. The shed shall be elevated from the existing ground level to avoid water logging inside the shed. Installation of electrical switch board must be done taking care of the prevention of shock and safety of machine.

d. No flammable materials shall be used for constructing the shed. Also flammable materials shall not be stored in and around electrical equipment / switchboard. Adequate clearances and operational space shall be provided around the equipment.

e. Fire extinguishers and insulating mats shall be provided in all power distribution centers.

f. Temporary electrical equipment shall not be employed in hazardous area without obtaining safety permit.

g. Proper housekeeping shall be done around the electrical installations.

h. All temporary installations shall be tested before energizing, to ensure proper earthing, bonding, suitability of protection system, adequacy of feeders/cables etc.

i. All welders shall use hand gloves irrespective of holder voltage.

j. Multilingual (Hindi, English and local language) caution boards, shock treatment charts and instruction plate containing location of isolation point for incoming supply, name & telephone No. of contact person in emergency shall be provided in substations and near all distribution boards / local panels.

k. ELCB tester /test meter shall be used for testing the ELCBs operation. ELCBs testing shall be carried out by using ELCB tester on monthly basis but in specific cases like heavy rain as decided by owner/EIC. Record of the testing shall be maintained.

l. Regular inspection of all installations at least once in a month.

The following features shall also be ensured for all electrical installations during constructionphase by the contractor:

a. Each installation shall have a main switch with a protective device, installed in an enclosure adjacent to the metering point. The operating height of the main switch shall not exceed 1.5 M. The main switch shall be connected to the point of supply by means of armoured cable.

b. The outgoing feeders shall be double or triple pole switches with fuses / MCBs. Loads in a three phase circuit shall be balanced as far as possible and load on

neutral should not exceed 20% of load in the phase.

c. The installation shall be adequately protected against overload, short circuit and earth leakage by the use of suitable protective devices. Fuses wherever used shall be HRC type. Use of rewirable fuses shall be strictly prohibited. ELCB/RCCB (Residual Current Circuit Breaker) must be fitted with all Electrical installation. The earth leakage device shall have an operating current not exceeding 30 mA.

d. All connections to the hand tools / welding receptacles shall be taken through proper switches, sockets and plugs.

e. All single phase sockets shall be minimum 3 pin type only. All unused sockets shall be provided with socket caps.

f. Only 3 core (P+N+E) overall sheathed flexible cables with minimum conductor size of 1.5 mm^2 copper shall be used for all single phase hand tools.

g. Only metallic distribution boxes with double earthing shall be used at site. No wooden boxes shall be used.

h. All power cables shall be terminated with compression type cable glands. Tinned copper lugs shall be used for multi-strand wires / cables.

i. Cables shall be free from any insulation damage.

j. Minimum depth of cable trench shall be 750 mm for MV & control cables and 900 mm for HV cables. These cables shall be laid over a sand layer and covered with sand, brick & soil for ensuring mechanical protection. Cables shall not be laid in waterlogged area as far as practicable. Cable route markers shall be provided at every 25 M of buried trench route. When laid above ground, cables shall be properly cleated or supported on rigid poles of at least 2.1 M high. Minimum head clearance of 6 meters shall be provided at road crossings.

k. Underground road crossings for cables shall be avoided to the extent feasible. In any case no underground power cable shall be allowed to cross the roads without pipe sleeve.

l. All cable joints shall be done with proper jointing kit. No taped/temporary joints shall be used.

m. An independent earthing facility should preferably be established within the temporary installation premises. All appliances and equipment shall be adequately earthed. In case of armored cables, the armor shall be bonded to the earthing system. IS: 3043 Code for earthing practices shall be followed at project site.

n. All cables (green colour) and wire rope used for earth connections shall be terminated through tinned copper lugs.

o. In case of local earthing, earth electrodes shall be buried near the supply point and earth continuity wire shall be connected to local earth plate for further distribution to various appliances. All insulated wires for earth connection shall have insulation of green colour.

p. Separate core shall be provided for neutral. Earth / Structures shall not be used as a neutral in any case.

q. ON/OFF position of all switches shall be clearly designated / painted for easy isolation in emergency.

3.3.7 Ergonomics and tools & tackles

a) The Contractor shall assign to his workmen, tasks commensurate with their qualification, experience and state of health.

b) All lifting tools, tackles, equipment, trailers, trucks/dumpers, accessories including cranes shall be tested periodically by competent authority for their condition and load carrying capacity. Valid test & fitness certificates from the applicable authority shall be submitted to Engineer in charge for their review/acceptance before the lifting tools, tackles, equipment, trailers, trucks/dumpers, accessories and cranes are used. Third party inspection certificateis mandatory for all lifting tools & tackles before put into use.

c) Load testing of Cranes by competent person must be made mandatory after each modification/alteration of crane configuration/change in boom length. All heavy equipment's including cranes must be maintained in good condition & record of such maintenance shall be maintained.

d) The contractor shall not be allowed to use defective equipment or tools not adhering to safety norms.

i. Tower Crane, Crane, Hydra mobile Crane (F-15 or equivalent), Hydraulic Rig & Boom Lift shall be inspected on fortnightly basis as per Format No. HSE-20, HSE-21, HSE- 22, HSE-23 & HSE-24.

ii. The Contractor shall deploy experienced operator & may arrange training program for operators of hydra mobile crane, crane, excavator, mobile machinery, Tower Crane, etc. at site by utilizing services from renowned manufacturers.

iii. Hydra mobile crane (F-15 or equivalent) having steering control mechanism shall be permitted at construction site only for the purpose of loading/unloading. However, continuous rigger availability during marching of hydraulic crane at site shall be ensured by contractor.

3.3.8 Occupational Health

a) The contractor shall identify all operations that can adversely affect the health of itsworkers and issue & implement mitigation measures.

b) The Contractor shall arrange Medical Camps at regular intervals at work sites and laborcolonies to assess health condition of workers.

c) The Contractor shall ensure vaccination of all the workers including their families if residing at site, during the course of entire project span.

3.3.9 Hazardous substances

a) Hazardous, inflammable and/or toxic materials such as solvent coating, thinners, anti- termite solutions, water proofing materials shall be stored in appropriate containers preferably with lids having spillage catchment trays and shall be stored in a good ventilated area. These containers shall be labeled with the name of the materials highlighting the hazards associated with its use and necessary precautions to be taken.

b) The work place shall be checked prior to start of activities to identify the location,

type and condition of any asbestos materials which could be disturbed during the work. In case asbestos material is detected, usage of appropriate PPEs by all personnel shall be ensured.

3.3.10 Slips, trips & falls

a) The contractor shall establish a regular cleaning and basic housekeeping programme that covers all aspects of the workplace to help minimize the risk of slips, trips & falls. The contractor shall take positive measures like keeping the work area tidy, storing waste in suitable containers & harmful items separately, keeping passages, stairways, entrances & exits especially emergency ones clear, cleaning up spillages immediately and replacing damaged carpet/ floor tiles, mats & rugs at once to avoid slips, trips & falls.

3.3.11 Demolition/ Dismantling

a) The contractor shall adhere to safe demolishing/ dismantling practices at all stages of workto guard against unsafe working practices.

b) Before carrying out any demolition/dismantling work, the contractor shall take prior approval of Engineer in charge and generate the Format No.HSE-9.

3.3.12 Road Safety

a) The Contractor shall ensure adequately planned road transport safety management system.

b) The vehicles shall be fitted with reverse warning alarms & flashing lights / fog-lights andusage of seat belts shall be ensured.

c) The Contractor shall also ensure a separate pedestrian route for safety of the workers and
Comply with all traffic rules & regulations, including maintaining speed limit of 20 KMPH or indicated by owner for all types of vehicles / mobile machinery. The maximum allowable speed shall be adhered to.

d) In case of an alert or emergency, the Contractor must arrange clearance of all the routes, roads, access.

e) Dumpers, Tippers, etc. shall not be allowed to carry workers within the site and also to & from the labour colony to & from project sites.

f) The Contractor shall not deploy any such mobile machinery / Equipment's, which do not have competent operator and / or experienced banks-man/signal-man. Such machinery/equipment's shall have effective limit-switches, reverse-alarm, and front & rear-end lights etc. and shall be maintained in good working order.

g) The Contractor shall not carry-out maintenance of vehicles / mobile machinery occupying space on project / plant roads and shall always arrange close supervision for such works.

h) Contractor's shall arrange /install visible road signs, diversion boards, caution boards, etc. on project roads for safe movement of men and machinery.

3.3.13 Welfare measures

Contractor shall, at the minimum, ensure the following facilities at work sites:

a) A crèche at site where 10 or more female workers are having children below the age of 6 years.

b) Adequately ventilated / illuminated rooms at labour camps & its hygienic up-keeping.

c) Reasonable canteen facilities at site and in labour camps at appropriate location

depending upon site conditions. Contractor shall make use of “industrial” variety of LPG cylinder & satisfactory illumination at the canteens. Necessary arrangement for efficient disposal of wastes from canteens & urinals /toilets shall also be made and regular review shall be made to maintain the ambience satisfactorily hygienic &shall also comply with all applicable statutory requirements.

d) Adequately lighted & ventilated Rest rooms at site (separate for male workers and female workers).
e) Provision for suitable mobile toilets to be made available by Contractor for remote/scatteredjob locations.
f) Urinals, Toilets, drinking water, washing facilities, adequate lighting at site and labour camps.
g) The contractor at periodic interval shall arrange to prevent mosquito breeding by fumigation/spraying of insecticides at workplace/fabrication yard.

3.3.14 Environment Protection

Contractor shall ensure proper storage and utilization methodology of materials that are detrimental to the environment. Where required, Contractor shall ensure that only the environment friendly materials are selected and emphasize on recycling of waste materials, such as metals, plastics, glass, paper, oil & solvents. The waste that cannot be minimized, reused or recovered shall be stored and disposed of safely. In no way, toxic spills shall be allowed to percolate into the ground. The contractor shall not use the empty areas for dumping the wastes.

The contractor shall strive to conserve energy and water wherever feasible.

The contractor shall ensure dust free environment at workplace by sprinkling water on the ground at frequent intervals. The air quality parameters for poisonous gases, toxic releases, harmful radiations, etc. shall be checked by the contractor on daily basis and whenever need arises.

The contractor shall not be allowed to discharge chemicals, oil, silt, sewage, sullage and otherwaste materials directly into the controlled waters like surface drains, streams, rivers, ponds. A discharge plan shall be submitted to Engineer in charge for approval.

3.3.15 Rules & Regulations

All persons deployed at site shall be knowledgeable of and comply with the environmental laws,rules & regulations relating to the hazardous materials, substances and wastes. Contractor shall not dump, release or otherwise discharge or disposes off any such materials without the express authorization of Engineer in charge. An indicative list of Statutory Acts & Rules relating to HSEis given under Appendix-D.

3.3.16 Weather Protection

Contractor shall take appropriate measures to protect workers from severe storms, rain, solar radiations, poisonous gases, dust, etc. by ensuring proper usage of PPEs like Sun glasses, Sun screen lotions, respirators, dust masks, etc. and rearranging/ planning he construction activitiesto suit the weather conditions. Effective arrangement (without creating inconvenience to project facilities & permanent installations) for protecting workmen from hailstorm, drizzle in the form of temporary shelter shall be made at site.

3.3.17 Communication

All persons deployed at the work site shall have access to effective means of communication so that any untoward incident can be reported immediately and assistance sought by them.

All health & safety information shall be communicated in a simple & clear language easilyunderstood by the local workforce.

For information to all, typical subjects that should be communicated

are: -Inside the company (Top to down)

a. Quality Policy
b. HSE Policy contents
c. Environment Policy
d. HSE Objectives
e. Safety Cardinal Rules
f. HSE Target – reached or missed
g. Praises & Warnings to personnel for HSE Management
h. Safety Walk Through Reports and safety defects / shortfalls (by management)
i. HSE Audit results
j. Revised Statutory Health & Safety provisions, if any
k. H & S publicity
l. Suggestions

Inside the Company (Bottom to up)

a. Complaints
b. Compliances on safety defects / shortfalls
c. Suggestions
d. Proposals for changes & improvements
e. HSE Reports (including near-miss reports)

3.3.18 Confined Space Entry

The contractor shall generate a work permit (Format No. HSE -7) before entering a confined space. People, who are permitted to enter into confined space, must be medically examined. All necessary precautions mentioned therein shall be adhered to. An attendant shall be positioned outside a confined space for extending help during an emergency. Effective communication shall be maintained between personnel in confined space and outside by combination of visual/voice or portable radio. Compressed gas cylinders shall not be taken into confine space.
Entry Register for confined space to be maintained with the name and time of entry/exit.

3.3.19 Excavation

The Contractor shall obtain permission from competent authorities prior to excavation wherever required.

The Contractor shall locate the position of buried utilities (water line, cable route, etc.) by referring to project in consultation with Engineer in charge. The Contractor shall start digging manually to locate the exact position of buried utilities & thereafter use mechanical means.

The Contractor shall keep soil heaps at least 1.5 M away from edge or a distance equal to depth of pit (whichever is more)

All excavated pits greater than 10 Sq.M plan area and depth more than 1.5M shall have at least two access routes for ingress and egress. Also, additional access routes shall be provided such that distance between any two access routes shall not be more than 20M.

The Contractor shall maintain sufficient “angle of repose” during excavation – shall alsoprovide slope or suitable bench as decided by PMC/ Owner.

The Contractor shall arrange “battering” or “benching” wherever required for preventing collapse of edge of excavations.

The Contractor shall identify & arrange de-watering pump or well-point system to prevent earth collapse due to heavy rain / influx of underground water.

The Contractor shall arrange protective fencing/ hard barricading with warning signal around excavated pits, trenches, etc. along with minimum 2 (two) entries, exits / escape ladders.

The Contractor must avoid “underpinning” / under-cutting to prevent collapse of chunk of earth during excavation

The Contractor shall use “stoppers” to prevent over-run of vehicle wheels at the edge of excavated pits / trenches.

The Contractor shall arrange strengthening of “shoring” & “strutting” proactively to avoid collapse of earth / edges due to vehicular movement in close proximity of excavated areas / pits/ trenches, etc.

3.4 Tool Box Talks (TBT)

Contractor shall conduct daily TBT with workers prior to start of work and shall maintain proper record of the meeting. A record shall be maintained in a format suggested by Engineer in charge.

The Contractor shall conduct TBT before start of every morning or evening shift or night shift activities, for alerting the workers on specific hazards and their appropriate dos & don’ts. The Contractor shall provide sufficient rests to the site workmen and their foremen to avert fatigue & thereby endangering their lives during the course of site works.

3.5 Training & Induction Programme

a) Initial induction of workers into Construction oriented activities and appraising them about the methodology of works and how to carry-out safely and the same should not be inter mixed with Tool Box Talks or HSE Training. In this regard careful action should be made & maintained for imparting HSE induction to every individual, irrespective of his task/designation/level of employment, whereas, HSE Training should be imparted to specific person/group of people who are to carry-out that specific task more than once – for Example, Riggers must be trained for working at heights, welders must be trained for work in confined space, fitters/carpenters, mesons must be trained for work at heights, etc.

b) Contractor shall conduct Safety induction programme on HSE for all his workers and maintain records. The Gate Pass shall be issued only to those workers who successfully qualify the Safety induction programme.

c) The Contractor shall brief the visitors about the HSE precautions which are required to be taken before their proceeding to site and make necessary arrangements to issue appropriate PPEs like Aprons, hard hats, ear-plugs, goggles & safety shoes etc., to his visitors. The Contractor shall always maintain relevant acknowledgement from visitor on providing him brief information on HSE actions.

d) Contractor shall ensure that all his personnel possess appropriate training to carry out the assigned job safely. The training should be imparted in a language understood by them and should specifically be trained about

- Potential hazards to which they may be exposed at their workplace
- Measures available for prevention and elimination of these

hazardsThe topics during training shall cover, at the minimum: -

- Why safety should be considered during work - explanation
- Education about hazards and precautions required
- Employees' duties & responsibilities
- Emergency and evacuation plan
- HSE requirements during project activities
- Firefighting and First-Aid
- Use of PPEs
- Occupational health issues – dos & don'ts
- Local laws on intoxicating drinks, drugs, smoking in force
- Common environmental subjects – lighting, ventilation, vibration, smoke/fumes etc.

e) Records of the training shall be kept and submitted to Engineer in charge.

DETAILS OF HSE MANAGEMENT SYSTEM BY CONTRACTOR

On Award of Contract

The Contractor shall submit a comprehensive Health, Safety and Environmental Plan or programme for approval by Engineer in charge prior to start of work. The Contractor shall participate in the pre-start meeting with Engineer in charge to finalize HSE Plans which shall including the following:

- HSE policy & Objectives
- Job procedure to be followed by the Contractor for construction activities including handling of equipment's, scaffolding, electric installations, etc. describing the risks involved, actions to be taken and methodology for monitoring each activity. Indicative list of procedures is enclosed as Annexure-H
- PMC/Owner review/audit requirement.
- Organization structure along with responsibility and authority, on HSE activities.
- Administrative & disciplinary steps involving implementation of HSE requirements
- Emergency evacuation plan/ procedures for site and labour camps
- Procedures for reporting & investigation of accidents and near misses.
- HSE Inspection
- HSE Training programme at project site
- HSE Awareness programme at project site
- Reference to Rules, Regulations and statutory requirements.
- HSE documentation viz reporting, analysis & record keeping.

APPENDIX-A
(Sheet 1 of 2)

A. IS CODES ON HSE

SP: 53 Safety code for the use, Care and protection of hand operated tools.

IS: 838 Code of practice for safety & health requirements in electric and gas weldingand cutting operations

IS: 1179 Eye & Face precautions during welding, equipment etc.

IS: 1860 Safety requirements for use, care and protection of abrasive grinding wheels.IS: 1989 (Pt -II) Leather safety boots and shoes

IS: 2925 Industrial Safety Helmets

IS: 3016 Code of practice for fire safety precautions in welding & cutting operation.IS: 3043 Code of practice for earthing

IS: 3764 Code of safety for excavation work

IS: 3786 Methods for computation of frequency and severity rates for industrial injuriesand classification of industrial accidents

IS: 3696 Safety Code of scaffolds and ladders

IS: 4083 Recommendations on stacking and storage of construction materials andcomponents at site

IS: 4770 Rubber gloves for electrical purposes

IS: 5121 Safety code for piling and other deep foundations

IS: 5216 (Pt-I) Recommendations on Safety procedures and practices in electrical worksIS: 5557 Industrial and Safety rubber lined boots

IS: 5983 Eye protectors

IS: 6519 Selection, care and repair of Safety footwear

IS: 6994 (Pt-I) Industrial Safety Gloves (Leather & Cotton Gloves)IS: 7293 Safety Code for working with construction Machinery

IS: 8519 Guide for selection of industrial safety equipment for body protectionIS: 9167 Ear protectors

IS: 11006 Flash back arrestor (Flame arrestor)

IS: 11016 General and safety requirements for machine tools and their operationIS: 11057 Specification for Industrial safety nets

IS: 11226 Leather safety footwear having direct moulded rubber sole

IS: 11972 Code of practice for safety precaution to be taken when entering a seweragesystem

IS: 13367 Code of practice-safe use of cranes

IS: 13416 Recommendations for preventive measures against hazards at working place

B. INTERNATIONAL STANDARDS ON HSE

Safety Glasses	:	ANSI Z 87.1, ANSI ZZ 87.1, AS 1337, BS 2092, BS 1542, BS 679, DIN 4646/
58311Safety Shoes	:	ANSI Z 41.1, AS 2210, EN 345
Hand Gloves	:	BS 1651
Ear Muffs	:	BS 6344, ANSI S 31.9
Hard Hat	:	ANSI Z 89.1/89.2, AS 1808, BS 5240, DIN 4840
Goggles	:	ANSI Z 87.1
Face Shield	:	ANSI Z 89.1
Breathing Apparatus	:	BS 4667,
NIOSHWelding & Cutting	:	ANSI Z49.1

APPENDIX-B

DETAILS OF FIRST AID BOX

SL. NO.	DESCRIPTION	QUANTITY
1.	Small size Roller Bandages, 1 Inch Wide (Finger Dressing small)	6 Pcs.
2.	Medium size Roller Bandages, 2 Inches Wide (Hand & Foot Dressing)	6 Pcs.
3.	Large size Roller Bandages, 4 Inches Wide (Body Dressing Large)	6 Pcs.
4.	Large size Burn Dressing (Burn Dressing Large)	4 Pkts.
5.	Cotton Wool (20 gms packing)	4 Pkts.
6.	Antiseptic Solution Dettol (100 ml.) or Savlon	1 Bottle
7.	Mercurochrome Solution (100 ml.) 2% in water	1 Bottle
8.	Ammonia Solution (20 ml.)	1 Bottle
9.	A Pair of Scissors	1 Piece
10.	Adhesive Plaster (1.25 cm X 5 m)	1 Spool
11.	Eye pads in Separate Sealed Pkt.	4 pcs.
12.	Tourniquet	1 No.
13.	Safety Pins	1 Dozen
14.	Tinc. Iodine/ Betadine (100 ml.)	1 Bottle
15.	Polythene Wash cup for washing eyes	1 No.
16.	Potassium Permanganate (20 gms.)	1 Pkt.
17.	Tinc. Benzoine (100 ml.)	1 Bottle
18.	Triangular Bandages	2 Nos.
19.	Band Aid Dressing	5 Pcs.
20.	Iodex/ Moov (25 gms.)	1 Bottle
21.	Tongue Depressor	1 No.
22.	Boric Acid Powder (20 gms.)	2 Pkt.
23.	Sodium Bicarbonate (20 gms.)	1 Pkt.
24.	Dressing Powder (Nebasulf) (10 gms.)	1 Bottle
25.	Medicinal Glass	1 No.
26.	Duster	1 No.
27.	Booklet (English& Local Language)	1 No. each
28.	Soap	1 No.
29.	Toothache Solution	1 No.
30.	Vicks (22 gms.)	1 Bottle

31.	Forceps	1 No.
32.	Snake –Bite Lancet	1No.
33.	Note Book	1 No.
34.	Splints	4 Nos.
35.	Lock	1 Piece
36.	Life Saving/Emergency/Over-the counter Drugs	As decided at site

Box size: Suitable size first aid box to be used for first aid items

Note: The medicines prescribed above are only indicative. Equivalent medicines can also be used. A prescription, in this regard, shall be required from a qualified Physician.

APPENDIX-C

TYPE OF FIRES VIS-À-VIS FIRE EXTINGUISHERS

Fire Extinguisher → / Fire ↓	Water	Foam	CO_2	Dry Powder	Multipurpose (ABC)
Originated from paper, clothes, wood	□	□	can control minor surface fires	can control minor surface fires	□
Inflammable liquids like alcohol, diesel, petrol, edible oils, Bitumen	x	□	□	□	□
Originated from gases like LPG, CNG, H_2	x	X	□	□	□
Electrical fires	x	X	□	□	□

LEGEND: □ : CAN BE USED

X : NOT TO BE USED

Note: Fire extinguishing equipment must be checked at least once a year and after every use by an authorized person. The equipment must have an inspection label on which the next inspection date is given. Type of extinguisher shall clearly be marked on it.

APPENDIX-D

List of Statutory Acts & Rules Relating to HSE

- The Indian Explosives Act and Rules
- The Motor Vehicle Act and Central Motor Vehicle Rules
- The Factories Act and concerned Factory Rules
- The Petroleum Act and Petroleum Rules
- The Workmen Compensation Act
- The Gas Cylinder Rules and the Static & Mobile Pressure Vessels Rules
- The Indian Electricity Act and Rules
- The Indian Boiler Act and Regulations
- The Water (Prevention & Control & Pollution) Act
- The Water (Prevention & Control of Pollution) Cess Act
- The Mines & Minerals (Regulation & Development) Act
- The Air (Prevention & Control of Pollution) Act
- The Atomic Energy Act
- The Radiation Protection Rules
- The Indian Fisheries Act
- The Indian Forest Act
- The Wild Life (Protection) Act
- The Environment (Protection) Act and Rules
- The Hazardous Wastes (Management & Handling) Rules
- The Manufacturing, Storage & import of Hazardous Chemicals Rules
- The Public Liability Act
- The Building and Other Construction Workers (Regulation of Employment and Condition ofService) Act
- Other statutory acts Like EPF, ESIS, and Minimum Wages Act.

APPENDIX-H

LIST OF PROCEDURES (MINIMUM) TO BE FORMING PART OF HSE PLAN:-

A. HSE Management Procedures:

- HSE Objectives & Performance
- HSE Training and Competence (including Induction)
- HSE Motivation &Award Scheme
- HSE Audits
- HSE Emergency Management
- HSE Incidents Reporting and Management
- First Aid & Management
- Roles, Responsibility, accountabilities and Authorities

B. Job procedures/Safe Operating procedures

- Setting Up Site & Signage's
- Working at Height
- Confined Space Entry
- Permit to Work
- Housekeeping
- Transportation of materials including Manual Handling
- Earthmoving Operations & excavation
- Scaffolding
- Fire Prevention/Protection
- Hazardous Substance handling & Storage
- Personal Protective Equipment

ACCIDENT / INCIDENT REPORT

(To be submitted by Contractor after every Incident / Accident within 24 hours to PMC/ Owner)

Report No.:_____ **Date**:

Project site:_____Name of work:

Contractor's name:_____ Contractor's Job Engineer (name)

Non-disabling injury (Non-LTA)	Hospitalized but resumed duty before end of 48 hrs	
Disabling injury (other LTA)	Hospitalized & failed to resume duty within next 48 hrs	
Fatal (LTA):	Death / Expiry	
First Aid case (non LTA)	Resume duty after first aid	

Name of the injured:_____Father's name of victim: _____

Sub Contractor's Name:

Gate Pass No.: ..... Age:_____Yrs. Victim's medical fitness exam. (Pre-empl.) date: -

Date & time of Accident / Incident: _____

Names of Witnesses: (1_____(2)_____(3)_____

Profession of victim:

Bar bender		Carpenter		Meson	
Fitter		Helper		Gas cutter	
Grinder		Welder		Electrician	
Driver		Rigger		M/c. operator	
Engineer		Manager		Other/specify	

Qualification

No formal education		Non-Matriculate		Matriculate	
Graduate		Post- grad		Other/specify	

Job Experience

NIL		Less than 2 yrs		2-5 yrs	
5-10 yrs		11-15 yrs		15 years and above	

Location where the incident happened:

_____

Activity / Works that were continuing during incident / accident: -

Excavation		Demolition		Concrete carrying	
Concrete pouring		Transportation of materials (manually)		Transportation of materials (mechanically)	
Work on or adjacent to water		Work at height (+2.0 mts)		Scaffold preparation	
Scaffold dismantling		Piling works		Welding	
Grinding		Gas-cutting		Pipe fit-ups & fabrication	
Structural fabrications		Machine works		Hydro-testing works	
Electrical works		Erection activities		Other/specify	

What exactly the victim was doing just before the incident / accident? .....

Nature of injury:

Bruise or Contusion		Abrasion (superficial wound)		Sprains or strains	
Cut or Laceration		Puncture or Open wound		Burn	
Inhalation of toxic or Poisonous fumes or gases		Absorption		Amputation	
Fracture		Other/specify			

Parts of body involved in incident / accident

Head		Face		Eyes	
Throat		Arm (above wrist)		Hand (including wrist)	
Fingers		Truck (Abdomen / Back / Chest / Shoulder)		Throat	
Leg (above ankle)		Foot (incl. ankle)		Toes	
Multiple				Other/specify	

Accident type:

Struck against		Struck by		Fall from Elevation	
Fall on same level		caught in		caught under	
caught in between		Rubbed or abraded		Contact with (Electricity)	
Contact with (Temp./ extremes)		Contact with chemicals or oils		Vehicle accident	
Other/specify					

Medical Aid provided:- (indicate specific aids / treatment etc.)-

---

Actions taken to prevent recurrence of similar incident / accident: .....

Intimation to local authorities (Dist. Collector / Local Police Station / ESI authority): Yes / No / NA. If yes, to whom

---

Safety Officer

Manager(Signature and Name)

Stamp of Contractor

Site Head / Resident Construction

(Signature and Name)

SUPPLEMENTARY INCIDENT / ACCIDENT INVESTIGATION REPORT

TICK THE APPROPRIATE ONE AS APPLICABLE (furnish within 72 hours)

Supplementary to Incident / Accident Report No:___(Copy enclosed)

Report No.:_____ **Date**:

Project site:_____Name of work:

Contractor's name:_____ Contractor's Job Engineer (name)

Non-disabling injury (Non-LTA)	Hospitalized but resumed duty before end of 48 hrs.	
Disabling injury (other LTA)	Hospitalized & failed to resume duty within next 48 hrs.	
Fatal (LTA):	Death / Expiry	
First Aid case (non LTA)	Resume duty after first aid	

Name of the injured:_____Father's name of victim: _____

Sub Contractor's Name:

Gate Pass No.: ..... Age:_____Yrs. Victim's medical fitness exam. (Pre-empl.) date: -

Date & time of Accident / Incident: _____

Names of Witnesses: (1_____(2)_____(3)_____

Profession of victim:

Bar bender		Carpenter		Meson	
Fitter		Helper		Gas cutter	
Grinder		Welder		Electrician	
Driver		Rigger		M/c. operator	
Engineer		Manager		Other/specify	

Qualification

No formal education		Non-Matriculate		Matriculate	
Graduate		Post- grad		Other/specify	

Job Experience

NIL		Less than 2 yrs.		2-5 yrs.	
5-10 yrs.		11-15 yrs.		15 years and above	

Location where the incident happened:

Activity / Works that were continuing during incident / accident: -

Excavation		Demolition		Concrete carrying	
Concrete pouring		Transportation of materials (manually)		Transportation of materials (mechanically)	
Work on or adjacent to water		Work at height (+2.0 mts)		Scaffold preparation	
Scaffold dismantling		Piling works		Welding	
Grinding		Gas-cutting		Pipe fit-ups & fabrication	
Structural fabrications		Machine works		Hydro-testing works	
Electrical works		Erection activities		Other/specify	

What exactly the victim was doing just before the incident / accident? .....

Particular of tools & tackles being used and condition of the same after incident/accident: .....

Description of Incident/Accident (How the incident was caused) : .....

Nature of injury:

Bruise or Contusion		Abrasion (superficial wound)		Sprains or strains	
Cut or Laceration		Puncture or Open wound		Burn	
Inhalation of toxic or Poisonous fumes or gases		Absorption		Amputation	
Fracture		Other/specify			

Parts of body involved in incident / accident

Head		Face		Eyes	
Throat		Arm (above wrist)		Hand (including wrist)	
Fingers		Truck (Abdomen / Back / Chest / Shoulder)		Throat	
Leg (above ankle)		Foot (incl. ankle)		Toes	
Multiple				Other/specify	

Accident type

Struck against		Struck by		Fall from Elevation	
Fall on same level		caught in		caught under	
caught in between		Rubbed or abraded		Contact with (Electricity)	
Contact with (Temp./extremes)		Contact with chemicals oroils		Vehicle accident	
Other/specify					

Name & Designation of person who provided First-Aid to the victim:

Name & Telephone number of Hospital where the victim was treated

Mode of transport used for transporting victim – Ambulance / Private car / Tempo / Truck /

Others How much time taken to shift the injured person to Hospital

In case of FATAL incident, indicate clearly the BOCW Registration No. of the victim/Company.....
...

Comments of Medical Practitioner, who treated / attended the victim/injured (attached / describedhere)

What actions are taken for investigation of the incident, please indicate clearly – (Video film /Photography / Measurements taken etc .....)

Immediate cause (Please tick the right applicable) –

Hazardous methods or procedures inadequatelyguarded		Poor housekeeping		Inadequate or improperPPE	
Environmental hazards (excess noise/ space constraint/ inadequate Ventilation		improper illumination/Moving on ovalsurface		Working on dangerous equipment	

Failure to secure		Horse-play		Failure to use PPE	
Inattention to surroundings		Improper use of hands &body-parts		By-passing safety devices	
Unsafe mixing or placement of tools & tackles		Bypassing standard procedures		Failure in communication	
Operating without authority		Improper use of equipment or tools & tackles		drug or alcoholic influence	
excessive haste		Others(specify)			

Basic cause

Over confidence		Impulsiveness		over-exertion	
Faulty judgment or poor understanding		Failing to keep attention constantly		Nervousness & Fear	
Fatigue		Defective vision		Ill health or sickness	
Slow reaction		Others (specify)			

Root cause

Inadequate Engg		Improper Design		Inadequate Planning &organization	
Inadequate knowledge		Inadequate skill		Inadequate training	
Inadequate supervision		Improper work procedure		Inadequate compliance with standard	
Substandard performance		Inadequate maintenance		Improper inspection	
Others (specify)					

Loss of man days and impact on site works, (if any) –

Remarks from Contractor's Safety Officer/ Engineer –

Was the victim performing relevant tasks for which he was engaged /employed? Yes / No
Was the Supervisor present on work-site during the incident? Yes / No
Have the causes of incident rightly identified? Yes / NoCause of Accident was

Remedial measures recommended by **Safety Officer of Contractor** for avoiding similar incident infuture

: .....

.....

.....

.....

.....

.....

.....

Intimation to local authorities (Dist. Collector / Local Police Station / ESI authority): Yes / No / NA. If yes, to whom

.....

_____

Safety Officer
Manager(Signature and Name)

Site Head / Resident Construction
(Signature and Name)
Stamp of Contractor

FORMAT NO. : HSE-4
REV0

NEAR MISS INCIDENT/ DANGEROUS OCCURRENCE SUGGESTED PROFORMA

(To be submitted within 24 hours)

- **Near Miss: Human injury escaped & no damage to property, equipment or interruption to work.**
- **Dangerous Occurrence**: Damage to property, equipment or interruption of work, but not resulting in personal injury/ illness, e.g. Fire incident, collapse of structure, crane failure, etc.

Report No.:

Name of Site:_____ Date:

Name of work:_____ Contractor:

Incident reported by :

Date & Time of Incident :

Location :

Brief description of incident

Probable cause of incident

Suggested corrective action

Steps taken to avoid recurrence Yes ☐ No ☐

Safety Officer Site Head / Resident Construction Manager(Signature and Name) (Signature and Name)

Stamp of Contractor

FORMAT NO. : HSE-5 REV0

MONTHLY HEALTH, SAFETY & ENVIRONMENTAL (HSE) REPORT

(To be submitted by each Contractor)

Actual work start Date: _____ For the Month of: _____

Project:_____ Report No: _____

Name of the Contractor: _____ Status as on : _____

Name of Work : Job No :

ITEM		UPTO PREVIOUS MONTH	THIS MONTH	CUMULATIVE
1) Average number of Staff & Workmen (average daily headcount, not man days)				
2)Total Man-hours worked				
3) Number of Induction programmes conducted				
4) Number of HSE meetings organized at site				
5) Number of HSE awareness programmes conducted at site				
6) Number of Tool Box Talks conducted				
7) Number of Lost Time Accidents (LTA)	Fatal			
	Other LTA			
8) Number of Loss Time Injuries (LTI)	Fatalities			
	Other LTI			
9) Number of Non-Loss Time Accidents				
10) Number of First Aid Cases				
11) Number of Near Miss Incidents				
12) No. of unsafe acts/ practices detected				
13) No. of disciplinary actions taken against staff/ workmen				
14) Man-days lost due to accidents				
15) LTA Free man-hours i.e. LTA free man-hours counted from the LastLTA (enter date:)				
16) Frequency Rate (No. of LTA per 2 lacs man-hours worked)				
17) Severity Rate (No. of man days lost per 2 lacs man-hours worked)				
18) Loss Time Injury Frequency (No. of LTI per 2 lacs man-hours worked)				
19) No. of activities for which HIRAC completed				
20) No. of incentives/ awards given				
21) No. of occasions on which penalty imposed by PMC/ Owner				
22) No. of Audits conducted				
23) No. of pending NCs in above Audits				
24) Compensation cases raised with Insurance				
25) Compensation cases resolved and paid to workmen				
26) No of Vehicular Accident cases				
27) No of fire/Explosion cases				
28) Whether workmen compensation policy taken			Yes	No

29) Whether workmen compensation policy is valid			Yes		No
30) Whether workmen registered under ESI Act, as applicable			Yes		No
31) Whether HIRAC Register prepared and updated			Yes		No
32) Whether Environment Aspect Impact Register prepared and updated			Yes		No
33) Whether Legal Register prepared and updated			Yes		No
Remarks, if any					

Date:

Prepared by Safety Officer Approved by Site Head / Resident Construction

Manager(Signature and Name) (Signature and Name)

FORMAT NO.: HSE-6 REV 0

PERMIT FOR WORKING AT HEIGHTS (ABOVE 2.0 METER)

Permit No. .... Name of Main Contractor …..................................
Name of work executing agency / sub agency / vendor: ....
Date .... Exact Location of work ....
Nature of work ....Duration of work (from) .... (To) ....
Number of workers covered within this permit ....
(*List enclosed with name & gate pass numbers*.)

Sl. No.	Items / Subjects	Status of compliance (Yes / No)	
1	Work areas / Equipment's inspected		
2	Work area cordoned off		
3	Adequate lighting is provided		
4	Precautions against public traffic taken		
5	Concerned persons in & around have been alerted & cautioned		
6	Hazards / risks involved in routine / non-routine task assessed and controlmeasures have been implemented at specific task		
7	ELCB provided for electrical connection & found working		
8	Ladder safely attached / fixed		
9	Scaffoldings are checked and TAGs are found used correctly		
10	Working platforms are provided and are found sound /safe for use		
11	Safe access & egress arrangements (e.g. ladders, fall arresters, life-lines etc.)are satisfactorily incorporated		
12	a. Openings on platform / floors are effectively cordoned / covered		
	b. Safety Nets are provided wherever required		
13	Use of following safety gadgets by people working at area under this permit, ischecked and found satisfactory - Safety helmet Safety harness (full body) with double lanyardSafety Shoes Safety gloves Safety goggles		
14	Housekeeping of work area found satisfactorily tidy / clean & clear		
15	Adequate measures have been taken for works being continued at the ground level, when simultaneous works are permitted overhead at that very location.		
16	Materials are not thrown from heights on to ground		
17	Medical examination of workers are made & found satisfactory		
18	Responsible job engineer / supervisor found physically present at work spot foroverall administration of work as well as safety of people.		

Above items have been checked & compliance has been found in place. Hence work is permitted to start / continue at the above-mentioned location. Work shall not start till identified lapses are rectified.

Additional Precautions, if any .....

Work Permit issued by Contractor Engineer/RCM	Verification By Contractor Safety Officer

AT THE END OF THE DAY/WORK:

All works at height are completed & workmen have returned safely from work location at (time)..... (Date) .....

(Sig. Contractor Engineer**)**

CONFINED SPACE ENTRY PERMIT

Project site _____ Sr. No. _____
Name of the work _____ Date_____
Name of Contractor _____ Nature of work
Exact location of work

Safety Requirements POSITIVE ISOLATION OF THE VESSEL IS MANDATORY		
(A) Has the equipment been?		
Y NR	Y NR	Y NR
☐☐ Isolated from power/steam/air	☐☐ water flushed &/orsteamed	☐☐ radiation sources removed
☐☐ isolated from liquid orgases	☐☐ Man ways open &ventilated	☐☐ proper lighting provided
☐☐ depressurized &/ordrained	☐☐ cont. inert gas flow arranged adequately cooled	☐☐
☐☐ blanked/ blinded/ disconnected	☐☐	
(**B) Expected Residual Hazards**		
☐☐ lack of O_2	☐☐ combustible gas/ liquid	☐☐ H_2S / toxic gases
☐☐ corrosive chemicals	☐☐ pyrophoric iron / scales	☐☐ electricity / static
☐☐ heat/ steam / frost	☐☐ high humidity	☐☐ ionizing radiation
☐☐	☐☐	☐☐
(C) Protection Measures		
☐☐ gloves	☐☐ ear plug / muff	☐☐ goggles / face shield personal gas alarm rescue equipment/team communication equipment
☐☐ protective clothing	☐☐ dust / gas / airline mask attendant with SCBA/airmask	☐☐
☐☐ grounded air duct/blower /AC	☐☐ safety harness & lifeline	☐☐
☐☐ Firefighting arrangements	☐☐	☐☐
☐☐		

Authorization / Renewal (It is safe to enter the confined space)

	No. of persons allowed	Name of persons allowed	Signature		Time		Signature
			Contractor's Supervisor	Contractor's Safety Officer	From	To	Workman

Permit Closure :

(A) Entry □ was closed □ stopped □ will continue on ...

(B) □ Site left in a safe condition □ Housekeeping done

(C) Multilock □ removed □ key transferred

□ Ensured all men have come out □ Man-ways barricaded

Remarks,if any:

FORMAT NO.: HSE-9
REV 0

DEMOLISHING/DISMANTLING WORK PERMIT

Project : Sr. No. :
Name of the work : Date :
Name of contractor : Job No. :

Name of sub-contractor: No. of workers to be engaged:
(*List enclosed with name & gate pass numbers*.)

Line No. / Equipment No. / Structure to be dismantled :

Location details of dismantling/ demolition with sketch: (clearly indicate the area)

S. **No.** The following items have been checked &compliance shall be ensured during currency of thepermit:

Item description	Done	Not Applicable
Services like power, gas supply, water, etc. disconnected	☐	☐
Dismantling/ Demolishing method reviewed & approved	☐	☐
Usage of appropriate PPEs ensured	☐	☐
Precautions taken for neighboring	☐	☐
structuresFirst-Aid arrangements made	☐	☐
Firefighting arrangements ensured	☐	☐

(Contractor's Supervisor) (Contractor's Safety

Officer)Permission is granted.

(Permit issuing authority-Client)

Name :
Date :

Completion report:

Dismantling/ Demolishing is completed on_____Date at_____Hrs.

Materials/ debris transported to identified location ☐ Tagging completed (as applicable) ☐

Services like power, gas supply, water, etc. ☐

CONTRACTOR'sNAME

FORMAT NO. : HSE-11 REV 0

HOUSEKEEPING ASSESSMENT& COMPLIANCE

Project : Sr. No. :

Name of the work : Date :

Name of contractor : Job No. :

Name of contractor : Fortnightly

Sl. No.	Subjects of Review	Satisfactory/ Yes	Non satisfactory/ No	Remarks	Action
1.	Cleanliness at the Main entry / access of site				
2.	Ground condition / floor areas free from water-logging / oil spillage				
3.	Ground & elevated floors free from rubbish / wastes / accumulated debris / scraps.				
4.	Manholes / openings are covered / fenced				
5.	Trenches are barricaded / walkways are inplace				
6.	Drains are cleaned / not choked / not occupied by dumped materials				
7.	Sufficient CAUTION boards / instructionsdisplayed				
8.	Construction machinery are maintained & Parked in orderly manner.				
9.	Movement of site people are not obstructed because of dumping / storing of construction materials				
10.	Access / egress to Electrical Distribution Boards / Panels clear from wires / cables /earth-strips etc.				
11.	Electrical panel rooms / sheds / MCC / Control rooms / Substations etc. are clean & tidy and Not used for storing dress / clothes, tiffin-boxor bicycles.				
12.	Passage behind Elec. panels are free for access				
13.	Fire extinguishers / fire-buckets are accessiblewithout any difficulty.				
14.	Stair-steps, platforms & landings are clear &				

	tidy				
15.	Sheds / rooms & work areas have got sufficientillumination as well as ventilation				
16.	Cables / Wires / welding leads are routed / Hanged appropriately & are not creating unsafecondition.				
17.	Stacking / storing of insulation materials or Their packing.				
18.	Removal or cleanliness of left-over sand, concrete, brick-bats, insulation-materials,excess earth, wastes etc.				
19.	Storing / stacking of sand, metal chips, re-bars, steel pipes, valves, fittings etc.				
20.	One escape route at ground & minimum twoescape routes at elevation available,				

FORMAT NO. : HSE-11 REV 0

(Sheet 2 of 2)

Sl. No.	Subjects of Review	Satisfactory/Yes	Non satisfactory/ No	Remarks	Action
21.	Captions / Posters / Slogans on various safety instructions are displayed legibly in local language				
22.	Cable trenches are water-free or regular Arrangement for taking out accumulated waterexists.				
23.	Windows of rooms / offices are regularly cleaned				
24.	Facilities for cycle sheds, drinking water, Washing, rest-rooms etc. are maintained in tidymanner.				
25.	Toilet, Urinals, Canteen / kitchen / pantry etc. are maintained & free from obnoxious smell.				
26.	Construction tools / tackles are stored Systematically - the items are tagged / tested /certified by competent third party.				
27.	Sufficient numbers of Dust-bins / Waste-binsfound at site and are regularly emptied.				

Additional remarks, if any -

Inspected by
Contractor Engineer

Verification By
Contractor Safety Officer

FORMAT NO. : HSE-13 REV 0

INSPECTION FOR SCAFFOLDING

Project : Sr. No.
:
Name of the work : Date :
Name of contractor : Job No.
:

Sl. No	Description	Yes	No	N.A.	Actions taken
1	Whether work permit is obtained to take up work at height above 1.5 M?				
2	Whether atmospheric condition is “stormy” or “raining” and works at heights have been permitted?				
3	Whether steel pipes scaffoldings are used for units /off-site areas?				
4	Whether scaffolding has been erected on rigid/firm/leveled surfaces / ground? Whether “foot-seals” or “base-plates” are used beneath the up- rights (vertical steel pipes)				
5	Whether scaffold construction is as per IS specification with toe-board andhand-rails (top-rail as well as mid-rail)?				
6	Whether distance between two successive up-rights are less than 2.5 M (height of scaffold & load carrying capacity governs the distance betweentwo uprights)				
7	Whether all uprights are extended at least 900 mm above the top mostworking platform (to enable fitting of handrails)?				
8	Whether vertical distance of two successive ledgers is satisfactory? (Varying between 1.3 Mts. To 2.1 M)				
9	Whether the peripheral areas of working at height are cordoned-off? (foravoiding accident to people arising out of dropped / deflected materials)				
10	Whether platform is provided? Is it safely approachable?				
11	Whether end of scaffold platform / board are extended beyond transoms?(125mm to 150 mm)				
12	Whether CE / IS approved quality and worthy conditioned full-body safety Harness (with double lanyard & karabiners) are used while working atheights?				
13	Whether life-line of safety harness is anchored to an independent securedsupport capable of withstanding load of a falling person?				
14	Whether the area around the scaffold is cordoned off to prohibit the entry of Unauthorized person / vehicle?				
15	Whether clamps used are of good condition, of adequate strength and freefrom defects?				
16	Whether ladder is placed at secured and leveled surface?				
17	Whether water-pass and oil-spills are avoided around the scaffold structure?				

18	Whether ladder is extended 1.5mts. Above the landing point at height?				
19	Whether more than one access/egress provided to the scaffold?				
20	Whether ladder used are of adequate length and overlapping of shortladders avoided?				
21	Whether metallic ladders are placed much away from near-by electrical Transmission line?				
22	Whether rungs of ladder are inspected and found in good order?				
23	Whether fall-arresters provided on both the access/egress routes?				
24	Whether diagonal (cross) bracings are provided at regular interval on thescaffold?				
25	Whether working platform on the scaffold has been made free from “jolt”or “gap”?				
26	Whether tools or materials are removed after completion of the day’s job at Heights?				
27	Whether a valid Permit for Work (PFW) is obtained before taking up workover asbestos or fragile roof?				
28	Whether sufficient precaution is taken while working on fragile roof?				

FORMAT NO. : HSE-13 REV 0

(Sheet 2 of 2)

Sl. No	Description	Yes	No	N. A	Actions taken
29	Whether provision is made to arrange duck ladder, crawling board forworking on fragile roof?				
30	Whether scaffold has been inspected by qualified civil engineers prior totheir use?				
31	Whether the scaffolding has been designed for the load to be borne by thesame?				
32	Whether the erection and dismantling of the scaffolding is being done bytrained persons and under adequate supervision?				
33	Whether safety net with proper working arrangement and life-line hasbeen provided?				
34	Whether TAGS (Green for acceptable and Red for incomplete/unsafe Scaffolds) are used on scaffolds?				
35	Whether sufficient illumination is provided in and around the scaffoldand access?				
36	Whether emergency rescue / response arrangements are made in place				

Inspected by
Contractor Engineer

Verification By
Contractor Safety Officer

FORMAT NO. : HSE-14 REV 0

(sheet 1 of 2)

PERMIT FOR ERECTION / MODIFICATION & DISMANTLING OF SCAFFOLDING

Project : Sr. No. :
Name of the work : Date :
Name of contractor : Job No. :
Nature of activities : Duration: From.....To.....

SL. No.	SUBJECTS / ITEMS	DONE	NOT DONE	REMARKS
1	Specific task of Erection / Modification / Dismantling of scaffolds, Identified & TAGGED accordingly (before as well as after carrying-outjobs).			
2	People engaged in doing the job are identified & are certified by Job Engineer of Main Contractor as experienced / trained.			Names to be noted
3	Concerned persons are alerted by the Job Engineer of Main Contractor in connection with possible hazards & what the workmen MUST do / MUST not do.			
4	Verification by Job Engineer of Main Contractor made for confirming that all persons permitted to carry-out the jobs are making use of Helmet, Safety Shoes, Goggles, Gloves & Double lanyard safety harness andother relevant PPEs.			
5	Area of work is effectively cordoned-off / barricaded / illuminated.			
6	For taking-up / lowering down Scaffolding members / clamps / couplings etc. appropriate ropes / pulleys/ chains etc. have been arranged for use (not to throw any item) & the same have been verified as “fit for purpose”.			
7	Items / members of scaffold, being lowered are removed from the area &stacked correctly.			
8	Ropes, chains, pulley blocks etc. being used for lifting or lowering scaffold items, are inspected by the Job Engineer & their certifications as Well as physical conditions have been found O.K, before signing thisPERMIT.			
9	Safety Net / Life-line / Fall Arresters etc. are arranged in position and Job Engineer has found working conditions favorable for activities to start.			
10	Scaffold erection or dismantling tasks are being supervised by Experienced Engineer / Competent person.			
11	Only competent & experienced people have been selected / engaged inScaffolding erection, modification or dismantling tasks.			
12	Adequate & effective actions for traffic and movement of people around the cordoned-off area taken to avoid inadvertent incident			
13	Working platforms are protected with handrails & toe-boards.			
14	Access & Exit (for reach & escape) are safe for use by people.			

15	Tools, tackles to be used for above jobs are verified by job Engineers of Main contractor as genuinely good and tied-up at height (to prevent their Fall).			
16	Site important Telephone Nos. are made known to everyone			
17	SOP (Safe Operating Procedure) for the specific task is made & followedtoo.			
18	Emergency vehicle has been arranged at work locations.			

- This permit for work shall be available at specific work location all the time.
- After completion of work, permit shall be returned to safety cell of main contractor, without fail.
- This Permit shall be issued maximum upto (Monday to Sunday).
- Additional Precautions, if any

- **ACCORD OF PERMISSION** (to be ticked) - **YES** ( ) **/ NO** ( )

Inspected by
Contractor Engineer

Verification By
Contractor Safety Officer]

(Sheet 2 of 2)

Everyday Site working conditions & performance of workmen shall be assessed / checked by ContractorSite Engr. and Safety Officer shall verify the same.

	Name / Sign.	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Site Engr.								
SafetyOff.								

FORMAT NO. : HSE-17 REV 1

PERMIT FOR EXCAVATION (depth 2m and above**)**

(Sheet 1of 2)

Project :
Name of the work :
Name of contractor :
Job Description :
Size of excavation :

Sr. No. :
Date :
Job No. :
Location:

SL. NO.	Description of Item	COMPLIANCE STATUS			Remarks
		Yes	No	Not applicable	
1)	Suitable and sufficient risk assessments and method Statements has been carried to ensure that the work shall be undertaken in accordance with specification and standard.				
2)	Are plans/details of underground services available and thesame has been reviewed?				
3)	Has survey done to locate the services/obstacles etc.				
4)	Has the live services (electrical, water line, airline, Telephone line, etc.) has been disabled for carrying out thejob.				
5)	Is adequate barriers/fences to protect the excavation are inplace?				
6)	Is Adequate warning signs are in place?				
7)	Is Assessment of ground conditions done and remedialaction (if any) taken?				
8)	Safe access / egress (e.g. ramp / steps / ladders etc.) provided for site workmen & supervisors.				
9)	Is the excavation work being undertaken in proximity of structure, etc.? If Yes, its effect is considered?				
10)	Availability of competent person for supervising theexcavation work?				
11)	Adequate safe arrangement to prevent collapse of edges (e.g. shoring / strutting / benching / sloping etc.) made atsite.				
12)	Hard barricades (at least 1.0M away from edge & for excavation near site access roads) with warningsigns/caution boards are provided				
13)	Accumulation / passage-ways of water at periphery of excavation / trench stopped/ restricted.				
14)	Is the equipment being used for excavation has been checked for adequacy and is in good working condition				

	having all the safety features?				
15)	Age & fitness of workmen ensured by medical test beforeengagement in job ?				
16)	Arrangement of Monitoring of possible oxygen deficiency or obnoxious gases done & action taken?				

PERMIT GRANTED - Yes / No

(*List enclosed with name & gate pass numbers*.)

Name & Signature of Site Engr. Contractor (Initiator)

Name & Signature of Area – In charge/RCM of Contractor (Issuing authority)Verification by Contractor Safety Officer

NOTES: -

1. Slopes or benches for excavation beyond 2.0M depth shall be designed & approved by Contractor's site head.
2. Excavated earth to be kept at least 1.5M away from edges
3. Safety helmets, Safety shoes or gum-boots, gloves, goggles, Face shield, Safety Harness shall be essentialPPEs.
4. Permit shall be made in **duplicate** and original shall be available at site of work.
5. Permit shall be issued for maximum **one week** only (Monday to Sunday)
6. After completion of works, permit shall be closed & preserved for record purpose

GRANT OF PERMIT AND EXTENSIONS

Sl. No.	**Validity period From _____To**	**Working Time From_____To**	**Initiator (site Engr. of Main Contractor)**	**Issuing authority (Area In charge/RCM of Main Contractor)**	**Review by PMC/ Owner (Remarks with date**
1.					
2.					
3.					
4.					
5.					
6.					
7.					

Additional safety instructions if any: -1.

2.

3.

FORMAT NO.: HSE-20 REV 0

Inspection of Tower Crane

Name of Contractor: Project:

Name of Work: **Job No:**

Vehicle Identification/Registration No: Date:

Sr. No.	Description	Observation	Remarks & Suggestions
1	Serial number plate & SWL marking		
2	Valid TPI Certificate		
3	Valid Insurance		
4	Safe access and egress are provided to the crane operator.		
5	Front glass of Operator cabin		
6	Operator crane cabin is provided with a locking mechanism soas to prevent unauthorized entry.		
7	A safety bar is fitted across the operator's cabin window where there is likelihood of the operator falling through it.		
8	Manufacturer Operating Manual and Maintenance Manual aremade available.		
9	An updated Operation and Maintenance log book is available in the operator cabin.		
10	All mounting bolts are in good condition.		
11	Load chart provided		
12	SLI available		
13	Crane hooks have got smooth surface and no dent		
14	Hook-latch / Dog-clamp in hook is effective		
15	Over hoist limit switch		
16	Double body earthing of Tower Crane		
17	Jib angle indicator is provided (For Luffing Jib Tower Crane).		
18	Emergency stop button, which will terminate the operation of the crane engine, is installed in the operator cabin and correctlyidentified.		
19	Effective braking mechanisms for Hoisting, Derricking,Slewing, Trolley Travelling maintained:		
20	Trolley Travelling limiter to prevent over-travelling of trolley		

	is functional.		
21	Limit switches to prevent over-derricking and over-lowering ofjib (For Luffing Jib Tower Crane) is functional.		
22	Slewing limiter to restrict slewing of crane is functional.		
23	Over load Limiter to prevent overloading of crane is functional.		
24	Load Moment Limiter to prevent over-turning moment isfunctional.		
25	Anti-collision devices are tested to stop the tower crane's operation such that the crane-to-crane interference must be maintained at not less than 3 m.		
26	Condition of boom		
27	Counter weight placement and pins		
28	Winches, pulleys and wire ropes are in good working condition.		
29	Colour coding		
30	Leakage in hydraulic cylinder		
31	Fire Extinguisher		
32	Tower crane is adequately grounded or protected againstlightning.		
33	Wind anemometer is installed and is in good working condition.		
34	Aviation lamp is functional (Reqd. for 30mt and above)		
35	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
36	Safety Induction for Operator		
37	Others		

Signature & Name ofOperator:

Signature and name of JobEngineer

Signature & Name of Contractor's Safety Officer

FORMAT NO. : HSE-21 REV 0

Crane Inspection Checklist

Name of Contractor: Project:

Name of Work: **Job No:**

Vehicle Identification/Registration No: Date:

Sr. No.	Description	Observation	Remarks & Suggestions
1	Crane hooks have got smooth surface and no dent		
2	Hook-latch / Dog-clamp in hook is effective		
3	Over hoist limit switch		
4	Over Load Indicator		
5	Over Boom limit switch		
6	Boom angle indicator		
7	Colour coding		
8	Condition of boom		
9	Condition of wire rope		
10	Rope drum / sheaves are in good working condition		
11	Swing break & lock		
12	Swing Alarm		
13	Over hoist break & lock		
14	Boom break & lock (For Telescopic Boom)		
15	Leakage in hydraulic cylinder		
16	Condition of Outrigger (For Tyre Mounted Crane)		
17	Outrigger fully extended Marking (For TyreMounted Crane)		
18	Condition of Tyre (For Tyre Mounted Crane)		
19	Wheel chokes are present and are used wheneverrequired (For Tyre mounted)		
20	Battery & lamps		
21	Moving & rotating parts guarded		
22	Load chart provided		
23	Reverse horn (For Tyre Mounted Crane)		

24	Body Condition of crane		
25	Front glass of Operator cabin		
26	Both side Mirror		
27	Number Plate (For Tyre Mounted Crane)		
28	Fire Extinguisher		
29	Horn		
30	Windshield and wipers		
31	Working of light & Indicator		
32	SLI		
33	Spark Arrestor(For Running Refinery/ Petrochemical/Chemical Plant)		
34	Foot-steps and hand-holds are in good working condition for exit /enter in to cabin		
35	TPI Certificate		
36	RC Document (For Tyre Mounted Crane)		
37	Fitness Certificate of Vehicle by authority		
38	Insurance		
39	PUC		
40	HMV License for Operator		
41	Pre Medical Check-up& Periodic Medical check- up (every 6 months) including vision test for Operator		
42	Safety Induction for Operator		
43	Others		

Signature & Name ofOperator:

Signature & Name of Contractor's Concern Engineer

Signature & Name of Contractor's Safety Officer

FORMAT NO. : HSE-22 REV 0

Hydra Crane Inspection Checklist

Name of Contractor: Project:

Name of Work: **Job No:**

Vehicle Identification/Registration No: Date:

Sr. No.	Description	Observation	Remarks & Suggestions
1	Identification number of Hydra crane boldly scribed infront and rear end of machine		
2	Hydra Operator has got adequate document in support of his competency (i.e. HMV driving license, knowledge &training)		
3	Marking of SWL on hook position is clearly visible		
4	Test & examination of Hydra crane by statutory / competent authority is carried out & document is valid		
5	Colour Coding		
6	RC Document		
7	Fitness Certificate of Vehicle by authority		
8	Valid Insurance		
9	Valid PUC		
10	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
11	Safety Induction for Operator		
12	Crane hooks have got smooth surface and no dent		
13	Hook-latch / Dog-clamp in hook is effective		
14	Over hoist limit switch		
15	Over Load Indicator		
16	SLI		
17	Condition of boom		
18	Condition of wire rope		
19	Rope drum / sheaves are in good working condition		

20	Leakage in hydraulic cylinder		
21	Tyre condition		
22	Battery		

23	Moving & rotating parts guarded		
24	Break		
25	Parking Break		
26	Front horn		
27	Reverse horn		
28	Hydra cabin body and frame of machine is in good order		
29	Both side Mirror		
30	Fire Extinguisher		
31	Front glass pane of the Hydra operator's cabin is clean & clear (i.e. not cracked / damaged / broken)		
32	Windshield and wipers condition		
33	Working of front & back lights, turn Indicators, parking lights & fog lamps		
34	Spark Arrestor (For Running Refinery/ Petrochemical/Chemical Plant)		
35	Wheel chokes are present and are used whenever required		
36	Foot-steps and hand-holds are in good working condition for exit /enter in to cabin		
37	Others		

Signature & Name of Operator

Signature & Name of Contractor's ConcernEngineer

Signature & Name of Contractor's Safety Officer

FORMAT NO. : HSE-23 REV 0

Hydraulic Rig Inspection Checklist

Name of Contractor: **Project:**

Name of Work: Job No:

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Control panel is clean & all buttons/switches are clearlyvisible (no paint over spray, etc.)		
2	All switch & mechanical guards are in good condition and properly installed		
3	All Safety Indicator lights work		
4	Drive controls function properly & accurately labelled (up, down, right, left, forward, back)		
5	Motion alarms are functional		
6	Safety decals are in place and readable		
7	Any defects such as cracked welds, fuel leaks, hydraulic leaks, damaged control cables or wire harness, etc.		
8	Braking devices are operating properly		
9	Winches, pulleys and wire ropes are in good working condition.		
10	Function of interlocks and limit switch		
11	The manufacturer's operations manual (in all languages of the operators)		
12	Oil level, Hydraulic Oil Level, Fuel Level, Coolant Level		
13	Battery Charge		
14	Outriggers in place or functioning. Associated alarms working		
15	Moving & rotating parts guarded		
16	Load chart provided		
17	Fire Extinguisher		
18	Spark Arrestor, if operated by using fuel (For RunningRefinery/ Petrochemical/ Chemical Plant)		

19	Serial number plate		
20	SLI		
21	TPI Certificate		
22	Colour Coding		

23	Insurance		
24	Pre Medical Check-up & Periodic Medical check-up (every 6months) including vision test for Operator		
25	Safety Induction for Operator		
26	Others		

Signature& Nameof Operator:

Signature & Name of Contractor's Concern Engineer

Signature & Name of Contractor's Safety Officer

FORMAT NO. : HSE-24 REV 0

Boom Lift Inspection Checklist

Name of Contractor: **Project:**

Name of Work: Job No:

Vehicle Identification/Registration No: **Date:**

Sr. No.	Description	Observation	Remarks & Suggestions
1	Operating and emergency controls are in proper working condition, EMO button or Emergency Stop Device		
2	Functional upper drive control interlock (i.e. foot pedal,spring lock, or two hand controls)		
3	Emergency Lowering function operates properly		
4	Lower operating controls successfully override the uppercontrols		
5	Both upper and lower controls are adequately protectedfrom inadvertent operation.		
6	Control panel is clean & all buttons/switches are clearlyvisible (no paint over spray, etc.)		
7	All switch & mechanical guards are in good condition andproperly installed		
8	All Safety Indicator lights work		
9	Drive controls function properly & accurately labelled (up, down, right, left, forward, back)		
10	Motion alarms are functional		
11	Safety decals are in place and readable		
12	Guardrails and anchor points are in place, and in goodcondition		
13	Work platform & extension slides are clean, dry, & clearof debris		
14	Work platform extension slides in and out freely with safety locking pins in place to lock setting on models with extension platforms.		
15	Any defects such as cracked welds, fuel leaks, hydraulic leaks, damaged control cables or wire harness, etc.		
16	Braking devices are operating properly		
17	The manufacturer's operations manual is stored on AWP(in all languages of the operators)		

18	Oil level, Hydraulic Oil Level, Fuel Level, Coolant Level		
19	Battery Charge		
20	Outriggers in place or functioning. Associated alarms working		

21	Tyres and wheels are in good condition, with adequate airpressure if pneumatic		
22	Wheel chokes are present and are used whenever required		
23	Moving & rotating parts guarded		
24	Load chart provided		
25	Fire Extinguisher		
26	Spark Arrestor, if operated by using fuel (For Running Refinery/ Petrochemical/ Chemical Plant)		
27	Serial number plate with Load capacity		
28	TPI Certificate		
29	Colour Coding		
30	Insurance		
31	Pre Medical Check-up& Periodic Medical check-up (every 6 months) including vision test for Operator		
32	Safety Induction for Operator		
33	Others		

Signature & Name ofOperator:

Signature & Name of Contractor's Safety Officer

SUB CONTRACTORS APPROVALS

[ANNEXURE - VIII TO SPECIAL CONDITION OF CONTRACT]

SUBCONTRACTOR'S APPROVALS

1.	NAME OF MAIN CONTRACTOR	
2.	NAME OF WORK, LOCATION	
3	NAME OF PROPOSED SUB-CONTRACTOR	
4	SCOPE OF WORK PROPOSED TO BE SUB-CONTRACTED (BRIEF) .	
5	ESTIMATED VALUE OF THE PROPOSED WORK TO BE SUB-CONTRACTED (INR):	
6	QUALIFYING CRITERIA FOR SUB- CONTRACTORS	
6.1	Similar Work experience :	.
	1 (One) Contract of 50% or 2 (two) contracts of 30 % each of estimated value of proposed work to be sub-contracted :	
	Annual Turnover . Not less than 100% of estimated value of proposed work to be sub-contracted :	
	Positive Net worth as per latest annual balance sheet/ Profit & loss account:	
7.	EXPERIENCE AND FINANCIAL DETAILOF PROPOSED SUB-CONTRACTOR	
	Contract Value of similar work execute d (as evidenced by work Order & Completion Certificate) During the last 7 years	
	Maximum Annual Turnover during years (as evidenced by Balance Sheets)	
	Net worth as per latest annual balance sheet/ Profit & loss account	
8	CRITERIA FOR QUALIFI ATION OF SUB-CONTRACTOR	.
9	Based on above information, We M/s_____(Name of the Main Contractor) Propose M/s_____(Name of the proposed Sub Contractor) as our sub-contractor) for the above mentioned works. We understand that notwithstanding above approval, We shall remain fully responsible for the performance of the said sub-contractor and any failure of the sub-contractor shall not absolve/relieve us of our responsibility to complete the works as per the terms and conditions of the Contract.	

TECHNICAL SPECIFICATION FOR RESTORATION OF DAMAGES FOR EXTERNAL SERVICES

AT

GLOBAL GATEWAY

M.G ROAD GURUGRAM

CLIENT

unitech

UNITECH LTD
8/13 Floor, Tower-B
Signature Tower, South City -1Gurugram

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REPL®
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Rudrabhishek Enterprises ltd
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INDEX

STRUCTURE WORK

1. Anti-Termite Treatment

a) Treatment for Masonry Foundation and Basements

The bottom surface and sides (up to a height of 30 cm. from the bottom) of the excavations made for masonry foundations and basements shall be treated with the chemical emulsion mentioned above at 5 lit per sq.m of surface area.

b) Treatment to Backfill Earth

After the masonry foundations and retaining walls of the basement come up, the back fillin immediate contact with the foundation structure shall be treated with the chemical emulsion at the rate of 7.5 lit per sq.m of the vertical surface of the sub-structure for each side. The earth is usually returned in layers and the treatment shall be carried out in similar stages. The chemical emulsion shall be directed towards the concrete or masonry surface of the columns and walls so that the earth in contact with these surfaces is well treated with the chemical.

c) Treatment for RCC Foundations and Basements

The treatment described in (c) & (d) above applies essentially to masonry foundations where there are voids in the masonry through which termites can seek entry in to the superstructure. Hence, the foundation requires to be completely enveloped by a chemical barrier. In the case of RCC foundations the concrete is dense being a 1:2:4 mix or richer, the termites are unable to penetrate it. It is therefore unnecessary to start the treatment from the bottom of excavations. The treatment shall start at a depth of 50 cm. below the ground level except when ground level is raised or lowered by filling or cutting after the foundations have been cast. In such cases the depth of 50 cm shall be determined from the new soil level resulting from filling or cutting mentioned above and soil in immediate contact with the vertical surface of RCC foundations. From this depth, the back fills around the columns, beams and RCC basement walls shall be treated at the rate of 7.5 lit per sq.m. The other details of the treatment shall be as laid down in (d) above.

d) Treatment of Top Surface of Plinth Filling

The top surface of the consolidated earth within the walls shall be treated with the chemical emulsion at the rate of 5 lit per sq.m of the surface before the sand bed or sub-grade is laid. If the filled earth has been well rammed and the surface does not allow the emulsion to seep through, holes up to 50 to 75 mm deep at 150 mm centres both ways may be made with 12 mm dia MS rod on the surface to facilitate absorption of the emulsion.

e) Treatment at Junction of Walls and Floor

Special care shall be taken to establish continuity of the vertical chemical barrier on inner wall surfaces from the ground level (where it has stopped with the treatment described in (d) above up to the level of the filled earth surface. To achieve this, a small

channel 3 x 3 cm shall be made at all the junctions of wall and columns with the

floor (before laying the sub-grade) and rod holes made in the channel up to the ground level 15 cm. apart and the rod moved back ward and forward to break up the earth and chemical emulsion poured along the channel at the rate of 7.5 lit per sqm of the vertical wall or column surface of the sub structure so as to soak the soil right to the bottom. The soil should be tamped back in to place after this operation.

f) Treatment to Soil along External Perimeter of Building

After the building is complete, the earth along the external perimeter of the building should be roded at intervals of 15 cm. and to a depth of 30 cm. The rods should be moved backward and forward parallel to the wall to break up the earth and chemical emulsion poured along the wall at the rate of 7.5 lit per sq.m of vertical surfaces. After the treatment, the earth should be tamped back in to place. Should the earth outside the building be graded on completion of building, this treatment should be carried out onthe completion of such grading. In the event of filling being more than 30 cm. the external perimeter treatment shall extend to the full depth of filling up to the ground level so as to ensure continuity of the chemical barrier.

g) Treatment for Walls Retaining Soil above Floor Level

Retaining walls like the basement walls or outer walls above the floor level retaining soil need to be protected by providing chemical barrier by treatment of retained soil in the immediate vicinity of the wall, so as to prevent entry of termites through the voids in masonry, cracks and crevices etc. above the floor level. The soil retained by the walls shall be treated at the rate of 7.5 lit per sqm of the vertical surface so as to effect a continuous outer chemical barrier in continuation of the one formed under (c).

h) Treatment of soil under apron along external perimeter of building

Top surface of the consolidated earth over which the apron is to be laid shall be treated with chemical emulsion @ 5 lit per sqm of the vertical surface before the apron is laid.If consolidated earth does not allow emulsion to seep through, holes up to 50 to 75 mm deep at 150 mm centers both ways may be made with 12 mm dia mild steel rod on the surface to facilitate saturation of the soil with the chemical emulsion.

i) Treatment of Soil Surrounding Pipes, Wastes and Conduits

When pipes, wastes and conduits enter the soil inside the area of the foundation, thesoil surrounding the point of entry must be loosened around each such pipe waste or conduits for a distance of 15 cm. and up to a depth of 7.5 cm before the treatment is commenced. When they enter the soil external to the foundations, they shall besimilarly treated unless they stand clear of the walls of the building by about 7.5 cm. fora distance of over 30 cm.

j) Treatment for Expansion Joints

Expansion joints at ground floor level are one of the biggest hazards for termite infestation. The soil beneath these joints should receive special attention when the treatment under (e) is carried out. This treatment should be supplemented by treating through the expansion joint after the sub-grade has been laid, at the

rate of 2 lit per linear metre.This specification is of utmost importance and should be executed by the Contractor very carefully as the area has a potential of rendering the whole anti termite treatment ineffective if treated casually.

k) Safety Precaution

Particular care should be taken to prevent skin contact with concentrates. Prolonged exposure to dilute emulsions should also be avoided. Workers should wear clean clothing and should wash thoroughly with soap and water, especially before eating and smoking. In the event of severe contamination, clothing should be removed at once and the skin washed with soap and water. If chemicals splash in to the eyes they shall be flushed with plenty of soap and water and immediate medical attention should be sought.
The concentrates are oil solutions and present a fire hazard owing to the use of petroleum solvents. Flames should not be allowed during mixing.

Care should be taken in the application of chemicals to see that they are not allowed to contaminate wells or springs, which serve as sources of drinking water.

2. CAST IN-SITU CONCRETE

2.1 Related Work

a. Concrete Formwork
b. Concrete Reinforcement
c. Concrete Finishing
d. Sealants

2.2 Applicable Indian Standards Codes

IS - 299 Specification for Ordinary, rapid hardening and low heat Portland
IS - 455 Cement
IS - 1489 Specification for Portland blast furnace slag Cement
IS - 4031 Specification for Portland pozzolona Cement
IS - 650 Method of physical tests for hydraulic Cement
IS - 383 Specification for Standard sand for testing of Cement
Specification for Coarse and Fine aggregate for use in mass
concrete.
IS - 515 Specification for natural and manufactured aggregate for use inmass 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 waterused in industry.
IS - 2645 Specification for integral cement water proofing compoundsIS - 1791 Specification for batch type concrete mixers
IS - 2438 Specification for roller pan mixer
IS - 2505 Specification for concrete vibrators, immersion typeIS - 2506 Specification for screed board concrete

vibrator
IS - 2514 Specification for concrete vibrating
tablesIS - 3344Specification 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 - 3370 Code of practice for concrete (Part I to IV structures for storage of liquids
IS - 3935 Code of practice for composite construction

2.3 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^{o} C and higher.

2.4 Quality Assurance

a. Supervising staff shall have qualifications and experience in the subject.
b. The following tests shall be carried out:

i. Mandatory Tests as per CPWD Specifications on bricks sand, aggregate etc.
ii. Testing preliminary test cubes;
iii. Testing work test cubes;

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 heatPortland cement.

Quality Assurance shall be a prime concern for line, levels & plumb.

2.5 Submittals

Samples:
Slide bearings

2.6 Materials

2.6.1 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 Engineer-in-charge and shall comply strictly to tests instructed by the Engineer-in-charge, and where tests are not laid out, with the requirements of the latest issue of the relevant Indian Standard.

2.6.2 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 Engineer-in-charge.

2.6.3 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 Engineer-in-charge.

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 Engineer-in-charge 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 dryand 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 consist 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 get to be approved, before its construction, from the Engineer-in-charge. 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 aspolyethylene 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.

Any damage occurring to cement due to faulty storage in the cement godown or on accountof negligence on its part, shall be the liability of the Contractor.

2.6.4 Aggregate

A. To be crushed naturally occurring materials conforming to IS: 383-1970. All physicalproperties 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 bemixed 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.

Coarse aggregates brought to site shall be washed clean if required and as directed by the Engineer-in-charge in charge.

2.6.5 Fine Aggregate

A. Shall be washed dry sand and shall confirm to IS: 383-1970 between Grading Zone Iand 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 waterso as to bring the percentage of silt content within the prescribed limit.
D. Fine aggregates shall be so stacked as to prevent dust and foreign matter getting mixedup with it as far as practically possible.

2.6.6 Water

A. Water for mixing and curing shall be fir for construction as per standard.
B. Water shall be tested in accordance with IS: 3025-1986. Maximum permissible limits ofdeleterious materials in water shall be as given in IS: 456-1978.
C. The pH value of water shall not be less than 6 and more than 9.
D. Water which may erode or discolor concrete or which has got more than 1000 ppm of chloride content shall not be used.
E. The Contractor shall make its own arrangements for storing of water if

necessary in drums, tanks to the satisfaction of Engineer-in-charge in charge. Care shall be taken to ensure that water is not contaminated anyway.

2.6.7 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 daysafter 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.

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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 daysafter 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.

2.7 Proportioning, Batching & Mixing of Concrete

2.7.1 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 Engineer-in-charge 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, asdetermined by Engineer-in-charge 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 Engineer-in-charge.

f. Proportioning by Water/Cement Ratio

The W/C ratio specified for use by Engineer-in-charge shall be maintained. Contractor shall determine the water content of the aggregates as frequently as desired by the Engineer-in-charge 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 Engineer-in-charge so as to maintain the specified W/C ratio. To allow for the variation intheir moisture content, suitable adjustments in the weights of aggregates shall also be made.

2.7.2 Batching and Mixing of Concrete

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 Engineer-in-charge.

If approved by the Engineer-in-charge 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 Engineer-in-charge. The Contractor should carry our 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.

2.7.3 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 andthe 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 auniform color 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 drumis 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.

2.7.4 Cleanliness

a. Clean mixer and handling plant by washing with clean water at the end of the work and atintervals 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.

2.7.5 Planning of Concrete

A. Engineer-in-charge shall be informed 24 hrs in advance before the pour

of each concrete toallow 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 inproposed location.
D. Use suitable stools, walkways, barrow runs, for traffic over reinforcement or freshly placedconcrete.
E. Clean the transportation equipment immediately after use or whenever cement andaggregate is used by using clean water.

Following issues are to be noted while

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.

2.7.6 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 byvolume, 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 ofcement 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 dayscuring.

1. Testing:
   6 cubes shall be taken from any mix, 3 of them to be tested at 7 days, 3 at 28 days.
2. Strength of concrete at 7 days shall be 2/3rds of the strength of concrete at 28 days. Strength of concrete at 28 days shall be as mentioned in table above and the criterion foraccepting concrete is only the strength of concrete at 28 days.

2.8 Reinforced Cement Concrete

RCC comprises of formwork, reinforcement and concrete. Concrete shall be classified by its compressive strength at the 28th day. The concrete grade shall be as designated in Table 2 ofIS: 456-2000.

Drawings 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 Engineer-in-charge well in advance of the actual pouring of concrete at the Site in thepermanent 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 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 proportions 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.

2.8.1 Design Mix and Trial Mixes

Design Mix and weigh batching will be done as approved by the Engineer- in-charge. The Contractor shall submit to the Engineer-in-charge the tentative Mix Design it proposes to use at the site.

On receipt of the above, the Engineer-in-charge may immediately order to carry out work or site test before the final approval. This shall be done with the mixer, weigh batches, etc. and materials actually used in the Project. 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 Engineer-in-charge in charge.

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 tothe 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 anyone 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-trail 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 well 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 thetests of materials used.
Compression strength on 150mm Cubes:

Grade of concrete at28 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.

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 Engineer-in-charge in charge.

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/cu m

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.

Grading of aggregateSilt content of sand Moisture content of aggregateSlump test of concrete mix Concrete cube test.

2.8.2 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 post 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.

2.8.3 Standard Deviation Based on Test Results

i. Number of test results - Total number of test results required to constitute an acceptablerecord 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.

2.8.4 Determination of Standard Deviation

i. Concrete of each grade shall be analyzed 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=Square root of (sum of squared deviations of

theindividual strength of n samples divided by n-1) where n = number of sample testresults.

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.

2.8.5 Mixing of Concrete

Weigh Batching shall be followed if mixed at the site for all structural concrete works. The Contractor shall provide Concrete Batch Mixers, Vibrators, Weigh Batchers conforming to relevant IS Specifications and from approved and recognized manufacturers. The capacity and number of mixers and vibrators required at the Site from time to time shall be to the approval of Engineer-in-charge. The Contractor shall maintain a platform weighing scale of capacity 300 kg with fraction of 100 gm at the site.

The machine will have to be got calibrated by the Contractor once in every two weeks or after200 cum of concrete whichever is earlier. The dials of the weigh batchers shall be checked with standard weights periodically.

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The machine will have to be got calibrated by the Contractor once in every two weeks or after200 cum of concrete whichever is earlier. The dials of the weigh batchers shall be checked with standard weights periodically.

2.8.7 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 Engineer-in-charge, the workability of the concrete shall be ascertained by compacting factor test and VEE BEE consist meter 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.

2.8.8 Temperature of Concrete

The placing temperature of concrete shall not be more than 38 degrees Celsius. If it is more, the Engineer-in-charge may order addition of ice or chilled water to the concrete. Also the Contractor shall take following precautions:

Mixer and Weigh Batcher 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.

2.8.9 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 andnot allowed to any direct wind contact to eliminate shrinkage cracks.

2.8.10 Workmanship

All works shall be true to level, plumb and square and all corners and edges in all cases shallbe unbroken and neat.

Any work not to the satisfaction of the Engineer-in-charge will be rejected and the same should be rectified or removed and replaced with work of the required standard of workmanship.

2.8.11 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 equipment's have to be maintained and kept operational by the Contractor.

2.8.12 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 Engineer-in-charge. Concreting shall commence only after formwork is approved reinforcement is recorded and permission to proceed with concreting has been approved in writing from the Engineer-in-charge.

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 Engineer-in-charge prior to start of construction at Site. Concrete shall be as gently deposited as is practically possible, in its final position to avoid remanding and shall be so deposited that segregation of aggregates do not occur. In case ofdeep 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.

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 ofwooden 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.

2.8.13 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 Engineer -in-charge 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 look.

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.

2.8.14 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 Engineer-in-charge 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 Engineer-in-charge. 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:

d. Form horizontal joints in walls designed to be continuous with floor slabs at the top of anintegrally 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:

Space at 4 - 7 meter in width for one

panel.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 edgesof 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.

2.8.15 Expansion Joint

As indicated in drawing or as directed by the Engineer-in-charge.

2.8.16 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 curedto the complete satisfaction of the Engineer-in-charge in charge. As said above afterconcrete 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 Engineer-in-charge in charge. 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, thedate of casting the concrete of each member of the structure which shall remain clearly visible at least till the completion of curing at least.

2.8.17 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 concretebegins 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 stillgreen.
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 Engineer-in-charge shall be final and binding on all parties.

2.8.18 Inspection and Corrective Measures

Immediately on removal of formwork, the RCC surface shall be examined by the Engineer-in-charge. 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 Engineer-in- charge in charge. In case of any violation of this rule, the concrete poured stands rejected. The decision of the Engineer-in-charge 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 Engineer-in-charge.

Surface defects minor in nature may be accepted as a special case by the Engineer-in- charge whose decision in this matter is final and binding on the Contractor. Once accepted, the defects shall be rectified as follows.

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 Engineer-in-charge, 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 Engineer-in-charge, 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 Engineer-in- charge.

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 Engineer-in-charge, shall be used. The methodology as specified by themanufacturers 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 theEngineer-in-charge carefully packed in to places in small amounts. The mortar is mixedas 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-shrinkgrout, as the case may be, a pressure gun similar to the gun used for greasingmotorcars.

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 while 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 is these cases will be most convenient.

2.8.19 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 Engineer-in-charge and the following procedure shall be followed:

Cracks not propagating/developing further and according to the Engineer-in-charge notdetrimental to the strength of the construction shall be grouted with non-shrinking epoxy based cement slurry or as directed by the Engineer-in-charge.

Cracks developing further and felt detrimental to the strength of construction shall be tested as per the relevant Indian Standards.

2.8.20 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 50 cum a day	3
More than 50 cum per day 3	+ 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.

2.8.21 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:

a) The average of the three consecutive cubes strength shall not be less than specifiedstrength.
b) No individual cube strength shall be less than 90% of the specified strength.
c) 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.
d) If cubes fail at 7 days, defective concrete can be dismantled, removed and replaced without awaiting 28 day test results.
e) If the concrete tests fail to meet the acceptance strength required for respective grades of concrete, the Engineer-in-charge may take one of the following actions:
f) 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
g) The work will be rejected and any consequential action as needed shall be taken, including cutting out and replacing a part or whole of work.

2.9 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 Engineer-in-charge.

Fixtures: Any fixture, steel angles, holdfasts etc shall be embedded according to the drawing or as instructed by the Engineer-in-charge in charge.

2.10 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 Engineer-in-charge. All surfaces coming in contact with in situ concrete shall be wire brushed and hosed down until the aggregate is free from cement slurry. Castellation 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.

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 Engineer-in-charge 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 pre-stressed precast controlled concrete work.

For all precast controlled concrete work a specially equipped site factory, with casting yard, pre-tensioning 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 all the above provisions needed for a workman like construction in precast controlled concrete in the rates.

All precast design mix concrete shall be weigh batched.

2.10.1 Precast Concrete Planks

Reference - IS 13990: 1994

The concrete Plank should be as specified in the drawings and shall be exactly of the size and pattern shown on the drawings and shall be made face up in the following manner. Stiff plastic concrete M30 shall be used with coarse aggregate 12mm and down size.

The concrete plank shall be as per the code IS 13990: 1994 Specification for precast reinforced concrete planks and joist for flooring and roofing

2.10.2 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.

Note: All precast work shall be carried out in a yard made for the purpose. This yard shall bedry, properly leveled 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 proportions) with smooth neat cement finish or a layer of M.S. sheeting. Where directed by the Engineer-in-charge, 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-in-charge, 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.Precast concrete units, when ready, shall be transported to site by suitable means approved by the Engineer-in-charge. Care shall be taken to ensure that no damage occurs during transportation. All adjustments, leveling, and plumbing shall be done as per instructions of the Engineer-in-charge. The Contractor shall render all help with instruments, materials, and men to the Engineer-in-charge for checking the proper erection of the precast units.

2.11 Ready Mix Concrete

Reference - IS 4926-1976

2.11.1 Terminology

- Ready Mixed Concrete - Concrete delivered at site 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.
- Agitation - The process of continuing the mixing of concrete at a reduced speed during transportation to prevent segregation.
- Agitator - Truck mounted equipment designed to agitate concrete during transportation to the site of delivery.

- 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.

2.11.2 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 containersfitted with agitating devices.

2.11.3 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-prozzolana cement conforming to IS: 1489-1976 or rapid hardening Portlandcement conforming to IS 8041E-1976 as may be specified by Engineer-in-charge at the time of placing the order. If the type is not specified ordinary Portland cement shall be used.

Fly ash: Fly ash when used for partial replacement of cement, shall conform to therequirements of IS: 3812 (part I)-1966.

Water: Water used for concrete shall conform to the requirement of IS: 456-1964.

Admixtures: 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.

Storage of Materials:-
Storage of materials shall be done in accordance with the requirements of IS: 456-2000.

2.11.4 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 inaccordance with IS: 456-1964.

b) When the concrete is manufactured and supplied on the basis of specified strength, theresponsibility for the design of mix shall be that of the manufacturer.

2.11.5 General Requirement

1. In addition to the requirements specified in this standard, the ready-mixed concrete shallgenerally comply with the requirements of IS: 456-2000.
2. The minimum quantity of cement and the details regarding proportioning and works control shall be as per Clause 3.8.1.
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 bringthe slump within required limits shall be injected into the mixer under such pressure and direction of floor that the requirements for uniformity.
4 Unless otherwise agreed to between the Client and the Contractor, when a truck

mixer of agitator is used for transporting concrete, the concrete shall be delivered to the site ofthe 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.

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 Client/PMC, no concrete shall be delivered, when the site temperature is less than 2.5°C and the thermometer reading is falling.

6 The temperature of the concrete shall not exceed 50C above the prevailing shade temperature, when the shade temperature is over 200C. The temperature of concrete mass on delivery shall not

7 Sampling and testing: Adequate facilities shall be provided by the contractor for the Client/PMC to inspect the materials used, the process of manufacture and the methods of delivery of concrete. He shall also provide adequate facilities for Client/PMC to take samplesof the materials used.

8 Sampling and Testing: Unless otherwise agreed to between the Client/PMC and the supplier,the sampling and testing of concrete shall be done in accordance with relevant requirements of IS: 456-1964, IS: 1199-1959and IS: 516-1959.

9 Consistency or Workability: The tests for consistency or workability shall be carried outin accordance with requirements of IS: 1199-1959 or by such other method as may be agreed to between Client/PMC and the Contractor.

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.

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 Engineer-in-charge throughout the Project.

2.12 Admixtures

2.12.1 General

Admixtures may be used in concrete only with the approval of Engineer-in-charge based upon evidence that, with the passage of time, neither the compressive strength not 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 Engineer-in-charge.

2.12.2 Air Entraining Agent

Where specified and approved by Engineer-in-charge, 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.

2.12.3 Retarding Admixtures

Where specified and approved by Engineer-in-charge retarding agents shall be added to the concrete mix in quantities specified by Engineer-in-charge.

2.12.4 Water Reducing Admixtures

Where specified and approved by Engineer-in-charge water reducing lignosulfonate mixture shall be added in quantities specified. The admixtures shall be added in the form of a solution.

2.12.5 Water Proofing Agent

Where specified and approved by Engineer-in-charge, chloride and sulphide free waterproofing agent shall be added in quantities specified.

2.12.6 Other Admixtures

a. The Engineer-in-charge may at his discretion instruct the Contractor to use any otheradmixtures in the concrete.
b. If the Contractor so wishes to use admixtures, then the following should be adhered to(subject or Engineer-in-charge's approval).
c. No reduction will be allowed to target mean strength when compared to admixture freeconcrete of the same class.
d. Dosage of admixture shall be strictly in accordance with the manufacturer's instruction.
e. The following information about the admixture shall be submitted to the Engineer-in-charge 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.

2.13 Miscellaneous Works

The following items are not intended to exclude any other items of works required by the Contractor, or that may be required by local code or good construction practice. The following work shall be included by the Contractor as they may not have been detailed specifically on the architectural and Engineer-in-charge drawings and specifications but are required in order that job is complete in every respect:

(1) The supply, maintenance and removal of all temporary rungs, and ramping as necessary on the site.

(2) Placing of concrete will be by pumps only or as approved by the Engineer-in-charge.

(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 ofconcrete

(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 Bid, 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 Engineer-in-charge, and frequent removed off the site. Any surplus concrete deposited at the work front of on the site (concrete droppings) must be removed by the Contractor.

(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 makinggood after installation by other Sub-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 block work ties to support all such walls as shown on the drawings or as directed by the Engineer-in- charge in charge.

(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 member's chases for any asphalt "track-in" and/ or flashingand 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 theContractor.

(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 theentire construction period.

1. Reinforcement

1.1 Related Works

A. Concrete Formwork
B. Cast in-situ Concrete

1.2 Applicable Standards

IS - 432 Specification for Mild steel and medium tensile bars and hard drawn steelwire.
IS - 1139 Specification for hot rolled mild steel, medium tensile steel and high yieldstrength 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 forconcrete reinforcement.
IS - 2080 Specification for high tensile steel bars used in prestressed concreteIS - 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

1.3 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)

1.4 BIS Certification

Material received at the Site shall have BIS Certification mark. Such bundle or coil containingthe 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 Engineer-in-charge in charge.

Each batch of steel brought to the Site shall be tested prior to use. Material acceptable as per IS Specifications will be allowed into the Project. All rejected material shall be removed from the Site by the Contractor within15 days of its rejection.

1.5 Storage

Reinforcement bars received at the Site shall be stored on hard, concreted platform and clearof 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 Engineer-in-charge 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.

1.6 Quality Assurance

i. Supervisory staff shall have qualification and experience in the above field.
ii. Welders qualified and having approved certificates for welding shall be employed.

1.7 Handling

i. Bend test requirements shall conform to the following and shall be based on 1800 bendsof 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

ii. Spacers shall be of any of the following:
   a. Wire
   b. Precast concrete
   c. Moulded plastic

Spacer material shall be of durable quality and shall not lead to corrosion ofreinforcement or spilling of concrete.

Precast concrete spacers shall be of the same mix as that of surrounding concrete.

iii. Tying wire shall be of 18 G black annealed mild steel wire or other approved type doublefold to tie the reinforcements.

iv. 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 shallbe cast from concrete and not from cement mortar; strength of these blocks shall be equal to the concrete in use.

v. Tying wire shall be of 18G black annealed mild steel wire or other approved type doublefold to tie the reinforcements. It shall be free from rust, oil, paint, grease, loose mill, seales or any other deleterious material undesirable for concrete or reinforcement orwhich may prevent adhesion of concrete to reinforcement.

1.8 Unit Weights

Unit weights per meter shall be as follows:

6 mm □	0.22 kg/ rm
8 mm □	0.39 kg/ rm
10 mm □	0.62 kg/ rm
12 mm □	0.89 kg/ rm
14 mm □	1.21 kg/ rm
16 mm □	1.58 kg/ rm
18 mm □	2.00 kg/ rm
20 mm □	2.47 kg/ rm
22 mm □	2.98 kg/ rm
25 mm □	3.85 kg/ rm
28 mm □	4.83 kg/ rm
32 mm □	6.31 kg/ rm
36 mm □	7.99 kg/ rm
40 mm □	9.86 kg/ rm

1.9 Execution

4.9.1 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 Engineer-in-charge priorto 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, excessiverust, loose mills scale, etc.

4.9.2 Welding

1. Do not weld reinforcement unless authorized by the Engineer-in-charge andrecommended by the manufacturers.
2. Site welding shall be done with suitable safeguards and techniques.
3. Welding, if approved, may be used for:
    a. Lapping reinforcement in position
    b. Fixing reinforcement to other steel members.
4. 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.
5. Welded joints:
    a. Shall not be made at bends in reinforcement.
    b. Stagger joints in parallel bars of principal reinforcement unless otherwise approved.
    c. The distance between staggered joints shall not be less than the end anchorage length joints.

4.9.3 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. Engineer-in-charge has to approve mechanical splices before using it at site.

4.9.4 Inspection

h. Ensure that the reinforcement placing is checked by Engineer-in-charge in charge.
i. Ensure that the Formwork to receive the reinforcement is clean and free from debris.
j. Cracked end of bars to be cut out.

4.9.5 Anchoring

Anchoring of bars and stirrups shall be provided exactly as detailed in the structural drawings or as directed by Engineer-in-charge. In case of reinforcement steel in tension, deformed bars may be used without end anchorage provided the development length requirement is satisfied. Hocks 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.

4.9.6 Lapping of Bars

Laps shall be strictly as per the structural drawing or as directed by the Engineer-in- charge. For general guidance the following principles shall be followed as given in IS: 456 – 2000:

a) As far as possible bars of the maximum length available shall be used.
b) Laps shown on drawings or otherwise specified by the Engineer-in-charge will bebased on the Contractor using bars of maximum length.
c) In case Contractor wishes to use bars of shorter length, laps shall be provided inthe manner and the locations approved by the Engineer-in-charge.

d) Splices shall be provided as far as possible away from the sections of maximumstress and be staggered.

e) Not more than half of the bars shall be spliced at a section

f) 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.

g) 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 La (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 2La 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.

h) 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.

i) 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.

j) 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 wise of 0.90mm to 1.6mm diameter twisted together tightly.

k) As and when necessary welded laps shall be proved as specified by the Engineer-in-charge.

4.9.7 Securing Reinforcement

a. Adequately secure with tying wire or approved steel clips.
b. Bend the tying wires well back clear of forms.

4.9.8 Concrete Cover

Shall be in accordance with ISI: 456-2000 and as per the instructions in structural drawings.

i.	Footings, retaining walls and Similarmembers 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

4.9.9 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 than25mm diameter between two layers at 1.5 mm centers except where bundled barsare detailed.

4.9.10 Precautionary Measures

a. Do not insert bars into placed concrete.
b. Do not damage forms and form linings, if any when fixing reinforcement.

4.9.11 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. Formwork

2.1 Related Work

Concrete
Reinforcement

2.2 Applicable Standards

IS - 303 Specification for Plywood for general purposes
IS - 4990 Specification for plywood for concrete shuttering
workIS - 1629 Rules for grading of cut size of timber
IS - 2750 Specification for steel scaffoldings.
IS - 4014 Code of practice for steel tubular, scaffolding

2.3 Section Includes

Design, fabrication, erection and striking of formwork for in - situ concrete

2.4 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 Engineer-in-charge with information demonstrating that a system will be used to ensurethat the work carried out under this section (including that done by sub-Contractors) will comply with the requirements of the specifications.

2.5 Formwork

Related Work

Concrete Form Work
Concrete
ReinforcementCast -
in situ Concrete

5.5.1 Quality Assurance

a. Supervisory staff shall have qualification and experience in the above field.
b. IS Standards – Note: Latest amendments shall be followed.

5.5.2 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 Engineer-in-charge 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 Engineer-in-charge has been received. Approval of the proposal in submitted form acceptance of modification does not relieve the Contractor of its obligation to achieve its required line finish within acceptedtolerance limits in terms of quality of works completed and safety. Neither will it diminish the Contractor's responsibility for the satisfactory performance of formwork.

Basic points to be understood in designing of formwork are 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 Plyboard, and shall be continuous, straight and without any warping.
c) Design of formwork shall take into account:Height of pour
Thickness of memberRate of pour Concrete slump Texture of finish placing temperature
Concrete density
Construction joints
Wind load
Method of Discharge
d) Form work design shall haveDimensional 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.

2.6 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 and that it 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 affect 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 shallalso be properly repaired before sue and properly cleaned to avoid stains and defects in concreting.

2.7 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

5.7.1 General

The Contractor shall account for all material and labour to achieve the above finishes to the satisfaction of the Engineer-in-charge.

5.7.2 Guidelines for Good Workmanship

Following are a few points as guidelines for good workmanship in formwork.

a) 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.
b) 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.
c) Joints shall be water-tight and no cement slurry shall be allowed to get through
d) Pre-fabricated or site forms shall be assembled so as to de-shutter 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 de-shuttering.
e) Pre-fabricated or site formwork shall be sufficient thickness with supporting spans in both directions. These shall be standardized in size for easy replacement and universal use at site
f) 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
g) 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 Engineer-in-charge in charge.
h) Props shall be adequately cross-braced horizontally
i) At the design and erection stage following additional points shall be considered and beincorporated into the setting
j) Opening of cleaning prior to the start of concreting
k) Pouring points shall avoid high drops and provide easy access to vibrating needles
l) Surfaces shall be treated with suitable releasing oil or emulsion prior to the reinforcement laying. Such releasing oil shall be got approved from the Engineer-in-charge in charge.

m) Ensure that forms and adjacent surfaces are thoroughly cleaned to receive concrete and debris.
n) Locate construction joints in a manner so as not to impair strength and appearance of structure.
o) Without absolving the details on the above, the Contractor shall comply with instruction of the Engineer-in-charge regarding formwork designing, erection, execution, rotation,maintenance and reuse.

Following points shall be observed very carefully:

a) Joints of formwork shall be watertight. It is easy to check from the bottom and makesure no light is visible
b) Props shall be on solid base, plumbed, in straight line, braced horizontally and cross

c) Tie-bars, bracing and spacers in beams, walls and columns shall be at correctplace/location and fully tight
d) Wedges shall be fully secured and nailed with heads left out for easy removal
e) All saw dust, dirt, shavings and any other unwanted material shall be cleaned and hosedout
f) Provision shall be made for watching formwork while concreting and any other platformneeded for movement of workers without any disturbance to the reinforcement
g) Provision is made for traffic on formwork: not to bear directly on reinforcing steel.
h) Number of reuses shall be decided by the Engineer-in-charge 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.

5.7.3 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 Engineer-in-charge.

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.

2.8 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.

5.8.1 Tolerance for RCC Buildings

Variation from plumb should be as follows:

a) In the lines and surface of columns, walls, and other vertical members, viz inside face of lift shaft, etc. 3 mm per 3.0 meter but not exceeding 10mm for the full height of the building.

b) For exposed corner column and other

conspicuous linesIn any bay up to 5 m maximum

	3 mm
In 10 m or more bays	5 mm

c) 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

d) Lintels, sills, parapets, grooves and other

conspicuous linesIn any bay up to 5 m maximum

	3 mm
In 10 m or more	5 mm

e) Variation of the linear building lines from established positions in plan and relatedposition of columns, wall and partitions

In bay up to 5 m maximum	5 mm
In 10 m or more	10 mm

f) 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 ofdeviation 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

g) Variation in sizes and location of sleeves, opening in walls and floors to be 5 mm(except for anchor bolts)

h) Variation in cross-sectional dimension of columns and beams and thickness of slabsand walls -5 mm, +10 mm

i) 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 topositioning of vertical steel or dowels.

2.9 Removal of Formwork

Formwork shall not be struck until the concrete has reached strength at least twice the stress to which the concrete may be subjected at the time of removal of formwork.

a) 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 formworkas early as possible to avoid shrinkage cracks.

b) Concrete surfaces to be exposed shall where required by the Engineer-in-charge in charge, be rubbed with carborandum stone to give a smooth and even finish.

c) Where concrete requires plastering or other finish later, the concrete surface shall behacked as directed.

5.9.1 Minimum time Requirements

For other cements the stripping time shall be suitably modified in consultation with theEngineer-in-charge in charge.

For precast moulds the stripping time shall be 24

hours.Striking time shall be as follows:

Type of Formwork	**Minimum period before striking**
i. Walls, columns	16-24 hrs
ii. Vertical faces	16-24 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 Engineer-in-charge.

2.10 Cleaning and Oiling of Forms

The contactor 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 dust 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 Engineer-in-charge.

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.

2.11 Openings / Inserts

Contractor shall provide all required openings, pockets, inserts as detailed in drawings. TheContractor shall provide required material and labour for fixing and supporting during concreting. It is imperative to consider that all openings and pockets shall be de-shuttered

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.

2.12 Fair Face Finished Concrete

These are additional requirements for fair faced concrete and include all visible concrete surfaces that are not specified or called for on drawings as plastered, including foundations and edges of slabs on ground.

2.13 Related work

The Contractor shall coordinate the work with masonry, electrical, mechanical, and plumbing andother trades.

2.14 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 Engineer-in-charge for reference.

2.15 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 Engineer-in-charge. Limits of deleterious materials permissible in aggregates shall be as for aggregates listed th codes.

2.16 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 minimize the number of joints and to conform to the location of movement joints shown onthe 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.

2.17 Form Ties

Form ties may be used to prevent form deflection. They shall be evenly spaced for appearance. Form ties, steel reinforcement and tie wire to have sufficient cover as called for,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.

3. Plastering Work

Relevant Bureau of Indian Standard Codes (BIS)to be

followed are:IS 383 Specification for Course Aggregate

and Fine Aggregate
IS 412 Specification for Expanded Metal sheet for General PurposeIS 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

3.1 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 Engineer-in-charge.

3.2 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 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 Engineer-in-charge.

Wherever directed by the Engineer-in-charge, 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 galvanized chicken mesh strips 400mm wide or as called for on drawings/documents which shall be in position before plastering.

3.3 Chasing & Breakage

All chasing, installations of conduits, inserts boxes etc., shall be completed before any plasteringor other wall finish is commenced on a surface. No chasing or cutting of plaster or other finish ona 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 Engineer-in-charge.

3.4 Samples

Samples of each type of plaster & other wall finish shall be prepared well in advance of undertaking the work for approval by the Engineer-in-charge. The Contractor shall also prepare Method Statement for plastering works.

3.5 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 aggregateshall 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 should 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.

3.6 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 de-bonded 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 chiseled 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 ratherthan 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 Engineer-in-charge. Following steps should be adopted prior to plaster:

a) Surface of application should be thoroughly cleaned.
b) Plaster Area must be provided with level dabs or spots allowing working and checking with 2-3m straight edge. Depth of plaster must not be than 8 mm at any point.
c) Required concealing services must be completed and tested.
d) No further cutting of masonry will be required.
e) Repairs carried out to masonry or concealed services must be cured and dry.
f) Surface must be sufficiently damp
g) Chicken wire mesh to be put in junctions of masonry and concrete abutments.
h) Corner beads and angle stops finished to line and level.

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 be rubbed with carborondum stone to give an even surface without any impression.

The plastered surface shall be cured for 14 days by wet curing. During this period, plaster shall beprotected from exposure to extreme temperature and weather.

The plaster shall be lined and leveled with aluminum hollow sections, 2 - 3 m long. There shall notbe 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 Indicative Itemsand Specifications.

All works shall be executed as per Method Statement approved by the Engineer-in-charge.

Plastering applies to all positions, locations and all the different kinds of surfaces of which the workis 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.

3.7 Lime for Rendering

This will 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 slackening. 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 effectivecovering of base surface. Before the base coat sets the lime rendering is applied and finished smooth and the entire plastered surface is truly plane.

3.8 Rate 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 fixingin position, straight cutting and other incidentals.

a) Execution of work at all levels and heights as shown in drawings and specified.
b) Preparation of Surfaces
c) Protection of masonry, if required
d) Protection of other finished surfaces.
e) Providing, fixing, maintaining and removing the same on completion
f) Scaffolding and working platform
g) Curing
h) Cleaning of adjacent areas, windows, doors etc
i) Forming grooves
j) Providing and fixing angle stops and corner beads.
k) Providing and fixing chicken mesh at junctions of RCC, brick, block work edges,corners, repaired areas, concealed conduits etc.
l) Edges of switch boxes, junction boxes and other services and fittings shall befinished next.
m) Labour and material
n) Raking out joints
o) Hacking and hatching the concrete surface and providing the key for holding downthe plaster
p) Watering

4. STRUCTURAL STEEL WORK

4.1 General

This section covers the supply, fabrication, erection and transportation to site and erection on prepared foundations the structural steel work consisting of beams, columns, trusses, bracings, shear connections (horizontal/vertical) etc. of structural steelwork.

Fabrication and approval of steel structures shall be in compliance with:

a) The specifications and relevant standards and codes as listed under and related drawings.
b) All fabrication drawings and supplementary drawings to be supplied by the Contractor duringexecution of the work and duly approved by the Engineer-in-charge.

4.2 Application

The fabrication and/or erection of the steel work consist of accomplishing all jobs herein enumerated including providing all labour, tools, tackle and plant; all materials and consumablessuch as welding electrodes, bolts and nuts, oxygen and acetylene gases, oils for cleaning etc. ofapproved quality as per this specification and relevant I.S. The work shall be executed by approved specialist agency experienced in the work and according to the drawings, specifications, relevant codes etc. in an expeditious and good workmanlike manner, conforming to the specifications and the relevant Indian Standards Codes and best standard practices and to complete satisfaction of the Engineer-in-charge.

4.3 Applicable Codes and Specifications

The following specifications, standards and codes shall be made a part of this specification. All standards, specifications codes of practice referred to herein shall be of latest editions including all applicable official amendments and revisions.

i)	IS:2062	-	Structural Steel
ii)	IS:1363	-	Black Hexagonal Bolts, Nuts and Lock Nuts (diameter 6 to 39mm) and black hexagonal screw (diameter 6 to 24 mm).
iii)	IS:1367	-	Technical supply conditions for Threaded Fasteners
iv)	IS:2016	-	Plain Washers
v)	IS:814	-	Specifications for Covered Electrodes for Metal Arc Welding for Mild Steel
vi)	IS:800	-	Code of Practice for General Construction in Steel
vii)	IS:816	-	Code of Practice for use of Metal Arc Welding for General Construction
viii)	IS:4353	-	Recommendations for Metal Arc Welding of Carbon and Carbon Manganese Steels
ix)	IS:817	-	Code of Practice for use of Metal Arc Welding for General Construction

x)	IS:1181	-	Qualifying Tests for Metal Arc Welders
xi)	IS:1182	-	Recommended Practice for Radiographic Examination of Fusion Welded Butt Jointsin Steel Plates.
xii)	IS:2595	-	Code of Practice for Radiographic Testing
xiii)	IS:3658	-	Code of Practice for Liquid Penetrant Flaw Detection
xiv)	IS:1477	-	Code of Practice for Painting of Ferrous (Part 1 & 2) Metals in Building
xv)	IS:1852	-	Specification for Rolling and Cutting Tolerances for Hot Rolled Steel Products
xvi)	IS:806	-	Code of Practice for Use of Steel Tubes in General Building Construction
viii	IS:1161	-	Specification for Steel Tubes for Structural Purposes.

4.4 Fabrication Drawings

Fabrication drawings shall include the following:

a) Member sizes and details
b) Types and dimensions of welds and bolts
c) Shapes and sizes of edge preparation for welding
d) Details of shop and field joints included in the assemblies
e) Bill of Materials
f) Quality of structural steel, welding electrodes, bolts, nuts and washers, etc. to be used.
g) Erection assemblies, identifying all transportable parts and sub-assemblies, associatedwith special instructions, if required, showing part marks and erection marks.
h) Calculations where asked for approval.
i) The specific electrodes for the specific connections of various members at differentlocations as per the instructions of the Engineer-in-charge.
j) Details of all members and connections.
k) Cambers and permissible tolerance in fabrication.
l) Welding and bolting procedures to be used both at shop and field.

4.5 Bill of Material

a) All material shall be of new stock, unless noted otherwise
b) Quality of structural steels, welding electrodes, bolts, nuts and washers etc. to be used.
c) Erection assemblies, identifying all transportable parts and sub-assemblies, associatedwith special erection instructions, if required.
d) Calculations where asked for, for approval.

Connections, splices etc. other details not specifically detailed in design drawings shall be suitably given on fabrication drawings considering normal detailing practices and developing full member strengths. Wherever asked for the calculations for the merit shall also be submitted for approval.

Any alternate design or change in section is allowed when approved in writing by the Engineer-in-charge.

However, if any variation in the scheme is found necessary later, the Contractor will be supplied with revised drawings. The Contractor shall incorporate these changes in his drawings.

The Engineer-in-charge would verify the correct interpretation of their requirements.

If any modification is made in the design drawing during the course of execution of the job, revised design drawings will be issued to the Contractor. Further changes arising out of these shall be incorporated by the Contractor in the fabrication drawings already prepared and the revised fabrication drawings shall be duly got reviewed from Engineer-in-charge.

4.6 Workmanship

The workmanship shall be of the best quality normally associated with this type of construction. All work shall be adequately supervised and care shall to be taken to ensure that the structural members remain in proper position.

4.7 Materials

All materials shall be new and shall conform to their respective specifications as specified. The use of equivalent or higher grade or alternative materials will be considered only in very special cases subject to the approval of the Engineer-in-charge.

7.7.1 Rolled Sections

The following grades of steel shall be used for steel structures:

Structural steel will generally be of standard quality conforming to IS: 226. Whenever welded construction is specified plates of more than 20 mm thickness will generally conform to IS: 2062.The general grade of steel for the structural steel work in exhibition halls or wherever specified shall be **Yst – 310** until and unless specified otherwise on the drawings and confirmed by the Engineer-in-charge.

7.7.2 Welding Materials

Welding electrodes shall conform to IS: 814.
Approval of welding procedures shall be as per IS: 823.

7.7.3 Mild Steel

Structural steel shall conform to IS: 2062 - Grade-A.

7.7.4 Black Bolts and Nuts

Black bolts, nuts and screws shall be in accordance with IS: 1363 - "Black Hexagonal Bolts (6 to 39mm) with nuts, and Black Hexagonal Screws (6 to 24mm) and IS: 1364 and IS: 1367 for other sizes.

All materials shall conform to their respective specifications. The use of equivalent or higher grade or alternate materials will be considered only in very special cases subject to the approvalof the Engineer-in-charge in writing.

4.8 Receipt and Storing of Materials

Steel materials supplied by the Contractor must be marked for identification and each lot should be accompanied by manufacturer's quality certificate, conforming chemical analysis and mechanical characteristics. Engineer-in-charge at his discretion may instruct the Contractor to get the testing of any structural steel material done from external laboratory of repute of their choice for the verification of quality assurance from time to time as per the provisions of the relevant latest IS codes. These tests shall be without prejudice to the presentation of manufacturers test certificates produced by the

Contractor. The results of the third party testing shall be overruling to the manufacturers test certificates until and unless the Contractor proves otherwise. The reasonably justifiable frequency of such test shall be the sole prerogative of the Engineer-in-charge.

All steel parts furnished by supplier shall be checked, sorted out, straightened, and arranged by grades and qualities in stores.

Structural steel members with surface defects such as pitting, cracks, laminations etc. shall be rejected if the defects exceed the allowable tolerances specified in relevant standards or as directed by the Engineer-in-charge.

Welding wire and electrodes shall be stored separately by qualities, grades and lots inside a dry and enclosed room, in compliance with IS: 816 - 1969 and as per instructions given by the Engineer-in-charge. Electrodes shall be perfectly dry and, if required heated in oven for a particular grade prior to their final consumption.

Fabricated steel shall not be handled until the paint has thoroughly dried. Care shall be taken toavoid paint abrasions and after damage. Steel work shall be transported in such a way so as notto over stress the fabricated sections. All pieces bent or otherwise damaged shall be rejected and shall be replaced by the Contractor.

Checking of the quality of the bolts of any kind as well as storage of same shall be made conforming to relevant standards. Each lot of electrodes, bolts, nuts, etc. shall be accompanied by manufacturer's test certificate.

Checking and inspection of fabricated structural steel work by the Engineer-in-charge shall be done at various stages of completion of fabrication work. The Contractor is required to ensure that fabricated steel work is properly stacked such that all joints of all members are visible or accessible for inspection at all stages of the fabrication work. Care should also be taken to ensure that fabricated members are not subjected to stresses due to defective stacking.

The Contractor may use alternative materials as compared to design specification only with the written approval of the Engineer-in-charge.

4.9 Quality Certificate of Materials

The Contractor shall be required to produce manufacturer's quality certificates for the supplied materials. Notwithstanding the manufacturer's certificates, the Engineer-in-charge may ask for testing of materials in approved test houses. The test results shall satisfy the requirements of the relevant Indian Standards. In addition to the routine external testing of materials as per the directions of Engineer-in-charge, the Contractor shall indulge in continuous checking / testing of material at site.

Whenever quality certificates are missing or incomplete or when material quality differs from standard specifications, the Contractor shall conduct all appropriate tests as directed by the Engineer-in-charge. Materials for which test certificates are not available or for which test resultsdo not comply with relevant BIS standard shall not be used.

Design drawings shall indicate the welds to be given non - destructive tests or the main visual examination. The extent of each type of test for each weld, and the method of testing shall be noted.

4.10 Fabrication

Fabrication shall be undertaken in accordance with IS: 800 and IS: 804 for pressed steel in addition to the following:

Fabrication shall be done as per approved fabrication drawings adhering strictly to work points and work lines on the same. The connections shall be welded or bolted as per design drawings. Work shall also include fabricating built up sections from rolled, pressed, box or tubular sections etc.

Any defective material used shall be replaced by the Contractor, care being taken to prevent anydamage to the structure during removal. Any damage caused because of mishandling due to transportation or any other factors to any member at any time shall be made good by the Contractor. Any faulty fabrication pointed out at any stage of work shall be made good by the Contractor.

Framing member may be either welded or fastened, high strength bolting or combinations of both. Strict compliance to IS requirement for all connections shall be mandatory without fail.

It would be preferred that all splice in the main rigid frames be made by welding. Bolted joints are, however acceptable provided high strength bolting is employed.

All welding shall reflect first class workmanship, and shall conform strictly to the code requirements. No welding shall be preferred when ambient temperature is below 40°F unless parts to be joined are preheated to not less than 180°F.

Certified copied of all mill test reports covering the chemical analysis and physical properties of the steel shall be submitted to Engineer-in-charge. Shop drawings shall define all welding to be done on main framing members, either by adequate notes, developed details, or proper welding symbol. Wherever high strength bolts are used in the workshop drawings shall so indicate.

Firms undertaking welding shall be currently certified by the Indian Welding Bureau shall meetall requirement of ISI standard. In addition to above all qualification test shall be conducted by the Engineer-in-charge for the qualification of deputing the firms as well as the individual weldersas deemed necessary.

Each weld shall be uniform in width and size throughout its full length. Each layer of welding shall be smooth and free of slag cracks, pinholes and under weld bends and base metal. In addition, the cover pass shall be free of coarse ripples, high crown, and deep riders or valleys between bends.

Field welding procedures of quality standards shall be in accordance with ISI codes.All fabrication shall conform to the BIS Code, the drawings and specifications.

All shop drawings shall be approved by Engineer-in-charge prior to the commencement of fabrication. All members shall be clearly marked and such marks shall be used as reference marks on the shop detail and erection drawings. Any special camber requirements for beams, trusses or girders joists shall be called for on the design drawings.

Fabrication shall be carried out only by firms recommended by Engineer-in-charge for the type ofwork certified.

7.10.1 Preparation of Materials

Prior to the commencement of release for fabrication, all rolled sections warped beyond allowable limit shall be straightened in a straightening machine only and feed from twists, taking care that a uniform pressure is applied. No hammering shall be applied to remove twists/warps or corrugations etc. Heating of rolled sections and plates for purpose of straightening shall not be permitted.

The sections can be straightened by hot working only when the Engineer-in-charges approves,and shall be cooled slowly after straightening.

Warped members like plates and flats may be used as such, only if wave like deformation does not exceed L/1000 but limited to 5mm (L-Length).

All acceptability criteria of members for physical checks shall be as per IS in addition to the above.

Surfaces of members that are to be joined by lap or fillet welding or bolting shall be even so that there is no gap between over-lapping surfaces.

7.10.2 Marking

Marking of members shall be made on horizontal pads or on appropriate racks or supports in order to ensure horizontal and straight placement of such members. Marking accuracy shall be at least + 1 mm.

7.10.3 Cutting

Members shall be cut mechanically (by saw or shear) or by oxyacetylene flame. Automatic oxy- acetylene flame cutting devices like "pug" machines to be used for plate edge preparation for theseams and butt. Such machine should also be used for cutting ISMB to half cut joists.

All sharp, rough, or broken edges, and all edges of joints shall be ground

smooth.No electric metal arc cutting shall be allowed.

All edges cut by oxyacetylene process shall be cleaned of impurities and slag and smoothly dressed prior to assembly.

Cutting tolerances shall be as follows:

a) For members connected at both ends + 1 mm.
b) Elsewhere + 3 mm.

The edge preparation for welding of members more than 22 mm thick shall be done by flame cutting and grinding. Cut faces shall not have cracks or be rough.

Edge preparation shall be as per IS: 823 - 1964.

7.10.4 Drilling

Bolt holes shall be drilled. Drilling shall be made to the diameter as specified in

drawings.No enlarging of holes by man drilling of oxyacetylene flame shall be

allowed.

Drilling shall be made to the diameter specified in drawings.

Allowed variations for holes (out of roundness, eccentricity, plumb-line deviation) shall be as perIS: 800.

Maximum deviation for spacing of two holes on the same axis shall be ±0.5mm.

Drilling faults in holes may be rectified by reaming holes to the next higher diameter, provided that spacing of new holecentres and distance of hole centers to the edges of members are not less than that allowed and that the increase of hole diameter does not impair the structural strength. Hole reaming shall be allowed if the number of faulty holes does not exceed 15% of thetotal number of holes for one joint.

7.10.5 Preparation of Members for Welding

Assembly of structural members shall be made with proper jigs and fixtures to ensure correct positioning of members (angles, axes, nodes, etc.). The first component assembly fabrication carried out in such manner shall be subjected to thorough in-house inspection by the Contractor and the inspection results on the fixtures/jigs shall be submitted to the Engineer-in-chargefor approval before proceeding with the fabrication.

Sharp edges, rust of cut edges, notches, irregularities and fissures due to faulty cutting shall be chipped or ground or filed over the length of the affected area, deep enough to remove faults completely.

Edge preparation for welding shall be carefully and accurately made so as to facilitate a good joint as per IS: 9595 and relevant fabrication drawings.

The members to be assembled shall be clean and dry on the welding edges. Under no circumstances shall wet, greasy, rust or dirt covered parts be assembled. Joints shall be kept free from any foreign matter, likely to get into the gaps between members to be welded.

Before assembly, the edges to be welded as well as adjacent areas extending for at least 20mmshall be cleaned (until metallic polish is achieved).

When assembling members, proper care shall be taken of welding shrinkage and distortions, as the drawings dimensions cover finished dimensions of the steelwork.

The components shall be got checked and approved by the Engineer-in-charge before assembly.

This permissible tolerances for assembly of members preparatory to welding shall be as per IS: 9595.

After the assembly has been checked, temporary tack welding in position shall be done by electric welding keeping in view of the finished dimensions of the structure.

4.11 Welding Procedures

Welding shall be carried out only by fully trained and experienced welders as tested and approved by the Engineer-in-charge. Any test carried out by the Engineer-in-charge or their representative or the inspectors shall constitute a right by them for such tests.

The steel structures shall be automatically, semi-automatically or manually welded.

Mild steel plates conforming to IS: 2062 and thicker than 25mm shall require preheating of the parent plate adjacent to the butt welding joint. In welding materials of unequal thickness the thicker part shall be taken for this purpose.

Preheating shall be done to a temperature of 120 Deg.C minimum and temperature maintained until welding is completed. In order to avoid rapid and non-uniform cooling after welding it may be necessary to apply heating while the weld is getting cooled.

Preheating may be applied by flame torch, by electric resistance or electric induction process such that uniform heating of the surface extending upto a distance of four times the thickness of the plate on either side of the welded joint is obtained.

Thermo-chalk or other approved methods shall be used for measuring the plate temperature.

All welding shall be done either manually by the shielded metallic arc process or automatically by the shielded arc or submerged arc method.

For multi-layer welding, before welding the following layer, the formerly welded layer shall be cleaned completely of slag and impurities metal bright by light chipping, wire brushing and grinding. Backing strips shall not be allowed.

The Contractor shall develop welding procedure for the approval of the Engineer-in-charge. Afterthe welding procedure has been approved, the Contractor shall record it on a special shop drawing. Weld sizes and types shall be shown on all Contractor's drawings where welding is required.

Suitable meters shall be provided to show the welding current and the arc voltage at all times during the welding operations. If the proposition of providing in the individual D.G. Sets to the welders is difficult to fulfill from practical angle then the Contractor shall have to make sufficient arrangement like ample capacity transformers or UPS of sufficient rating to furnish a constant flow of energy for requisite quality assurance up to the satisfaction of the Engineer-in-charge.

Electrodes for shielded arc manual welds shall comply with the requirements of IS: 814 and shallbe amenable to radiographic tests and shall be of approved make.

Electrodes classification group 1 or 2 as given in IS: 814 shall be used for welding steel conforming to IS: 1977, IS: 2062 and IS: 8500. Joints in materials up to and above 20mm thick and all-important connections shall be made with low hydrogen electrodes giving a radiographic quality weld. - As per Annexure Enclosed. The important junctions / connections shall be as defined by the Engineer-in-charge. The Tender drawings should be considered only indicative and all subsequent detailing required shall be provided at the time of actual execution.

Unless specifically stated otherwise, welded parts requiring machine finish shall be

completely welded before being finished.

All welds shall usually be made continuous unless otherwise mentioned in the approved drawing. The minimum throat dimension of fillet welds shall be 4.0mm and as per the drawings as referred to hereinbefore.

All defects in welds shall be chipped out to sound metal and such areas shall be visually examined to ensure that the defect has been completely removed before repair welding. Such portions shall be re-welded to the satisfaction of the Engineer-in-charge inclusive of the needed Dye-penetration/radiographic tests if needed by the Engineer-in-charge. The dimensions and shapes of the edges to be joined shall be such as to allow thorough fusion and complete penetration and the edges of plates shall be properly formed to accommodate the various welding conditions. The surface of the plates for a distance of 20mm from the edges to be welded shall be thoroughly cleaned of all rust, grease and scale to bright metal.

The technique of welding employed, the appearance and quality of the welds made and the methods used in correcting defective work, shall conform to IS:1024 and IS:822.

Welding shall be carried out by fully trained and experienced and certified welders. They should satisfy the requirement of IS: 1181 and 817. Qualification tests for welders as well as tests for approval of electrodes will be carried out as per IS: 823. All welders shall be qualified for specificlocations welds by the Engineer-in-charge after conducting the sample tests at site. The sample plates shall have to be got radio graphed or ultrasound checked depending upon the instructionsof the Engineer-in-charge. Other test like those of electrodes shall be got done by the Contractorfrom externally approved labs. The nature of test for performance qualification of welders shall be commensurate with the quality of welding required on this job as judged by the Engineer-in- charge.

The bare wire electrodes for submerged arc welding where reacquired to be carried out shall conform to IS: 7280.

Full welding shall begin only after the checking and approval of the tack-welded assemblies by the Engineer-in-charge.

Welding procedures and tests for welder's skill shall be conducted as per IS: 9595 and approvedby the Engineer-in-charge.

When welding is carried out in open area, steps shall be taken to protect the place of welding against wind or rain. The electrode wires and parts being welded shall be dry.

For continuing the welding of seams, discontinued due to some reason the end of the discontinued seam shall be melted in order to obtain a good continuity. Before resuming the welding operation, the grooves as well as the adjacent parts shall be well cleaned for a length ofapprox. 50mm.

For single butt welds and double butt welds, the re-welding of the root is mandatory but onlyafter the metal deposit on the root has been cleaned by back gauging or chipping.

The welding seams shall be left to cool slowly. The Contractor shall not be allowed to cool the welds quickly by any method.

For multi-layer welding, before welding the following layer, the formerly welded layer shall be cleaned metal bright by light chipping and wire brushing. Backing strips shall

not be allowed.

The order and method of welding shall be so that

a) No unaccepted deformation appears in the welded parts.
b) Due margin is provided to compensate for contraction due to welding in order to avoid anyhigh permanent.

Assembly or erection lugs and brackets welded to any part of the structure shall be removed after completion of their function by means of chipping or gouging so that the metal of the structural member is not damaged or reduced in thickness. Damage to the structural member shall be rectified to the satisfaction of the Engineer-in-charge.

In fabrication and erection of structure discontinuities or notches which might initiate cracks shallbe avoided. Particular care shall be taken in lining up longitudinal, brackets and other structureswhich oppose each other. Misalignment exceeding one-half the thickness of the opposing members shall be rectified.

The defects in welds must be rectified according to IS: 9595 and as per instruction of the Engineer-in-charge.

4.12 Tests on Welds

7.12.1 General

Engineer-in-charge shall be the final authority to decide the importance of any weld and prescribe the mode of testing required for reassurance of the quality.

7.12.2 Weld Inspection

The weld seams shall satisfy the following:

a) Shall correspond to design shapes and dimensions; and
b) Shall not have any defects such as cracks, incomplete penetration and fusion, under-cuts,rough surfaces, burns, blow holes porosity, slag intrusion etc. beyond permissible limits.

During the welding operations and approval of finished elements, inspections and tests shall bemade as directed by the Engineer-in-charge. Total number of radiographic exposure shall be

Decided by the Engineer-in-charge. However, if the radiographic tests prove the welds to be defective, rectification of the weld and repeat inspection inclusive of radiographic tests shall be undertaken by the Contractor as required by Engineer-in-charge.

All welds shall be inspected visually and random sample welds by dye penetration D.P tests alsoshall be carried out as directed by the Engineer-in-charge to check the quality of welding. Total length of welds to be D.P. tested shall be decided by the Engineer-in-charge. However, this limitwill not be applicable when weld defects are spotted, which may need repair/weld and repeat D.P./radiographic tests as needed by the Engineer-in-charge.

In case of heavy structural steel fabricated components like vierendeal girders, all the butt weldsin components under tension and 20 percent for other components shall be radio graphically tested by Engineer-in-charge. For the remaining butt and fillet welds

minimum 20 percent shall be subjected to dye penetration tests.

The frequency and locations of the conduction of such test shall be determined by the Engineer-in-charge or as instructed by the Engineer-in-charge.

The mechanical characteristics of the welded joints shall be as per latest edition of IS: 9595.

7.12.3 Shop Test Pre-assembly

For steel structures that have the same type of welding the shop test pre-assembly shall be performed on one out of every 10 members minimum.

For bolted steel structures, shop test pre-assembly is mandatory for all elements as well as for the entire structure in conformity with test on welds clause.

7.12.4 Shop Inspection and Approval

The Contractor shall maintain a well-planned quality control programme to monitor the quality of the fabrication work in properly documented formats for every stage of fabrication. The format should not only record the dimensions and hole centers of members as fabricated against the dimension of drawings calling out the deviation involved, but should also record the deviation of fittings, assemblies etc. as well as the quality of the welding. The formats should be documentedsuch that they can be referred back, if required. The complete documents of quality control programme of the Contractor shall be made available, whenever required by the Engineer-in- charge for inspection and comments by the Engineer-in-charge. Approval by the Engineer-in-charge will depend on the proper and satisfactory documents being maintained by the Contractor for quality control programme of the work.

Technical approval of the steel structure in the shop by the Engineer-in-charge is mandatory.

The Contractor shall not limit the number of kinds of tests, final as well as intermediate ones requested by the Engineer-in-charge.

The Contractor shall provide necessary tools, gauges, instruments etc. and technical and non- technical personnel for shop tests by the Engineer-in-charge.

Erection & shop drawings for structural steel and miscellaneous metal jobs shall be prepared based on the drawings & specification only.

The shop drawings shall be reviewed conformity to the design drawings.

Approval of detailed drawings shall be accorded by the Engineer-in-

charge.

Detail & erection drawings shall bear the stamp Approval of Engineer-in-

charge.

7.12.5 Shop Acceptance

The Engineer-in-charge shall inspect and approve at the following

stages:The following approvals may be given in shop:

c) Intermediate approvals of work that cannot be inspected later.
d) Partial approvals
e) Final approvals

Intermediate approval of work shall be given when a part of the work is preformed later:

a) Cannot be inspected later
b) Inspection would be difficult to perform and results would not be satisfactory.

Partial approval in the shop is given on members and assemblies of steel structures beforethe primer coat is applied and includes:

7.12.6

a) Approval of materials
b) Approval of field joints
c) Approval of parts with planed surfaces
d) Test erection
e) Approval of members
f) Approval of markings
g) Inspections and approvals of special features, like Rollers, loading platformmechanism etc.

During the partial approval, intermediate approvals as well as all former approvals, shall betaken in to consideration.

7.12.7 Final approval in the Shop

The final approval refers to all elements and assemblies of the steel structures, with shopprimer coat, ready for delivery from shop to be loaded for transportation, or stored.

The final approval comprises of:

f) Partial approvals
g) Approval of shop primer coat
h) Approval of mode of loading and transport
i) Approval of storage (for materials stored)

4.13 Painting and Delivery of Structural Steel Work

7.13.1 Pre-Treatment and Painting

The painting generally shall comply with the requirements of IS: 1477 (Part 1 & 2) - Code of Practice for painting of Ferrous Metals in Buildings, except otherwise specified herein.

The Contractor shall take all precautions, to protect efficiently all newly treated surfaces from injury. No painting, decoration or coating shall be commenced until prepared surfaces have beenapproved by the Engineer-in-chargeand shall not be undertaken when the atmosphere is misty or damp and until all dirt's on the surfaces to be painted have been removed by washing or othermeans and the surfaces dried and cleaned.

All steel plates and sections shall be prepared as stated hereinafter and given one coat of Zinc rich epoxy primer prior to the commencement of fabrication work. The primer

coats shall be

Applied using suitable brushes soon after completion of pre-cleaning of pretreatment in order to prevent contamination of the surface in any way. The paint will be brushed in the minute depressions on the steel surface, ensuring a film free from `Holiday's Galvanized components, ifany shall not be painted. The primer applications shall be strictly initialized only when the member has been duly sand blasted and made absolutely free from rust, corrosion, grease, dirt, oil etc. and as surface finish of standard SA 2.5 is achieved

Edges prepared for welding shall not be painted before erection but shall be protected with a temporary rust preventive coat which shall be easily removable by washing with kerosene (e.g. Ensis Fluid No.256 or DTD 279-B).

Before starting the painting operation on structures, the following metal data and information shall be taken into account:

a. The condition of the metal surface
b. The presence of harmful materials on it such as scale trust, moisture, grease, dirt, salts etc.

Correct timing for the application of the primers as well as other coats shall be as directed by theEngineer-in-charge.

7.13.2 Surface Preparation

All oil, paraffin, grease and dirt shall be removed from the surfaces to be painted, using solvents.Following solvent cleaning, all weld spatters, slags, burrs, loose rust and mill scale and other foreign substances shall be removed by wire brushing/Sand blasting. If rust forms or other surface become contaminated in the interval between cleaning and painting, re-cleaning to the same degrees shall be required. Surfaces not to be painted shall be protected by appropriate and adequate masking during the cleaning the cleaning and painting of adjacent metal work. The surfaces that are in contact with the ground, gravel or brick work and subject to moisture shall be given bituminous coat.

If specified elsewhere, in the schedule of quantities, the Contractor shall paint further coats of red-oxide after erection and placing in position of the steel structures. All surface preparation shall be subject to approval by the Engineer-in-charge before any paint is applied.

7.13.3 Packing, Transportation and Delivery

After final shop acceptance and marking, the item shall be carefully packed and loaded for transportation and dispatched to site.

Lifting must be securely done at pre identified lifting locations adequate to protect item against warping during loading and unloading.

Proper lifting devices shall be used for loading, in order to protect items against warping/ bending.

Bolts, nuts and washers shall be packed and transported in gunny bags.
The parts shall be delivered in the order stipulated by the Engineer-in-charge and shall beaccompanied by documents showing:

a. Quality and quantity of structure or members

b. Position of member in the structure
c. Particulars of structure
d. Identification number job symbol.

7.13.4 Erection

The Contractor should arrange his own erection plant and equipment, welding set tools and tackles, scaffolding, trestles equipment, etc., and any other accessories and ancillaries required for the work.

The Contractor shall examine the site condition and transportation clearances before deciding whether the main structural components are to be fabricated and erected in one piece or in morethan one piece. Maximum number of erection joints permitted in a chord member of a girdershall be two i.e. no girder shall be fabricated and erected in more than 3 (three) pieces. Proper splice material shall be provided at the erection joints and indicated in fabrication drawings. When erection joints are provided in chord member, their location shall invariably be marked in the fabrication drawings to be approved by the Engineer-in-charge.

The Contractor shall arrange for erection bolts and nuts, drifts, compressed air required for erection and also cranes, trailers, tractors, with necessary tools and tackles for loading, unloading handling and transport of fabricated or raw steel to the erection site and erection thereof.

All steel work shall be efficiently and sufficiently protected against damage in transit to site and during erection from any cause whatsoever. All projecting plates or bars and all ends ofmembers at joints shall be stiffened, all straight bars and plates shall be bundled, all screwed ends and machined surfaces shall be suitably packed and all bolts, nuts, washers and small loose parts shall be packed separately in cases so as to prevent damage or distortion during transit. Should there be any distortion of fabricated members the Contractor shall immediately report the matter to the Engineer-in-charge. Distorted steel received from stores or distorted during transport from stores to the fabrication yard shall not be used in fabrication unless the distortions are minor which in the opinion of the Engineer-in-charge can be removed by acceptable methods. These distortions shall be rectified by the Contractor by cold-bending. If heating is necessary to rectify the defects, the details of the procedure shall be intimated to the Engineer-in-charge whose approval shall be taken before such rectification. The temperature of heat treatment shall not exceed the limits beyond which the original properties of steel are likely to be impaired.

The Contractor shall be responsible for the stability of the structure at all stages of its erection atsite and shall take all necessary measures by the additions of temporary bracing and guying to ensure adequate resistance to wind and also to loads due to erection equipment and their operation. Guying and bracing shall be done in such a way that it does not interfere with the movement or working of other agencies working in the area. For the purpose of guying, the Contractor shall not use other structures in the vicinity which are likely to be damaged by the guy.

Any faulty erection done by the Contractor shall be made good.
Approval by the Engineer-in-charge or their representatives at any stage of work does not relieve the Contractor of any of his required guarantees of the contract.

7.13.5 Concrete Encasing of Steel Components

Steel components where required shall be encased with concrete as shown in the

drawing and as directed by the Engineer-in-charge. The finish, alignment, level of encased components shall be true to line and shape and shall not differ from adjoining reinforced concrete components.Any defects in encasing works shall be rectified to full satisfaction of the Engineer-in-charge.

7.13.6 Storage and preparation of parts prior to erection

The storage place for steel parts shall be prepared in advance and got approved by the Engineer-in-charge before the steel structures start arriving from the shop.

A platform shall be provided by the Contractor near the erection site for preliminary erection work.

The Contractor shall make the following verifications upon receipt of material at site.

a) For quality certificates regarding materials and workmanship according to these generalspecifications and drawings.

b) Whether parts received are complete without defects due to transportation, loading and unloading and defects, if any, are well within the admissible limit.

7.13.7 Erection & Tolerances

Erection in general shall be carried out as required and approved by the Engineer-in-charge.

Positioning and leveling of the structure, alignment and plumbing of the stanchion and fixing every member of the structure shall be in accordance with the relevant drawings and to the complete satisfaction of the Engineer-in-charge.

The following checks and inspection shall be carried out before during and after erection.

a. damage during transportation
b. accuracy of alignment of structures
c. erection according to drawings and specifications
d. Progress and workmanship.

In case there be any deviations regarding positions of foundations or anchor bolts, which would lead to erection deviations, the Engineer-in-charge shall be informed immediately.

The various parts of the steel structure shall be so erected so to ensure stability against inherentweight, wind and erection stresses.

The structure shall be anchored and final erection joints completed after plan and elevation positions of the structural members have been verified with corresponding drawings and approved by the Engineer-in-charge.

The bolted joints shall be tightened so that the entire surface of the bolt heads and nuts shall rest on the member. For parts with sloping surfaces tapered washers shall be used.

7.13.8 Final acceptance and handing over the structure

At the time of acceptance, the Contractor shall submit the following documents:

- Shop and erection drawings - either in tracings or reproducible.

- 5 copies of each of the following:

  c) Shop acceptance documents
  d) Quality certificate for built up structural members, plates, etc. (electrodes,welding wire, bolts, nuts, washers etc.)
  e) List of certified welders who worked on erection of structures.
  f) Acceptance and intermediate control procedure of erection operations.

Approval by the Engineer-in-charge at any stage of work does not relieve the Contractor of any of his required guarantees of the contract.

7.13.9 Grouting of Pockets

Grouting of pockets and under base plates will be done only after the steel work has been leveled and plumbed and the bases of stanchions are supported by steel shims. The space below the base plate and pockets shall be thoroughly cleaned.

All grouting shall need to be done with non-shrink grout of approved make and quality only as per the specifications issued by the manufacturer. It shall be poured under suitable head and tamped until the space has been completely filled. If the location of grouting is such that the grout cannot reach all anticipated locations, then the Contractor shall have to arrange for mechanical or pneumatic pushing arrangement.

7.13.10 Painting of Steel Elements

Structural steel components which shall remain exposed without concrete encasing shall have painting on exposed outer surface as stated hereinafter.

Painting shall consist of providing two coats of primer and two finishing coats of approved paint to steel members as per IS: 1477 (Part I & II). Paint to be used shall be as below.

In painting of structural steel elements paint manufacture's recommendation shall be followed subject to fulfilling the following requirements:

g) The surfaces to be painted shall be prepared by sand blasting as per Swedish SpecificationSA 2½ .
h) On the prepared surface two coats (each coat 25 microns DF7) zinc phosphate primer orapproved equivalent shall be applied.
i) On the prime coated surface two coats of epoxy polyamide based anti-corrosive paint (eachcoat 35 microns DFT) or approved equivalent shall be applied.

7.13.11 Primer Coat shall not be Applied Unless

j) Surface has been wire brushed/Sand blast, cleaned of dust, oil, rust, etc.
k) Erection gaps between members, spots that cannot be painted or where moisture or otheraggressive agents may penetrate, have been filled with an approved type of paint.
l) The surface to be painted is completely dry.
m) The parts where water aggressive agents may collect during transportation, storage, erection and operation are to be provided with proper protective treatment and are

provided with holes for drainage of water.

n) Members and parts have been inspected and accepted.
o) Welds have been accepted and all slags are removed.

The following are not to be painted or protected by any other product:

a) Surfaces which are in the vicinity of joints to be welded at site.
b) Surfaces bearing markings.
c) Other surfaces indicated in the design.

Joints which are to be welded at site will be pointed afterwards as specified. Special attention shall be given to location not easily accessible and which after assembly and erection cannot beinspected and painted. Holes shall be provided for water drainage where required and inaccessible box type sections shall be hermetically sealed by welds.

4.14 ANNEXURE - A

INSPECTION

Inspection	Coverage	Procedure	Evaluation findings and remedy of defect
Inspection of weld sea mappearance	All welds	Naked eye or lens	All faulty welds shall Be rectified.
Checking o fsizes	At least one for each weld seam	Ordinary measuring instruments (rule, templates)	Should faulty weld be found all welds shall be checked & all defects shall be Rectified.
Mechanical tests fo r welding procedure performance and electrodes		As per IS: 823	As per IS: 823

4.15 ANNEXURE - B

INADMISSIBLE WELD DEFECTS AND TOLERANCE ALLOWED FOR WELDS

Defects	Detailing of sketchin of gdefects	Allowed tolerance an remedy d defects of	Cause of defects	Mode of finding defects

Unsatisfactory appearance	Uneven widthrugged	At discretion cutweld & re-weld	Uneven welding progress, voltage fluctuations, varying Arc length, negligence, inexperience welder	External (visual) inspection
Unsatisfactory shape	Shallow or jutting welds	No variance fromdesign shape shall be allowed	Negligence	Visual inspection template Checking.
Incomplete weld		Not allowed fill inweld		Template checking
Molten metalflow		Not allowed fill inweld	Excessive melting Wrong handling ofelectrode.	Visual inspection
Pits		Not allowed cut &re-weld	Wrong welding technique	Visual inspection
Surface cracks		Not allowed cut &re-weld	Great stresses, sudden cooling, Wrong type ofelectrode.	Visual inspection
Incorrect Sectional Dimensions a) Depth b) Weld		b1 = ± 2mmb2 = ± 2mmb = ± 1mmc = ± 1mm Chisel & grind.	Negligence	Template checking

Insufficient	For weld lengths11 + 5mm for 12 + 10mm for shorter seams cut and re-weld or	Negligence	Rule checking

	complete tolength		
Back cuts	If 0.5mm for 10mm & C 1mm For 10mm replace relevant members	Burned material excessive melting	Visual Inspectio n
Surface porosities	Max. 5% of weldseam area cut and re-weld	Frequent interruptions or welding electrodes inadequately covered	Visual inspectio n

No defect that might diminish weld strength shall be allowed. Sectional weld shape must complywith design indications. No concave welds shall be allowed for specified convex welds, or vice versa. Tolerance for concavity or convexity of welds shall bed. 1 x a ("a" being the height of the triangle within the section shown), but not more than 0.6 mm.

4.16 ANNEXURE - C

MILD STEEL WELDING ELECTRODEWELD ALLOY 6013

Identification : Tip Color: Red Current Conditions: AC/DC (+)

Classification :

AWS : E-6013
BS : E-4322 R 11
IS : ER-4211
DIN : E-4322 R 312

Characteristics : Weld Alloy – 6013 is a light – medium coated, normal penetration, general purpose, all positions, and rutile type electrodes with pleasing operating characteristics. Operates with equal ease on both DC & AC. The weld metal possesses good mechanical properties.

Applications : Typical applications include light structural work, storage tanks, machinery construction, rail coaches & wagons, ships and for general repairs and maintenance.

Weld metal	: C	Mn	Si	S	P
Chemistry %	: 0.06-0.10	0.35-0.50	0.15-0.35	0.03max.	
0.03max					

ALL-Weld :	UTS	YS	Elong.(%)	Impact value (j)	
Mechanical	(N/mm^2)	(N/mm^2)	(L=5d)	AT-RT	At-
0ºCProperties Min.	420-510	360-400	22-26	70-100	50

Current Data	: Size (mm)	2.5x350	3.15x350	4x450Current (amp) 60-80		90-130
	Size (mm)	130-170	5x450	6.3x450Current		
	(amp) 190-230			240-320		

Packing	:Size (mm)	2.5	3.15	4	5	6.3
PiecesPer case	135x16	90x16	60x16	45x16		
30x16Approved by	: BIS, RDSO Class B2& C2					

WELD ALLOY 6013

Identification : Tip Colour : Blue Current Conditions :

AC/DC(+)Classification : AWS : E-7018
BS : E5144 B12024 (H)
IS : EB5426 H3JX
DIN : E5144 B1026

Characteristics :A heavy coated, low hydrogen, iron powder type electrode producing tough & ductile welds of radiographic quality slag easily removable. Easy to operate in all position. Specially recommended for heavy joints under restrain and joints subject to dynamic loading. Deposit efficiency is 110% approx.

Applications :An ideal electrodes for all types of fabrication including heavy structures subject to dynamic loading and heavy impact. Typical applications include pressure vessels, coaches, wagons, penstocks, boilers, earth moving equipment, blast furnace steel work, atomic reactor shells and pipe work.

Weld metal Chemistry %	:C	Mn	Sl	S	P
	:0.07	1.1	0.50	0.025	0.022

ALL-Weld	: UTS	YS	Elong.(%)	Impact value (j)	
Mechanical Properties	(N/mm^2)	(N/mm^2)	(L=4d)	AT-30ºC	
	550	470	28.00	50	

Current Data	:Size (mm)	2.5x350	3.15x450	4.0x450	5.0x450
	Current (amp)	70-100	100-140	160-190	180-230

Packing	:Pieces per : 100x10	75x10	50x10	30x10
Specification	Carton / Case			

Welding instruction: Ensure that the electrodes are dry.Rebake the moist electrodes at 300^0C forone hour before use. However, it is a safe practice to rebake the electrodes at 250ºC- 300ºC forone hour before use to ensure best results

Approved by : IBR, RDSO Class C2&D2 , IRS Gr3y

8.0 LIST OF CODES

The materials and workmanship shall be in accordance with the requirement of the appropriate IS code wherever applicable together with any building regulations or bye-laws governing the works.

The following list is included for guidance only and the omission from the list does not relieve thecontractor from compliance therewith:

IS 8112:1989 IS 3812:1981		Ordinary portland cement 43 Grade. Flyash for use as pozzolana and admixtures,
IS 2386(Part8):1963		Method of test for aggregate for concrete.
IS 516:1959		Method of test for strength of concrete
		Coarse and fine aggregate from natural sources for concrete.
IS 1077:1986		Method of test for strength of Bricks.
IS 456		Code of practice for plain and reinforced concrete.
IS 1597		Code of practice for construction of stone masonry.
IS 1597 PART 1		Code of practice for construction of rubble stone masonry.
IS 6313 PART 2		Anti-termite measures in buildings, pre-constructional chemical treatment measures.
IS 2524 : Part 2		Code of practice for painting of non-ferrous metals in buildings: Part 2 Painting
IS : 383		Code of Practice for specification for coarse sand.
IS : 2645		Code of Practice for specification for integral cement waterproofing compound.
IS : 7193		Code of Practice for specification for glass fibre base bitumen felt.
IS : 8112		Code of Practice for specification for 43 grade ordinaryPortland cement.
IS : 12118		Code of Practice for specification for two part polysulphidebased cement.
IS : 13826		Code of Practice for method of test for water proofing.

9.0 MASONRY WORKS

9.1 Brick Works

i) The bricks shall conform to the IS No. 1077-1986 of minimum crushing strength of 75 Kg./Cm2.

ii) The building bricks are to be the best quality table moulded kiln burnt, patent bricks, hard sound, square with sharp arises, even and uniform in shape and colour free from cracks, stones, flaws and other defects. Samples of bricks are to be submitted to the Project Manager for approval before full quantity is ordered. All supply of brick to conform to the sample approved. No brick after 14 hours immersion in water shall absorb water more than 15% of its own weight.

iii) The cement and sand shall be as described under 'Cement Concrete' and the mortar unless specified otherwise in Indicative Items is to be composed of one part cement to four parts of coarse sand by volume, thoroughly mixed by hand.

Hydrophobic cement used in mortar shall be thoroughly machine mixed. No mortar that has started to set shall be used in the work.

iii) Every brick shall be thoroughly soaked in water before use. Broken bricks shall not be used except as closers. The courses shall be truly horizontal and the work strictly plumb, joints shall be broken vertically and they shall not exceed 1/2" in thickness. All joints in brick work are to be well filled with mortar.

iv) The brick work shall not be raised more than 12 single courses per day and shall be builtin English bond, except brick on edge and half brick thick walls shall be built in stretcher bond. Except for brick on edge work, the bricks shall be placed with "frog" facing upwards.

v) All joints in brick work shall be raked out 1/2" deep as the work proceeds, and before themortar sets.

vi) The brick work is to be carried out with all necessary setbacks, projections, cuttings andtoo things in conformity with the drawings.

vii) The brick work shall be cured by watering and continuously kept wet for 10 days, and the work shall be well protected during rainy season.

viii) All uneven, irregular and bad brick work poor in workmanship shall be demolished if deemed necessary by the Engineer-in-charge and rebuilt by the contractor. If necessarythe contractor will have to provide wooden plug, etc. The work will have to be executed at all height and lift.

ix) Should any efflorescence be observed in brick work, it should be washed down by cleanwater and brick surface treated with such chemicals as are deemed necessary by the Engineer-in-charge, till efflorescence subsides. Should the efflorescence persist, the brick work shall be demolished if deemed necessary by the Engineer-in-charge and the work rebuilt with new bricks including making good all the work disturbed.

x) Half brick masonry

All brick work under 115 mm thick shall be reinforced with hoop iron, 16 gauge 25 mm wide, or 2 Nos. 6 mm dia bars, in every coarse in the bottom for the first four courses and in every fourth coarse thereafter. The said bars shall be cast in or securely fixed to adjoining concrete walls or columns. 75mm thick RCC bond with 1:2:4 mix concrete and

2 Nos. 10 mm dia MS bars with 'U' shaped 6 mm thk MS strips @ 150 mm centers, shallbe provided at every 2 metre height or as directed.

9.2 Mortar

The mortar for masonry work shall be cement and sharp coarse sand and shall be madein small quantities so as to be used up within 30 minutes. The cement and sand of the required proportion shall be first mixed dry thoroughly and water added and mixed to a sufficiently thick consistency as required by the Engineer- in-charge. No left over mortar shall be used. Unless otherwise specified the

mortar shall be of the following proportions.

a) One cement and five coarse sand for 230 mm thick masonry work and above.

b) One cement and four coarse sand for piers, half brick walls, honeycombed brickwork,hollow blocks.

9.3 Walls under structural members

Allowance shall be made for leaving, temporarily, open courses immediately below all structural members built in to the walls. The open courses shall be left to permit full deflection of structural members. The open courses shall then be made good, and pointed up after the structural members have been fully loaded and before the completion of the works.

9.4 Autoclaved Aerated Concrete Block

The Autoclaved aerated concrete blocks having oven dry density 550 to 650 Kg/Cum, fireresistance minimum 2 hours. The characteristics of AAC block will be conforming to BIS - 2185
(3) -1984: Autoclave Aerated Concrete
Block BIS – 6041: Construction of AAC
block masonry
BIS – 6072 – 1971: Specification of Autoclaved Reinforced Cellular Concrete Block
MasonryBIS – 6042 – 1969: Construction of Light Weight Concrete Block Masonry
BIS – 6441 – 1972: Methods of Test for Autoclaved Cellular Concrete
Products BIS – 6073 – 1971: Autoclaved Reinforced Cellular Concrete
Floor & Roof SlabsBIS – 3809 – 1979: Fire Resistance Test of Structure

The blocks shall be stored on the site on a level ground. Protected against rain fall and snow fall.

Laying of Mortar: The mortar shall not be spread so much ahead of the actual laying of the units that it tends to stiffen and lose the plasticity there by resulting in poor bond. Consistency as per requirement of site must be maintained at the point of laying over bed.
Mortar joint shall be struck off flush with wall surface and when the mortar starts stiffening, it shall be compressed tightly.

9.5 Raw Material for Manufacturing of Bricks

Fly ash

Generally fly ash is obtained from the boiler o the power plant. It can be dry fly ash or bottom ash obtained directly from the hopper or obtained from the slurry pond, confirming to the granulation size passing 95% from 0.06mm mesh.

Sand

Siliceous sand used for production of fly ash and line colored bricks or to get light grey color.It should not contain more than 10% of water content in it.

Lime

Quicklime having active Calcium Oxide (CaO) used for production of Fly ash sand

lime bricksshould be ground to fulfill following requirements:

Granulation of quicklime if supplied as powder	0.063mm.max.
0.1% (Residue of sieve mesh)	0.08mm.max.
80%	

9.6 Mechanized Autoclaved Fly Ash Sand Lime Bricks

9.6.1 General Requirements

9.6.1.1 Visually the bricks shall be sound, compact and uniform shape. The bricks shall be free fromvisible cracks, warp age and organic matter. This shall be confirming to BIS 12894-2002.

9.6.1.2 The bricks shall be solid and with or without frog 10 to 20 mm deep on one of its flat side. Thebricks shall have smooth rectangular face with sharp and square corners.

9.6.2 Dimension and Tolerances

9.6.2.1 The size of the fly ash sand lime bricks shall be 228mm x 110mm x 72mm. The tolerance onlength shall be $\pm$ 3mm and that on breadth and height shall be $\pm$ 2mm.

Note:- The tolerance requirements on length, breadth and height of fly ash sand lime bricks shall remainthe same given above.

9.7 Materials

9.7.1 fly ash
fly ash shall confirm to Grade 1 or Grade 2 of IS 3813 : 1981

9.7.2 Bottom Ash
Bottom ash used as replacement of sand shall not have more than 12 percent loss on ignitionwhen tested according to IS 1729: 1967

9.7.3 Sand
Deleterious materials, such as clay and silt in sand, shall preferably be less than 5 percent.

9.7.4 Lime
Lime shall confirm to Class C hydrated lime of IS 712 : 1984

9.7.5 Additives
Any suitable additive considered not detrimental to the durability of the bricks may be used.

9.8 Classification

9.8.1 The fly ash sand lime bricks shall be of the following four classes depending upon their averagecompressive strength:

Class	Average Compressive Strength N/mm^2	
	Not Less Than	Less Than
7.5	7.5	10.0
10	10.0	15.0

15	15.0	20.0
20	20.0	—

9.9 Physical Characteristics

9.9.1 Compressive Strength

The minimum average compressive strength of fly ash sand lime bricks shall not be less thanthe one specified for each class in 6.1 when tested as described in IS 12894-2002. The compressive strength of any individual brick shall not fall below the minimum average compressive strength specified for the corresponding class of bricks by more than 20 percent.

Note: - In case any of the test results of compressive strength exceed the upper limit for the class, the same shall be limited to the upper limit of the class for the purpose of average.

9.9.2 Drying Shrinkage

The average drying shrinkage of the bricks when tested by the method described in IS 4139: 1989, being the average of three units, shall not exceed 0.15 percent.

9.9.3 Efflorescence Test

The bricks when tested in accordance with the procedure shall have the rating of efflorescence not more than 'moderate' up to Class 10 and 'slight' for higher classes.

9.9.4 Water Absorption

The bricks, when tested in accordance with the procedure after immersion in cold water for 24 hours, shall have average water absorption not more than 25 percent by mass up to class 10 and 15 percent by mass for higher classes.

9.10 Sampling and Criteria for Conformity

9.10.1 Sampling and criteria for conformity of the bricks shall be as given in IS 5454: 1976

9.11 Marketing

9.11.1 Each brick shall be marked in a suitable manner with the manufacturer's identification mark orinitials.

10.0 WATER PROOFING

10.1 GENERAL

Standards

Indian and other International Standards followed for this section shall be as listed below. Any discrepancies or ambiguities seen shall be brought to the notice of the Cleint/PMC and clarification / confirmation sought. His decision shall be final. However, as a general rule, more stringent specifications shall be followed.

i)	IS 269	Specification for 33 grade ordinary and low heat Portland Cement.
ii)	IS 383	Specification for coarse and fine aggregates from natural Sources.
iii)	IS 2645	Specification for integral cement water proofing compound.
iv)	IS 6494	Code of practice for water proofing of underground Reservoirs and swimming pool.
v)	IS 8112	Specification for 43 grade ordinary Portland cement.

vi) IS 12118 Specification for two part polysulphide based cement :Part -1General requirements.

vii) IS 13826 Method of Test.

viii) IS 3495 Method of Test for Burnt clay building bricks.

10.2 Quality Assurance

Manufacturer's Qualification

a) Not less than five years' experience in manufacturing of membrane roofing.

   i) Obtain primary materials from single manufacturer. Manufacturer's name shallappear on containers and accessories.
   ii) Provide secondary materials as required by manufacturer of primary materials.

10.2.1 Applicators Qualification

a) Approved by manufacturer prior to execution of this work order, with experience on atleast five projects.
b) Foreman of Field Crew: Minimum five years' experience with system of waterproofingbeing installed.

10.2.2 Certifications

Manufacturer's certifications on manufacturer's letterhead:

i) Certify system design; penetration, transition, and perimeter details; and systemspecifications are appropriate and satisfactory for this particular project.
ii) Certify products proposed for use comply with standards.
iii) Certify materials ordered and supplied are compatible with each other suited for local and purpose intended and shipped in sufficient quantity to ensure proper timely installation.
iv) Certify materials have express warranty of merchantability and fitness for particular purposes of this Project.
v) Certify manufacturer has reviewed project and will issue warranty upon successful completion of installation.
vi) Certify materials shipped to site meet membrane manufacturer's published performance standards and requirements of this Specification.
vii) Membrane manufacturer's approval of insulation type and method of installation.
viii) Manufacturer's approval of installer.

10.2.3 Submittals

i) Product Data

Contractor to submit along with his proposal product data for material he proposes to use.

ii) Informational Submittals.

a) Certifications specified in quality assurances
b) Manufacturer's instructions

10.3 Waterproofing compounds

10.3.1 Waterproofing compounds shall be cementious (cement based) non-shrinking, self-curingmixtures. These shall be :

a) Free from sodium and chlorides
b) Free from material detrimental to concrete and reinforcement.
c) Able to create a membrane in one or multiple coats as per manufacturer's instruction.
d) Membrane capable to prevent infiltration when applied to interior faces and ponded.
e) Permeability, shear bond strength, compressive strength, volume changes meetsminimum requirements of codes.

10.3.2 Accessories

All other accessories materials such as primers, bonding agents, polymers etc. shall be as recommended by waterproofing manufacturer.

10.3.3 Guarantee

The waterproofing work and sealing of sleeve after passing cable, bunch of wires and pipe etc. shall be guarantee for 10 years on the non-judicial stamp paper of appropriate vale.

10.4 METERIALS

a) Cement
Cement shall be ordinary Portland Cement conforming to IS and shall be of grade 43 or 33.

It shall be received in bags of 50 kg and each batch shall be accompanied with a test certificate of the factory. Also it shall be tested before use to ascertain its strength, setting time, etc. In casecement has been stored for over 6 months or for any reasons the stored cement shows signs of deterioration or contamination, it shall be tested as per the direction of the PM prior to use in the works.

Cement shall be stored in such locations so as to prevent deterioration due to moisture dampness. A dry and water proof shed shall be provided. Bags shall be stacked on rigid water- proof platforms about 15 to 20 cm clear above the floors and 25 to 35 cm clear or away from the surrounding walls. A maximum high stack of 12 bags is permitted. Stacks shall be so arranged that the first batches are used first (FIFO), and that they permit easy access for inspection and handling.

b) Sand

i) Natural sand deposited by stream or glacial agencies as a result of disintegration of rock is the best form of sand and shall be used.
Sometimes it is obtained from crushed stone screenings but often contains a high percentage of dust and clay. It tends to be flaky and angular. This type produces harsh concrete and should beavoided.

c) Sea sand shall not be used.

i) Sand shall be hard, durable, clean and free from adherent coatings and organic matter and shallnot contain any appreciable amount of clay. Sand shall not contain harmful impurities such as iron, pyrites, coal particles, lignite, mica shale or similar laminated material, alkali, and organic impurities in such form or quantities as to affect the strength or durability of concrete or mortar.

ii) When tested as per IS 2386 Part II, sand shall not exceed permissible quantities of deleterious materials as given in table 10f IS 383.

iii) Grading of sand shall conform to IS and shall fall within limits.

iv) Sand shall be stored in such a way that it does not get mixed with mud, grass, vegetables and other foreign matter. The best way is to have a hard surface platform made out of concrete, bricks or planks. It should be to the approval of the PM.

d) Water

i) Water used for mixing and curing shall be clean, reasonably clear and free from objectionable quantities of silt, oils, alkalies, acids, salts so as not to weaken mortar, or concrete or cause efflorescence or attack the steel in RCC while curing. It shall be free of elements, which significantly affects the hydration reaction. Potable water is generally satisfactory but it shall be tested prior to use in the works.

ii) Water tested shall be in accordance with IS 3025. Maximum permissible limits of deleterious materials in water should be as given in IS 456.

iii) Water storage tanks shall be such as to prevent any deleterious materials getting mixed with it.

iv) Water shall be tested and approved in writing by the PM prior to use in the works.

Water Proofing using Injection Grouting

a) Providing and laying water proofing treatment by chemical injection grout process on walls of UGSump and basement using 12mm dia MS nozzles of minimum 25mm deep in walls placed and fixed @1.50m distance in both directions in the walls and @ 0.75m c/c along construction joints, consisting of injecting cement slurries of different viscosities under pressure by pump using pidicrete AM @ 225 gm / kg of cement and sealing off nozzles after the injection operation with suitable admixture including providing and applying two coats of pidicrete MPB cementious coatings in the ratio of 3:1 (3 parts of cement : 1part pidicrete MPB) keeping W/C ratio as per manufacturers specifications & providing 12-15mm thick neat finished cement plaster 1:4 (1 cement:4 coarse sand) added with pidiproof LW @ 200 ML / kg cement as per manufacturers specification and direction of Client/PMC. At construction joints v-grooves to mode and filled with acrylic mortar with pidicrete MPB @ 10% by wt. of cement.

b) Providing and laying water proofing treatment by chemical injection grout process on base slabof UG Sump using 12mm dia MS nozzles of minimum 25mm deep in walls placed and fixed @1.50m distance in both directions in the walls and @ 0.75m c/c along construction joints, consisting of injecting cement slurries of different viscosities under pressure by pump using pidicrete AM @ 225 gm / kg of cement and sealing off nozzles after the injection operation with suitable admixture including providing and applying two coats of pidicrete MPB cementious coatings in the ratio of 3:1 (3 parts of cement : 1part pidicrete MPB) keeping W/C ratio as per manufacturers specifications & providing 25 mm thick neat finished cement plaster 1:4 (1cement:4 coarse sand) added with pidiproof LW @ 200 ML / kg cement as per manufacturers specification and direction of Client/PMC. At construction joints v-grooves to mode and filled with acrylic mortar with pidicrete MPB @ 10% by wt. of cement and top of cement plaster provide embeded P-gravels.

Water Proofing for Toilets, Pantries, Balconies.

a) Providing and applying water proofing treatment to toilets, pantries, balconies and other wet areas base and walls with three coats of Tapecrete each mixed with grey cement in proportion 1 : 2 (1 tapecrete : 2 grey cement) over a primer coat as per manufacture specification. All joints, corners, junction of pipes &masonary to be sealed with epoxy putty. The water proofing is to be laid on a smooth plaster surface. The treatment is to be done on the base, underneath and behind all pipesand taken up on vertical walls upto a height of minimum 150 mm above the finished floor level or directed by Client/PMC. 12 to 15 mm cement plaster to be done after the treatment etc. all complete as per manufacture specification &recommendation. (Rate to include all plaster work required for the complete treatment)

10.5 WATERPROOFING TERRACE WITH INVERTED ROOFING

A. **WATERPROOFING:** For waterproofing of roofs brick bat coba and integral water proofing.

AND ON VERTICALS: 2 layers of fiber glass tissue and finally protected with 2 layers of Hessian based felt type 3 grade 1 – each layer laid in hot asphalt over a coat of bituminous primer with 75mm and 100mm side and end laps respectively.

The 'Insulation & waterproofing' specification should be laid directly on the RCC slab after it has been plastered smooth. A cement concrete fillet is made at the junction of the roof slab and parapet/walls. A chase of 50mm depth and 50mm width is cut in parapets at a height of 200mm above the proposed finished roof level for the specification to be tucked in.

Immediately after the insulation & waterproofing specification has been laid on the base it shouldbe covered with cement concrete laid to slope.

Horizontal:

1. A layer of bituminous primer.
2. A layer of hot refined mineral asphalt.
3. A layer of polymeric polyethylene felt with 75mm and 100mm side and end laps.
4. A layer of hot refined mineral asphalt.
5. A layer of polymeric polyethylene felt with 75mm and 100mm side and end laps.
6. A layer of hot refined mineral asphalt.
7. A layer of Extruded Polystyrene of 32 Kg. Cum density of 75mm thickness.
8. Bituminized Kraft paper with 6" overlaps sealed with bitumen and spot stuck.
9. A layer of hot refined mineral asphalt.
10. A layer of polymeric polyethylene felt with 75mm and 100mm side and end laps.
11. A protective layer of Hessian based felt type 3 grade 1 laid with hot asphalt with 75mm and100mm side and end laps and further sealed with hot bitumen.

Vertical:

Laying 2 layers of fiber glass tissue and protected with 2 layers of Hessian based felt type 3 grade1 – each layer laid in hot asphalt over a coat of bituminous primer with 75mm and 100mm side and end laps respectively.

PROTECTIVE CONCRETE

75 MM THICK AVERAGE CEMENT CONCRETE 1: 2: 4 (1 cement: 2 coarse sand: 4 stone aggregates of 12 mm down size.) with providing and fixing weld mesh fabric of

size 150 x 150 x
2.25 mm including cutting straightening and welding each other wherever required on horizontal surface. The water proofing course on the vertical shall be inclusive of cost of protection with a 115 mm thick cladding wall of brick masonry.

Providing and laying brick tile over roof with 1 : 3 C.M. mixed with 2% of integral water proof compound of approved make by weight of cement over a layer of 12mm thick cement mortar (1 : 3).

1. EXPANSION JOINT

Providing and fixing of expansion joint system related with floor location as per drawings and direction of Engineer-In-Charge. The joints system will be of extruded aluminum base members, self-aligning / self-centering arrangement and support plates etc. as per ASTM B221-02. The system shall be such that it provides floor to floor /floor to wall expansion control system for various verticallocations in load application areas that accommodates multi directional seismic movement withoutstress to it's components. System shall consist of metal profiles with a universal aluminum base member designed to accommodate various project conditions and finish floor treatments. The cover plate shall be designed of width and thickness required to satisfy projects movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self- centering arrangement that freely rotates / moves in all directions. The Self - centering arrangementshall exhibit circular sphere ends that lock and slide inside the corresponding aluminum extrusion cavity to allow freedom of movement and flexure in all directions including vertical displacement. Provision of Moisture Barrier Membrane in the Joint System to have watertight joint is mandatory requirement all as per the manufactures design and as approved by Engineer -in- Charge. (Materialshall conform to ASTM 6063).

2. FLOOR/ROOF JOINT OF 50MM GAP

2.1 APPLICATION PROCEDURE

Expansion joint shall be provided as shown in the drawing and as per direction of Engineer-in- Charge. All joints should be cleaned and free from loose aggregates, the edges should be in properline. The joint should be of the appropriate width as per the drawings.

Provide continuous frame on each side of the joint, designed to support gasket and center plate where required. After installing the frames at both sides, place the centre plate in between the twoframes and finally flush the gasket on the top of the frames.

Fixing of the joint after proper assembly of the components should be through the proper stainlesssteel counter skunked screws, which should be drilled to the base concrete slab beams with a bonding agent.

1.0 P.O.P. Punning

1.1 **General:** Plaster of Paris punning (Plaster) is generally applied on already cement plasteredsurface to give it a smooth and even surface.

1.2 **Preparation of surface**: Projecting burrs of mortar formed during existing cement plaster shall be removed. The surface shall be scrubbed clean with wire brushes. In addition the plastered surface shall be pock marked with painted tool, at spacing of not more than 4 cm centers and depth of pocks to be approx. 3 mm deep. This is to ensure a proper key for theplaster. The surface shall be cleaned of all oil and grease marks etc.

1.3 **Plaster of Paris**: The Plaster of Paris shall be of semi-hydrate variety calcium sulphate. It shall not be too quick setting. Initial setting time shall not be less than 17 minutes.

1.4 **Application:** The material will be mixed with water to a workable consistency. Plaster of Paris shall be applied directly on the wall plasters in suitable sizes panels and finished to smooth surfaces by steel trowels. The plaster shall be applied in such a manner that it fully fills the gaps the thickness over the plastered surface is as specified int. the description of the item. The finished surfaces shall be smooth and true to plane, slopes or curves as required.

1.5 Painting

i. **Extent and intent**: The contractor shall supply all materials, labour, tools, ladders, scaffolding and other equipment necessary for the completion and protection of all painting work. Painting, as herein specified shall be applied to all surfaces requiring painting throughout the interior and exterior of the building as given in the schedule of finishes or elsewhere. Care is to be taken that all surfaces to be painted are thoroughly cleaned and dry.

ii. Materials: Materials used in the work shall be of manufacture approved by the Architect/Employer. Ready mixed paints, varnishes, enamels, lacquers, stains, paste fillers, distempers and other materials must be delivered to the job site in the original containers, with the seals unbroken and labels intact. Each container shall give the manufacturer's name, type of paint, colour of paint and instructions for reducing the thinning shall be done only in accordance with directions. Remove rejected materials immediately from the premises.

iii. Colour: All colours, as provided in the colour schedule shall be approved by the Architect/Employer. The contractor shall mix manufacturer's colours as per Architect's/Employer's requirements and shall prepare painted samples of the colours selected and submit same for approval by the Architect. No work is to proceed until the Architect has given his approval, preferably in writing of the colour samples.

iv. Commencement of work: Painting shall not be started until the surfaces to be painted arein a condition fit to receive painting and so certified by the Architect. Painting work shall be taken in hand only after all other contractor‟s work is completed.

Building where painting work is to be commenced shall be thoroughly swept and cleaned up before commencement of painting.

a) White wash shall be provided to over plastered surfaces, if any, as directed by Project Manager and Architect.

b) Dry distemper of approved shade shall be provided to all internal surfaces of all rooms including toilets and kitchen etc. all as directed by Project Manager and Architect.

c) Before application of white wash / distemper the surfaces shall be prepared to cleanand even surface.

d) White wash shall be prepared from lime slacked on site, mixed and stirred with sufficient water to make a thin cream. This shall be allowed to stand for 24 hours and shall be screened through clean cloth. Four kg. of gum dissolved in hot water shall be added to each cubic meter of the cream (115 gm/cft). Blue shall be added to giverequired whiteness. The approximate quantity of water to be added in making creamshall be five liters per kg. of lime. 10% Zinc Oxide shall also be added to obtain a desired shining in the white wash.

e) Dry distemper shall be carried out in two or more coats over one coat of approved primer as per manufacturer's instructions to give even shades.

f) White wash and dry distemper shall be applied in specified coats by using flat brushes or spray pumps. Each coat shall be allowed to dry before next coat is applied,if additional coats than what have been specified are necessary to obtain uniform and smooth finish it shall be given to no extra cost.

g) The finished dry surface shall not show any signs of cracking and peeling nor shall itcome off readily on the hand when rubbed.

h) All paints have to be low VOC paints and certificates of the same should be providedby the bidder.

2.0 MS FIRE CHECK DOOR OF 120 MINUTES FIRE RATING

2.1 SCOPE:

This specification covers the design, supply of materials, Manufacture and installation of factory made metal fire doors of approved make and ISO 9001-2000 Certified Company andthe manufacturer has to be approved manufacturer of supply and fixing of CE/UL certified metal steel fire doors at all levels with all accessories and including supply and installation ofhardware.

2.2 APPLICABLE CODES AND STANDARDS:

All standards, specifications, acts, and codes of practice referred to herein shall be the latesteditions including all applicable official amendments and revisions.
List of certain important Indian Standards, Acts and Codes applicable to this work is given below. However, the applicable standards and codes shall be as per but not limited to the listgiven below:
IS: 277 Galvanised steel sheet (plain and corrugated) of GPL Grade with Z 120 Coating.
IS: 3614 Metallic and non-metallic fire check doors-Resistance test and Part – 2

performance criteria.

2.3 MATERIAL:-

a) Door frame shall be Single rebate Grooved profile of size 125 x 60 mm made out of 1.60mm(16gauge) minimum thick galvanized steel sheet confirming to IS 2260 & 4351 with groovedseal. Frames shall be mitered and field assembled with self-tabs. All provision should be mortised, drilled and tapped for receiving appropriate hardware. Rubber door silencers should be provided on the striking jamb. Frames should be provided with back plate bracket and anchor fasteners for installation on a finished plastered masonry wall opening. Once frame installed should be grouted with cement & sand slurry necessary for fire doors on the clear masonry opening.

b) Door leaf shall be 46mm thick fully flush double skin door with or without vision lite. Door leafshall be manufactured from 1.2mm (18guage) minimum thick galvanized steel sheet. The internal construction of the door should be rigid reinforcement pads for receiving appropriate hardware. The infill material shall be resin bonded honeycomb core with fire rated proprietaryinsulation filler bonded to both faces of sheet with lock seam joints at style edges. All doors shall be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers. The edges should be interlocked with a bending radius of 1.4mm. For pair of doors astragals has to be provided on the meeting stile for both active and inactive leaf. Vision lite wherever applicable should be provided as per manufacturer's recommendation with a beeding and screws from inside.

c) The door frames and door shutters shall be primed with 'H' primer and finished with PU/Powder coated .The shutter would be mounted with SS Ball Bearing Hinges of size 100mm x 75mm x 3.0mm of Becker Fire Solutions (4Nos per leaf), appropriate openings forvision panel glass. Prototype Test certificate for a test carried out earlier at CBRI Roorkee forfire rating of doors, shall be attached along with manufacturers test certificate.

d) All door shall be factory made and rate to include installation, hardware's like hinges, panic bar, door closer, Vision Panel 300x 200, Glass, lock, handles, coordinator etc. as desired with necessary reinforcement and direction of Engineer in charge.

e) The following information shall be submitted by the contractor for obtaining approval of the Engineer-in-charge before start of work.

Product Data	:	Manufacturer's data sheets on each product to be used, including preparation instructions and recommendations. Storage and handling requirements and recommendations. Details of Construction and fabrication. Installation methods.
Shop Drawings	:	Detailed plans and elevations, details of framing members,anchoring methods, clearances, hardware, and accessories clearly Shown.

Manufacturer's Certificates	:	Certifying that products meet or exceed specified requirements.
Operation and Maintenance Data	:	Submit lubrication requirements and frequency, and periodic Adjustments required.
Name of installer	:	Approved by the manufacturer, specializing in performing work of This section with minimum three years' experience.
Manufacturer's warranty	:	For all parts and components of the fire rated door set system except counterbalance spring and finish for 5 years

2.4 DELIVERY, STORAGE, AND HANDLING:-

Fire rated door set shall be delivered and stored in manufacturer's unopened packaging untilready for installation. It shall be protected from exposure to moisture and shall be stored in adry, warm, ventilated weather tight location.

2.5 INSTALLATION:-

The Contractor shall furnish all materials, labour, operations, equipment, tools & plant, scaffolding and incidentals necessary and required for the completion of all metal work in connection with steel doors, as called for in the drawings, specifications and bill of quantities which cover the major requirements only. Anything called for in the tender documents shall be considered as applicable to the items of work concerned. The supply and installation of additional fastenings, accessory features and other items not specifically mentioned, but which are necessary to make a complete functioning installation shall form a part of this contract.

The Contractor shall submit the details of manufacturers from the list of approved makes from which he intends to procure the doors. The contractor shall procure the doors only after the approval of the manufacturer from the Engineer-in-charge.

All metal work shall be free from defects, impairing strength, durability and appearance andshall be of the best quality for purposes specified made with structural proprieties to withstand safety strains, stresses to which they shall normally be subjected to. All fittings shall be of high quality and as specified and as per approval. The Contractor shall strictly follow, at all stages of work, the stipulations contained in the Indian Standard Safety Code or its Equivalent British Standard and the provisions of the safety code and the provision of the safety rules asspecified in the General Conditions of the Contract for ensuring safety of men and materials. Any approval, instructions, permission, checking, review, etc by Engineer-in- Charge, shall not relieve the Contractor of his responsibility and obligation regarding adequacy, correctness, completeness, safety, strength, quality, workmanship,

i. Door closer confirming to CE & EN 1154 and B.S. – 476, Part-22, two hours fire door.

ii. Panic Exit Device – Single / Double leaf confirming to CE & EN 1154 and B.S. – 476, Part-22, two hours fire rated.

iii. Mortice Lock with lever handle confirming to CE & EN 122090 / DIN 18251 and B.S.- 476,Part-22 , two hours fire rated.

iv. Stainless steel ball bearing hinges 4 nos. on each side of shutters size 100 mm x 100 mm x3 mm with screws etc. complete.

v. Vision panel: 6 mm thick borosilicate toughened glass 120 min fire rated glass on each leafof size 300 x 200 mm.

2.6 TESTING:-

The fire doors shall be tested by CBRI/ International Test House or any Test Lab approved by the competent authority in accordance with BS 476 part 22. Galvanized steel to be used conforming to IS 277. Testing charges shall be paid by the department.

2.7 MOCK- UP:-

Before proceeding for mass production of all units, the contractor should fix typical mock-upunits of each type to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. The contractor should proceed for mass production only after approval of Mock-ups by Engineer-in-Charge or his authorized representative.

3.0 TOILET CUBICLES

3.1 SCOPE: -

Providing and fixing Toilet cubical as under with door, pilaster and divider of 18mm thick board both side decorative compact laminate of required colour, shade and sizes including stainless steel accessories (SS-304 grade) like square top rail, box, knob, thumb turn and indicator, twin coat hook, door stopper, gravity hinges, and locking arrangement, SS channel etc. as desired. all complete as per drg. and direction of Engineer in charge. (Cubical size
=(1050x1500) mm, Cubical Height =2100mm, External Laminate finish = Metallic)

3.2 APPLICABLE CODES: -

IS: 2046 for Compact Laminate.

3.3 MATERIAL: -

The Modular Toilet cubical shall be of size and shape as shown on drawings for a unit of 3/4/5 WCs, erected at locations enclosed by corner masonry walls. Division, frontal and nib panelsshall be of 18 mm thick solid grade compact high pressure laminate as per IS:2046 and BS-476 class 1 fire retardant in Suede finish, manufactured under high specific pressure > 5 MPaand temperature >120oC with bunch of kraft papers impregnated with thermosetting phenolic resin and decorative papers made of Alpha cellulose fiber impregnated with thermosetting melamine resin which provide superior scratch, abrasion, heat, chemical, impact, graffiti & moisture resistance along with anti-bacterial properties. Panels have a black core that whenmachined, presents a distinctive black edge. Panel is anchored to the wall with SS 304 gradeU & F Channel. The top fitting should consist of SS square top rail which will get fixed with pilasters. All screws will be of SS 304 Grade in stainless steel. All pilasters are supported withAdjustable Palm Design Pedestal Footing made from Stainless steel

grade 316 giving a clearance height of 150 mm from the floor. The base will be anchored to the floor. Compactlaminate should be Green guard and IGBC certified.

The following stainless steel (SS 304) accessories to be used : Door Knob; coat hook with rubber stopper; self closing (gravity) hinges; privacy Thumb turn with occupancy indicator, top rail and Adjustable Palm Design Pedestal Footing SS 316 Grade.

Design no. as specified by Arch. / Engineer-in-charge in suede finish. Size of panels to be asper drawing.

The mock-up shall be approved by the Engineer-in-Charge before starting the installation oftoilet cubicles. Vendor shall submit the certificate of warranty for a term of 5 years on moisture related damages (partitions), 1 years for toilet cubicles workmanship and accessories.All thematerial supplied and installed shall be as per the description and specifications in the item. The following information shall be submitted by the contractor for obtaining approval of the Engineer-in-charge before start of work.

Product Data	:	Manufacturer's data sheets on each product to be used, including preparation instructions and recommendations. Storage and handling requirements and recommendations. Details of construction and fabrication. Installation methods.
Shop Drawings	:	Detailed plans and elevations, details of framing members, anchoring methods, clearances, hardware, and accessories clearly shown.
Name of fabricator / installer	:	Approved by the manufacturer, specializing in performing work of this section with minimum two years experience.
Manufacturer's Warranty	:	Components of the toilet cubical for 5 years against breakage, corrosion, and defects in factory workmanship.

3.4 DELIVERY, STORAGE, AND HANDLING:-

Toilet cubical material and hardware shall be delivered and stored in manufacturer's unopened packaging until ready for fabrication and installation. It shall be protected from damage.

3.5 FABRICATION:-

The substrates shall be prepared including but not limited to blocking and supports in walls and ceilings at points of attachment using methods recommended by the manufacturer for achieving the best result. Area shall be inspected to receive toilet cubicles for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation ofmounting brackets. Spacing of plumbing fixtures shall also be verified to assure compatibilitywith installation of compartment. Installations shall not be preceded until substrates have been properly prepared with blocking and supports in walls and ceilings at points of attachment and deviations from

manufacturer's recommended tolerances are corrected. All the fabrication work shall be carried out as per approved shop drawings.

3.6 INSTALLATION:-

All installation shall be carried out by the fabricator/installer approved by the PMC. Installation shall be in accordance with manufacturer's written instructions approved by the Engineer-in-charge.

Blocking and supports in walls and ceilings shall be verified that they have been installed properly at points of attachment. Location should not interfere with door swings or use of fixtures. Installation of cubical units should be rigid, straight, true to plumb, and level. Evidences of drilling, cutting, and fitting to room finish shall be concealed by capping / shoebox plate etc. U-channels and noise deafening tapes shall be provided as per drawing. All the units shall be tested for proper operation. The following fittings shall be provided in eachtoilet cubical.

1. Gravity hinge – 3 Nos.
2. Coat hook cum Door stopper – 1 No.
3. Door knob cum vacant / engaged position showing device – 1 No.
4. Lock set – 1 No.

3.7 INSTALLATION:-

Adjustment of hardware for proper operation after installation may be permitted provided it does not **damage** the unit either structurally or aesthetically. Hinge cam may be set on in- swinging doors to hold doors open when unlatched and on out-swinging doors to hold unlatched doors in closed position.

Touch-up, repair or replacement of damaged products shall be done with prior approval of the **Engineer**-in-charge, whose decision shall be final and binding.

Exposed surfaces of compartments, hardware, and fittings shall be cleaned thoroughly.

3.8 TESTING:-

Required numbers of tests shall be performed on Decorative Thermosetting Synthetic ResinBonded Compact Laminated Sheets as per provision of IS: 2046. Hardware and fittings shallbe of grade 304 stainless steel shall also be tested based on relevant IS codes as decided by the Engineer-in-Charge. Testing charges shall be paid by the department.

4.0 TEXTURE PAINT

4.1 (Work to be carried out as per Manufacturer Specification)

Providing and applying External Texture finish of approved makes as per approved design and pattern. Texture finish shall be applied over the plastered surface with required thicknessshall 2 to 2.5 mm thickness to form the necessary approved

design by using trowel / putty blade and it should be allowed for drying minimum 12 hrs before the application of top painting
, 2 coats or more of external weather proof water based emulsion shall be applied over this and a coat of primer may be applied based on the approved texture pattern. Including surfacepreparation like through cleaning, prewetting & removal of loose mortars, etc. The quoted rate shall include the cost for all the above items including labours, tools & tackles, required scaffholding, platforms, etc. for all heights, all taxes, etc.

The contractor shall supply all materials, labour, tools. ladders. scaffolding and otherequipment necessary for the completion and protection of all texture work as herein specifiedshall be applied to all surfaces requiring texturing throughout the exterior of the building as given in the schedule of finishes or elsewhere. The texturing shall be carried out by a specialist sub-contractor, approved by the PMC. Care is to be taken that all surfaces to be textured are thoroughly cleaned and dry.

4.2 STORAGE

Storage of materials to be used on the job shall be only in a single place approved by the Engineer-in-Charge. Such storage place, shall not be located within any of the buildings included in the contract.

The paint shall be continuously stirred in the container so that its consistency is kept uniformthroughout

The painted surfaces shall present uniform appearance and semi-gloss finish free from steaks, blisters etc.

4.3 APPLICATION

For new work, the surface shall be thoroughly cleaned off all mortar dropping, dirt dust, algae, fungus or moth, grease and other foreign matter of brushing and washing, pitting inplaster shall make good, surface imperfections such as cracks, holes etc. should be repairedusing white cement. The prepared surface shall have received the approval of the Engineer -in- charge after inspection before painting is commenced.

Before pouring into smaller containers for use, the texture shall be stirred thoroughly in its container, when applying also the texture shall be continuously stirred in the smaller containers so that its consistency is kept uniform. Dilution ratio of texture with potable watercan be altered taking into consideration the nature of surface climate and as per recommended dilution given by manufacturer. In all cases, the manufacturer's instructions and directions of the Engineer-in-charge shall be followed meticulously. The lids of texture drums shall be kept tightly closed when not in use as by exposure to atmosphere the texturemay thicken and also be kept safe from dust.

5.0 ALUMINIUM EXTRUDED SECTIONS

5.1 SCOPE (Work to be carried out as per latest CPWD specifications of works):-

The scope of the work is the fabrication, supply and erection at site of all types of glazed doors, windows and ventilators in accordance with the drawings and specifications.

It is the responsibility of the tenderer to inspect the site and obtain for himself all relevant information and details in respect of the work including access facilities for stacking and storage field work in making connections with self-tapping screw assembling etc and take into account all such things in working out his rates for the finished work.

The supply and erection will include all parts such as but not restricted to frames, tracks, guides, mullions, styles, rails, couplers, transoms, rails, plates glazing bars, glass, hinges, arrangement, spring catches, cord and pulley arrangements, spring catches, cord and pulleyarrangements door closers floor springs etc., required for the whole work whether the parts/ items are individually and specifically referred to in the schedules/ specifications/drawings or not provided that the supply and installation of such parts can be inferred there from and arenecessary to make the work complete, unless separate provision is made in the bills of quantities for supply to such parts/items.

The doors, windows, ventilators, will be fabricated to suit the finished clear openings in the building/structure which the tenderer will himself measure.

5.2 MATERIALS:-

The members will be made out of aluminium alloy corresponding to IS:733 and will consist ofextruded sections and of other shapes, and to sized gauges as shown in the drawings/ described in accordance with the relevant IS codes. The members shall be chosen to providestrength/ stability and maximum resistance to wear and tear.

The Sections will be as per approved makes, extruded sections. As indicated in the drawingsthe tenderer should specifically mention which sections he is using.

The weight of sections and the corresponding catalogue numbers are mentioned. The IS specifications are to be strictly adhered.

The alloy of extruded aluminium should be BS or IS old HE9, Alcon 50 SWP. to this effect test certificate has to be provided for the extruder.

5.3 FINISHING:-

The extruded aluminium section has to be mechanically finished to remove all scratches; extrusion marks etc and subsequently thoroughly cleared in all alkali baths prior to anodizing.

The polyester powder coating should be of desired shade with minimum average thickness to 50 microns or other shades as required and to this effect the tenderer must have to produce test certificate from authorized institutions Bureau of Indian Standard.

The polyester powder coated material should be properly wrapped in gummed tape before fabrication to avoid scratches during fabricated and erection shall be kept protected till handing over.

5.4 FABRICATION:-

Before commencing the fabrication the contractor shall submit to client for their approval detailed shop drawings, based on the Architects drawings and corresponding specification showing junctions, fittings, accessories such as hinges flush bolts, locks, latches, latching arrangements, peg stays, rotor arms, anodize pivots gaskets rubber packing door felts, mastic, sealant etc., including fixing and sealing arrangements . Type and method of scaffolding he intends to use, Fabrication is to be taken up only after approval by client and in accordance with the approved drawings .Sections for fabrication of door/ window/ventilators etc shall be as per architectural drawings or as approved by the client. A sample of finished door/windows/ ventilator / fire check door / railing etc. shall be fabricated as per the shop drawings approved by client for final approval before under taking mass production/ fabrication.

The doors, window, ventilators and partitions shall as per thickness given in the BOQ item /specifications, Polyester Powder coating shall be as specified in the item specifications.

All materials shall conform to relevant IS. Codes and in the absence of IS code, they should correspond to the best engineering practice; decision of the Client/Consultant shall be final and binding on the contractor.

Fabrication shall be done true to the drawing/ sample approved and in correspondence to thefinished openings at the site. All joints shall be mitred at the corners, true right angles, and joints to be finished neatly to hairlines, with concealed fasteners, wherever possible joints shall be made in concealed locations.

All fabricated/finished items shall be packed and carted properly to site to prevent any damage in transit. On receipt at site they shall be carefully stacked in protected storage to avoid distortion/damage.

Site installation shall be with concealed screws, self-tapping or other approved fasteners or may be by welding, due precautions shall be taken to avoid any distortion/discoloration/damage to the finished items.

Wood work faces/parts coming in contact with masonry shall before shifting to the site be given a heavy coat of alkali resistance bitumen paint. Steel items coming in contact with other incompatible materials shall be given a thick coat of zinc chromate primer.

6.0 ROOF INSULATION

Providing and laying roof insulation with 80 mm thick impervious sprayed, closed cell free Rigid Polyurethane foam over deck insulation conforming to IS - 12432 Pt. III (density of foambeing 40-45 kg/ cum), over a coat of polyurethane primer applied

@ 6-8 sqm per litre, laying400 G polythene sheet over PUF spray and providing a wearing course of 40 mm thick cement screed 1:2:4 (1 cement : 2 coarse sand : 4 stone aggregate 20 mm nominal size) in chequered rough finish, in panels of 2.5 m x 2.5 m and embedding with 24 G wire netting and sealing the joints with polymerized mastic, all complete as per direction of Engineer-in-Charge.

6.1 Reference Code : IS:

12432General

Rigid urethane foam is a generic; name given to polyurethane (PUR) or polyisocyanurate (PIR) rigid foam. These are high efficiency thermal insulation material suitable for use on surfaces operating within the temperature range of -180 to 110°C for PUR and -180 to 140°Cfor PIR. When applied by spray application processes, the service temperature range is restricted to -30 to +120°C for both the materials.

a) In all cases of overdeck insulation where there is a parapet wall or an upstand aroundthe roof, effectiveness of junction between roof and vertical portion would be ensuredby continuing the treatment to a vertical extension of 0.5 m,Min around the roof perimeter. Such extra area are to be measured.
b) For treatments on vertical areas of overdeck insulation. a multiplication factor of 1.2 shall be applied to the actual area to account for rebound losses! over thickness.
c) To account for ex-cess rebound losses in underdeck PURIPIR Spray insitu application.measured area shall be subject to a multiplication factor of 1.4.
d) Spray treatment is applied as a continuous treatment and hence no deductions shall be made in measurements for cutouts having area of one square metre or less.

6.2 Application :

i. Manufacturer's application instructions should be followed at all times. Only qualified applicators with prior experience of spraying the specified foam system should be deployed. Prior to application of the spray foam, the contractor shall apply a test area on the surface to be insulated. This area shall be checked for:

a) Local surface roughness
b) General foam surface appearance; c) Specified foam thickness
d) Foam quality, such as striations, voids, uniform cells
e) Foam adhesion

ii. The panel with the accepted/approved foam shall be treated as the standard for the subsequent implementation of the foaming work.

iii. The foam shall be applied to roof substrate at a surface temperatures in the range of l5°C·to 50°C in 12 mm thick (minimum) passes to reach the desired over all thickness with -3 to +10 nun tolerance. The substrate temperatures stated above may vary depending upon the foam system selected. In areas where obstacles do not permit normal spray techniques and the application tolerances specified above can not be met, the contractor may apply the specifiedminimum thickness of foam required by a

suitable method that he shall select. However, the completed application of foam shall be rendered monolithic with adjacent areas where normal spray application is applied. All foam over roofs of buildings or tanks shall be applied in such a manner as to provide easy drainage of water and prevent ponding.

iv. Extreme caution shall be taken to prevent spraying in the presence of water/moisture (rain, fog, condensation) as well as when wind velocities are greater than 25 km/h. Shielded scaffolds may be used to allow spraying in high wind velocities with client's approval.

v. The equipment shall be operated with the temperature settings within the range specified by the foam manufacturer.

vi. Compressed air sources shall have moisture traps. Before spray application begins, all hosesand guns shall be solvent-flushed and inspected to ensure that no moisture is present.

vii. All flames, sparks, welding and smoking shall be prohibited in the application area.

viii. All affected items, in the surrounding area, shall be protected from over spray. Spray guns must be held near perpendicular to the surface being insulated and pressures adjusted so that overspray is minimized.

ix. The applicator shall keep with him on the scaffolding or on the roof, or in both locations, sufficient buckets, plastic film, etc, to enable him to discharge any test foam without causing unwanted deposition on the application area.

x. Care is required when spraying on roof surfaces through which chimneys/ducts/pipes penetrate when their temperature exceeds the maximum service temperature limit of foam. An appropriate hot face insulating material 25 to 50 mm in thickness shall be installed prior to foam application in the area. approximately 600 mm x 600 mm on the surface surrounding all such hot chimney inlet or outlet lines, or any area where hot spots are likely.

6.3 Coating :

When foam is exposed to the weather/ultra-violet rays, or used in areas where water will accumulate, or in a corrosive atmosphere, a protective coating is necessary. Since coating performance is highly dependent on the applied film thickness, appropriate minimum film coatings should be ensured.

Coatings shall be polyurethane based for best compatibility with the sprayed foam and shallbe applied within 24 h of completion of spraying application. Brush applied high solid build coatings of 0.5 rum to 1 mm, DFT (Typical) preferably single

component moisture cure type are best suited to provide protection to the sprayed foam. Most of these coatings can be spray applied using airless guns as well.

Coatings which are suitable include chlorosulphonated polyethylene based solvent bearing products and high solid acrylic latex coatings. When non-urethane based coatings are used,there may be need for a primer. In each case, it must be ensured that:

a) Coating is elastorneric

b) Dry film thickness of coating is not less than 0.75 mm.

7.0 EXTRUDED POLYSTERENE RIGID INSUALTION

Providing and fixing 75 mm thick extruded polystyrene rigid insulation board of required sizebetween cavity wall, complying with ISO 4898:2008 & ASTM C 578-08b - type VI, having thermal conductivity of 0.0289 W/m K as per ASTM C 578 (measured as per IS 3346), compressive strength of > 350 kPa listed as per ASTM D 1621, density of 34-36 kg/cum as per ASTM D 1622, water absorption < 1% by volume as per ASTM D 2842, oxygen index of
24.1 to 28.1 listed as per ASTM D 2863, cell size 0.4 mm of dia (max) as per ASTM D 3576.Fire retardant property as per DIN 4102, Part 1 of class B2 and as per ASTM E84 class A, fixed with suitable water based adhesive and fastener, complete in all respect as per the directions of Engineer-in-Charge.-Charge.

7.1 MATERIAL

Extruded Polystyrene boards to be manufactured from General Purpose polystyrene granules though an automated extrusion process free of CFC blowing agents : preferably with a blend of co2 & ethanol : low Global warming index : the boards are 100 % closed cell structure with a unique properties of high compressive strength & a stable thermal conductivity properties over the life cycle of building etc. The insulation boards complying with ISO 4898:2008 & ASTM C 578-08b/15b - type VI, having thermal conductivity of 0.0289 W/m K as per ASTM C 578 (measured as per IS 3346), compressive strength of > 350 kPa listedas per ASTM D 1621, density of 34-36 kg/m³ as per ASTM D 1622, water absorption < 1% by volume as per ASTM D 2842, oxygen index of 24.1 to 28.1 listed as per ASTM D 2863, cell size 0.4 mm of dia (max) as per ASTM D 3576. Fire retardant property as per DIN 4102, Part 1 of class B2 and as per ASTM E84 class A.

7.2 APPROVED SYSTEM

The boards of size 600mm width x 1250 mm length & 75 mm thickness with square edge tobe laid in brick patterns with the help of suitable bituminous vapour barrier & mechanical fasteners of appropriate length with fixtures like rock wool sleeves, Fire stop, foam filler at theperimeter joints & wherever any opening etc are provided as per the instructions of Engineerin charge complete with all respects.

7.3 FINISH

Board to be finished with Fiber glass mesh as per manufacturer specifications.

7.4 THERMAL PERFORMANCE

The extruded polystyrene insulation system improves the thermal efficiency of the building byreducing the U value as per the prescribed norms in the ECBC codes

depending on the typeof building in terms of hours of operations & geographical location. The thermal performanceis very stable through out the life cycle of the building. It improves the thermal comfort & alsohelps in optimizing the loads thereby reducing the capex & operating cost of HVAC systems.

FIRE PERFORMANCE

XPS boards must be fully tested in accordance with DIN 4102 Part 1 of class B2 and as per ASTM E84 class A, with regard to fire properties, Flame spread , & surface burning characteristics . Also suitable Fire stops, sleeves, PU spray wherever there are electrical cut outs & opening. The boards must be of self-extinguishing characteristic etc.

7.5 QUALITY ASSURANCE

The suspended ceiling system is to be manufactured within a recognized quality management system as per ISO 4898 & ASTM C 576 requirements. Each batch should also have the raw material GPPS test certificates.

FAÇADE WORK

1.0 GLASS & GLAZING

GENERAL

1.1 SCOPE

Work as shown shall be specified for all glass and glazing components within the Specification Section. All material and workmanship shall be in accordance with the requirements of the contract documents.

1.2 WORK INCLUDED

The work of this Section includes all labour, material, equipment and services necessary to complete related trades with glazing components as shown on the drawings and specified herein, including but not limited to Semi Unitized structural glazing, entrance glazing etc as per BOQ.

1.3 DESCRIPTION

Glass and glazing shall be comprised glass panels as per Indicative BOQ is fabricated to specific size as determined by the facade manufacturer to fit within framing elements allowing for proper movement, performance and loading. Façade fabricator shall be responsible for the application of said glazing and shall accommodate limitations in regard to fabricated sizes, installation and protection of work in accordance with the design intent illustrated in the design drawings.

1.4 DESIGN DRAWINGS

The Consultants/Architect's Drawings indicate the design concept and relation to adjacent construction together with specified "Performance Criteria" tolerances, materials, finishes and standards.

1.5 STANDARDS

i. AAMA Glazing Specification Manual"

ii. FGMA "Glazing Sealing Systems Manual" and "Glazing Manual"

1.6 QUALITY ASSURANCE

i. The glazing elements shall be installed by a firm well experienced in the fabrication and installation of glazing within the glazed scope of work.

ii. The work of this section, specifically the application of glazing accessories and glass, determination of size of lites, and installation practices shall be the responsibility of the vendor utilizing the glass specified.

iii. Performance

a) Tempered glass shall be subject to a maximum spontaneous lite breakage of 8 litesper 1000. Manufacturer shall warrant against breakage exceeding 8 lites per 1000.

b) Systems incorporating glazed elements shall limit deflection of glass as per themanufacturer's recommendations.

c) Glass shall be designed to withstand glazed element performance criteria times 1.5.

1.7 WARRANTY

i. Submit manufacturer's warranty certifying that, except where specifically noted, the glass has been furnished and installed in accordance with the Contract Documents.

ii. Certify that the glazing including, insulated glass shall be free of defects in material and workmanship for a period of ten (10) years from the date the glass is accepted by the Projectmanager/ Consultant.

iii. The glass shall be warranted against defective materials, delaminating, seal failure, condensation and defects in manufacture pursuant to Paragraph 1.07 B.

1.8 SUBMITTALS

i. Product data: For each glass product and glazing material indicated.

ii. Samples: For the following products in the form of 300mm x 300mm long samples for sealants. Install sealant samples between strips of material representative in color of the adjoining framing system.

iii. Glazing Schedule : Use same designations indicated on drawings for glazed openings in preparation a schedule listing glass types and thickness for each size opening and location

iv. Product Certificates: signed by manufacturers of glass products certifying that products finished comply with requirements for the Insulated glass.

v. Qualification data; for firms and persons specified in "Quality Assurance "Article to demonstrate their capabilities and experience. Include lists of completed projects with projectnames and addresses .names and addresses of architects and owners, and other information specified.

vi. Pre-construction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating sealants were tested for adhesion to glass and glazing channel substrates and forcompatibility with glass.

vii. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products.

1.9 MATERIALS

i. Insulated Glass Units (6mm + 16mm gap + 6mm = 28mm thick)

ii. Zinc Titanium Alloy cladding

iii. Insulated Aluminum Sandwich panels

iv. Aluminum composite panels

v. 38-42mm thick polished Granite stone

vi. 38-42mm thick slot blasted sandstone

vii. 38-42mm thick chisel dressed sandstone

viii. 12 + 1.52 PVB inter layer + 12 = 25.52mm thick laminated frameless glass.

1.10 FABRICATION

A. Fabricate glass units in accordance with industry standards.

B. Provide certification to glass make up and tempering in lieu of etching glass make up on lites.

C. Fabrication tolerances shall be as per FGMA.

1.11 ELASTOMERIC GLAZING SEALANTS

General: Provide products of type indicated, complying with the following requirements:

i. Compatibility : Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products ,seals of laminated glass units and glazing channel substrate, under conditions of service and applications ,as demonstrated by sealantmanufacturer based on testing and field experience. Primer application to be determined by the sealant manufacturer.

ii. Suitability, comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

iii. Colors of exposed glazing sealants: As selected by architect from manufacturer's full range for this characteristic. Electrometric Glazing sealant standard: Comply with ASTM C 920 and other requirements indicated for each liquid – applied, chemically curing sealant in the glazing schedule.

iv. Additional Movement Capability: Where additional movement capability is specified in the glazing sealant schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements in ASTM C 920 for uses indicated.

1.12 GLAZING GASKETS

i. **Dense Compression Gaskets**: Molded or extruded gaskets of material indicated below, complying with standard referenced with name of Elastover indicated below, and of profile and hardness required to maintain watertight seal:
1. Silicone, ASTM C 1115

ii. **Soft Compression Gaskets**: Extruded or Moulded, Close -cell, integral-skinned gaskets of material indicated below ;complying with ASTM C 509,Type II, black; and

of profile hardnessrequired to maintain water tight seal.
1. Silicone ASTM C 1115.

1.13 MISCELLANEOUS GLAZING MATERIALS

i. General : Provide products of material .,size and shape complying with referenced glazing standards, requirements of manufacturers of glass and other glazing materials for application indicated ,and with a proven record of compatibility with surfaces contacted in installation.
ii. Cleaners, primers and sealers: Types recommended by sealant or gasket manufacturers
iii. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 ,plus or minus5
iv. EPDM gaskets continuous along extrusions with a Shore A durometer hardness of 65 plus orminus 5 A required by glass manufacturer to maintain glass lites in place for installation indicated.
v. Edge Blocks; Elastomeric material of hardness needed to limit glass lateral movement.

1.14 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

i. Fabricate glass and other glazing products in sizes required to glaze openings indicated forproject, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of the product manufacturer and referenced glazing standards, to comply with the system performance requirements.
ii. Clean – cut or flat – grind vertical edges of butt – glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and out door faces.
iii. Grind smooth and polished exposed glass edges

1.15 INSTALLATION

1.15.1 FACTORY INSPECTION

Inspect all windows prior to installation of glass to ensure glazing pockets are theappropriate size and free of obstructions. Utilize proper setting blocks.

1.15.2 INSTALLATION

i. Install all glazing components in accordance with FGMA standards by experienced installers,in a clean and workmanlike manner.

ii. Apply all sealing materials in strict compliance with the sealant manufacturer's recommendations. Before application, remove dirt, dust, moisture and other foreign matter from contact surfaces. Mask adjoining surfaces to maintain a clean and neat appearance. Tool the sealant to fill the joint and provide a smooth finish.

iii. Protect all installed material to ensure continuity of finishes, sealant joints and glazing.

1.15.3 CLEANING & PROTECTION

i. Install the glazing elements so as to avoid soiling or smudging of the face of glass.
ii. Provide protective tape of low tack for alum/glass etc to be peeled off after completion.
iii. Clean glass at the time of the installation. Final cleaning shall be conducted prior to finalacceptance by Architect/ consultant.

2.0 GLAZED ALUMINIUM CURTAIN WALL

2.1 RELATED DOCUMENTS

i. Drawings and general provisions of the Contract, including General and Supplementary Conditionsand Division 1 Specification Sections, apply to this Section.

2.2 SUMMARY

i. This Section includes the following:

   a. Glazed aluminum curtain wall with semi unitized or unitized glazed units with Insulated glassor Monolithic glass as mentioned in the Bill of Quantities.

ii. Related Sections: The following Sections contain requirements that relate to this Section:

   a. Section 07900 – Sealants
   b. Section 08800 - Glazing

2.3 SYSTEM DESCRIPTION

A. General: Provide Glazed Aluminium curtain wall system that has the following capabilities based ontesting, manufacturer's standard units in assemblies similar to those indicated for this Project:

   i. Withstands loads and thermal and structural movement requirements indicated withoutfailure. Failure includes the following:

   a. Air infiltration and water penetration exceeding specified limits.
   b. Framing members transferring stresses, including those caused by thermal andstructural movement, to glazing units.

B. Wind Loads: Provide Glazed Aluminium curtain wall system, including anchorage, capable of withstanding wind-load design pressures calculated according to requirements of authorities having jurisdiction or the American Society of Civil Engineers' ASCE 7, "Minimum Design Loads for Buildings and Other Structures," 6.4.2, "Analytical Procedure," whichever are more stringent.

   i. Sides way (Story Drift): Accommodate building story drift when wind loads effect maximum overturning moment. Calculate story drift according to requirements of authorities having jurisdiction.

   ii. Deflection of framing members in a direction normal to wall plane is limited to L/240 for DGU and L/175 for Single glazing of clear span or 19mm, whichever is smaller, unless otherwise indicated.

   iii. Deflection of framing members overhanging an anchor point is limited to 2 times thelength of the cantilevered member, divided by 175.

   iv. Test Performance: Provide Glazed Aluminium curtain wall system that does not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.

a. Test Pressure: 150 percent of inward and outward wind-load design pressures.
b. Duration: As required by design wind velocity; fastest 1 mile of wind for relevant exposure category.

C. **Seismic Loads:** Provide Glazed Aluminium curtain wall, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction or ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section9, "Earthquake Loads," whichever are more stringent.

D. **Dead Loads:** Provide Glazed Aluminium curtain wall system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load. Provide a minimum 3mm clearance between members and top of fixed panels, glazing, or other fixedpart immediately below. Provide a minimum 1.5mm clearance between members and operable windows and doors.

E. **Live Loads:** Provide Glazed Aluminium curtain wall system, including anchorage that accommodates supporting structure's deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.

F. **Air Infiltration:** Provide Glazed Aluminium curtain wall system with permanent resistance to air leakage through system of not more than 0.06 cfm/sq. ft. of fixed wall area when tested according toASTM E 283 at a static-air-pressure difference of 30.5kg/m.

G. **Water Penetration:** Provide Glazed Aluminium curtain wall system that does not evidence water leakage when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 58.5kg/m

H. **Water Penetration:** Provide Glazed Aluminium curtain wall system that does not evidence water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of inward acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 49kg/m (479 Pa). Water leakage is defined as follows:

i. According to AAMA 501.1.
i. Uncontrolled water infiltrating system or appearing on system's normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not waterleakage.

I. **Thermal Movements:** Provide Glazed Aluminium curtain wall system, including anchorage, that accommodates thermal movements of system and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, noise or vibration, and other detrimental effects.

i. Temperature Change (Range): 20°C, ambient; 45°C, material surfaces.

J. **Structural Support Movement:** Provide Glazed Aluminium curtain wall system that accommodates structural movements including, but not limited to, sway, twist, column shortening, long-term creep, and deflection.

K. **Average Thermal Conductance:** Provide Glazed Aluminium curtain wall system with an average U-value of not more than 0.66 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.1.

L. **Sound Transmission:** Provide Glazed Aluminium curtain wall system with average sound transmission loss through system of not less than 34 decibels (dB) when tested according to ASTM E 90.

M. **Dimensional Tolerances:** Provide Glazed Aluminium curtain wall system, including anchorage thataccommodates dimensional tolerances of building frame and other adjacent construction.

2.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1Specification Sections.

B. Product Data for each product specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

C. Shop Drawings showing fabrication and installation of the Glazed aluminium curtain wall either semiunitized or unitized system to create a Glazed Aluminium curtain wall system including plans, elevations, sections, details of components, and attachments to other units of Work.

   i. For installed products indicated to comply with certain design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Samples for initial selection in the form of manufacturer's color charts showing the full range of colors available for components with factory-applied color finishes.

E. Samples for verification of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

F. Cutaway Sample of each vertical-to-horizontal intersection of system, made from (300-mm) lengthsof full-size components and showing details of the following:

   i. Joinery.
   ii. Anchorage.
   ii. Expansion provisions.
   iv. Glazing.
   v. Flashing and drainage.

G. Welder certificates indicating that welders comply with requirements specified in "Quality Assurance" Article.

H. Installer certificates signed by manufacturer certifying that installers comply with requirements in "Quality Assurance" Article.

I. Preconstruction test reports from a qualified independent testing agency indicating and interpretingtest results relative to compliance with performance requirements of glazed aluminum curtain wall system.

J. Product test reports from a qualified independent testing agency evidencing compliance of glazed aluminum curtain wall system with requirements based on comprehensive testing

of manufacturer's current system.

K. Field test reports from a qualified independent inspecting and testing agency indicating and interpreting test results relative to compliance with performance requirements of glazed aluminum curtain wall system.

2.5 QUALITY ASSURANCE

A. **Testing Agency Qualifications:** To qualify for approval, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

B. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of Glazed Aluminium curtain wall system that are similar to those indicated for this Project in material, design,and extent.

C. **Installer Qualifications:** Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing Glazed Aluminium curtain wall system similar to those required for this Project and who is acceptable to manufacturer.

i. Engineering Responsibility: Engage a qualified professional engineer to prepare or supervise the preparation of data for Glazed Aluminium curtain wall system, including drawings, testing program development, test-result interpretation, and comprehensive engineering analysis that shows systems' compliance with specified requirement.

ii. Engineering Responsibility: Prepare data for Glazed Aluminium curtain wall system, including drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

D. **Source Limitations:** Obtain each type of Glazed Aluminium curtain wall system from one source and by a single manufacturer.

E. **Product Options:** Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sight lines and relationships to one another and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance.

F. **Product Options:** Drawings indicate size, profiles, and dimensional requirements of the Glazed Aluminium curtain wall system and are based on the specific system indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

i. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

G. **Preconstruction Testing:** Comply with the following requirements:

i. Preconstruction Testing Service: Owner will engage a qualified independent testing agencyto perform the preconstruction testing indicated.

ii. Preconstruction Testing Service: Engage a qualified independent testing agency to performthe preconstruction testing indicated.

iii. Test Glazed Aluminium curtain wall system for compliance with requirements specified for performance and test methods. Conduct tests using specimen representative of proposed materials and construction including perimeter components according to AAMA 501 recommendations.

H. **Welding Standards:** Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum."

i. Engage welders who have satisfactorily passed AWS qualification tests for welding processes involved and who are currently certified for these processes.

I. **Mockups:** Prior to installing Glazed Aluminium curtain wall system, construct mockups for each form of construction and finish required to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for Work.

i. Locate mockups on-site in the location and of the size indicated or, if not indicated, asdirected by Architect.

ii. Notify Consultant 7 days in advance of the dates and times when mockups will beconstructed.

iii. Demonstrate the proposed range of aesthetic effects and workmanship.

iv. Obtain Architect's approval of mockups before start of Work.

v. Retain and maintain mockups during construction in an undisturbed condition as a standardfor judging the completed Work.

a. When directed, demolish and remove mockups from Project site.
b. Approved mockups in an undisturbed condition at the time of Substantial Completionmay become part of the completed Work.

J. **Pre-installation Conference:** Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Review methods and procedures related to Glazed Aluminium curtain wall system including, but not limited to, the following:

i. Inspect and discuss condition of substrate and other preparatory work performed by othertrades.

ii. Review structural loading limitations.

iii. Review and finalize construction schedule and verify availability of materials, Installer'spersonnel, equipment, and facilities needed to make progress and avoid delays.

iv. Review required inspecting, testing, and certifying procedures.

v. Review weather and forecasted weather conditions and procedures for coping withunfavorable conditions.

vi. Manufacturers of said materials shall approve the material applications of this product inaccordance with the industry practices.

2.6 PROJECT CONDITIONS

A. **Field Measurements:** Verify dimensions by field measurements before fabrication and show recorded measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

i. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

2.7 WARRANTY

A. **General Warranty:** The special warranty specified in this Article shall not deprive the Owner of otherrights the Owner may have under other provisions of the Contract Documents and shall be in additionto, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. **Special Warranty:** Submit a written warranty executed by the manufacturer agreeing to repair or replace components of Glazed Aluminium curtain wall system that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

i. Structural failures including, but not limited to, excessive deflection.

ii. Noise or vibration caused by thermal movements.

iii. Failure of system to meet performance requirements.

iv. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

v. Failure of operating components to function normally.

vi. Water leakage.

vii. Glazing breakage.

viii. Bad Workmanship

C. Warranty Period: 10 years from date of Completion.

2.8 PRODUCTS

2.8.1 MANUFACTURERS

i. This scope shall be considered design Build. All aspects of the system shall meet nominal dimensions and site lines illustrated in the contract documents and meet the performance standards noted herein. Design is based on using standard

components.

2.8.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated complying with the requirements of standards indicated below.

i. Sheet and Plate: ASTM B 209.

ii. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.

iii. Extruded Structural Pipe and Tubes: ASTM B 429.

iv. Welding Rods and Bare Electrodes: AWS A5.10.

B. Glazing as specified in Division 8 Section "Glazing."

C. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers; in hardness recommended by manufacturer.

D. Glazing sealants and fillers as specified in Division 8 Section "Glazing."

E. Framing system gaskets and joint fillers as recommended by manufacturer for joint type.

F. Sealants and joint fillers for joints within Glazed Aluminium curtain wall system as specified in Division 7 Section "Joint Sealants."

2.8.3 COMPONENTS

A. Exterior Trim – Extruded Aluminum 6063 T6 with PVDF finish of minimum 45microns.

C. Brackets and Reinforcements: Provide manufacturer's standard high-strength aluminum brackets and reinforcements. Provide non-staining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, no staining, no bleeding fasteners and accessories compatible with adjacent materials. Finish exposed portions to match glazed aluminum curtain wall.

i. At movement joints, use slip-joint linings, spacers, and sleeves of material and typerecommended by manufacturer.

ii. Where fasteners anchor into aluminum less than 3mm thick, provide reinforcement to receivefastener threads.

iii. Use exposed fasteners with countersunk screw heads finished to match framing members,unless otherwise indicated.

E. Anchors: 3-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

i. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel insertscomplying with ASTM A 123 or ASTM A 153 requirements.

F. Concealed Flashing: Manufacturer's standard corrosion-resistant, no staining, no bleeding

flashing, compatible with adjacent materials, and of type recommended by manufacturer.

H. System shall include provisions for countersunk stainless steel fasteners attached to horizontal and or vertical aluminum mullions. Stainless steel fasteners shall have appropriate grommets for a weather tight application.

2.8.4 FABRICATION

A. General: Fabricate Glazed Aluminium curtain wall system according to Shop Drawings. Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.

C. Prepare components to receive concealed fasteners and anchor and connection devices.

D. Fabricate components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.

E. Welding: Weld components to comply with referenced standard and Shop Drawings, unless otherwise indicated. Weld before finishing components. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

F. Glazing Pockets: Provide minimum clearances for thickness and type of glass indicated according toFGMA's "Glazing Manual."

G. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

2.8.5 ALUMINUM FINISHES

A. General: Provide PVDF Coating of minimum 45 microns for all exposed Aluminium extrusions.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8.6 STEEL PRIMING

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.

B. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.

C. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surfacepreparation and pretreatment.

2.9 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances andother conditions affecting performance of Glazed Aluminium curtain wall system. Do not proceed with installation until unsatisfactory conditions have been corrected or accommodations acceptable to Architect have been made.

2.9.1 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing Glazed Aluminium curtain wall system. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure non movement joints. Seal joints watertight,unless otherwise indicated. Provide means to drain water to the exterior to produce a permanently weatherproof system.

B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturerfor this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring in glazing channels, condensation occurring within framing members, and moisture migrating within the system to the exterior.

D. Install framing members plumb and true in alignment with establishedlines and grades.

E. Anchorage: After system components are positioned, fix connections to building structure as indicated on Shop Drawings.

i. Provide separators and isolators to prevent metal corrosion and electrolytic deterioration andto prevent impeding movement of moving joints.

F. Welding: Weld components to comply with referenced standard and Shop Drawings, unless otherwise indicated. Weld in concealed locations to minimize distortion or discoloration of finish. Protect glazingsurfaces from welding.

G. Install glazing according to Shop Drawings. Comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.

H. Install sealant according to Shop Drawings. Comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.

I. Erection Tolerances: Install glazed aluminum curtain wall system to comply with the following maximum tolerances:

i. Plumb: 3mm in 3m; 6mm in 12m.

ii. Level: 3mm in 6m; 6mm in 12m.

iii. Alignment: Where surfaces abut in line, limit offset from true alignment to 1.5mm; where a revealor protruding element separates aligned surfaces by less than 50mm, limit offset to 6mm.

iv. Location: Limit variation from plane or location shown on Shop Drawings to 3mm in 3.6m; 12mmover total length.

2.9.2 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform testing indicated.

B. Testing Agency: Engage a qualified independent testing agency to perform testing indicated.

C. Air Infiltration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 783.

D. Water Penetration: Test areas of installed system indicated on Drawings for compliance with systemperformance requirements according to ASTM E 1105 at minimum differential pressure of 20 percentof inward acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 6.24 lbf/sq. ft. (299 Pa).

E. Water Spray Test: After completing the installation of 75-feet- (23-m-) by-2-story minimum area of glazed aluminum curtain wall system, test system for water penetration according to AAMA 501.2 ina 2bay area directed by Architect.

F. Repair or remove Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

2.9.3 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure glazed aluminum curtain wall system is without damage or deterioration at the time of Substantial Completion.

3.0 JOINT SEALERS

3.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

3.2 SECTION INCLUDES

A. The Work of this Section includes all labour, materials, equipment and services necessary to complete the joint sealers work as shown on the drawings and/or specified herein, including but isnot necessarily limited to the following.

i. Exterior wall joints not specified to be sealed in other Sections of work.
ii. Interior wall joints not specified to be sealed in other Sections of work.
iii. Joints at wall penetrations.
iv. All other joints required to be sealed to provide a positive barrier against penetration of airand moisture.
v. Water repellency treatment for the stone.
vi. Non- staining silicone for the stone cladding grooves.

3.3 RELATED SECTIONS.

A. Glazing sealants - Section 08800.

3.4 QUALITY ASSURANCE

A. Qualification of Installers: Use only personnel who are thoroughly familiar, skilled and specially trained in the techniques of sealant work, and who are completely familiar with the published recommendations of the sealant manufacturer.

B. Pre-Construction Field Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to project joint substrates according to the method in ASTM C1193 that is appropriatefor the types of Project joints.

C. Perform testing as per ASTM C510 on interior and exterior sealants to determine if sealants or primers will stain adjacent surfaces. No sealant work shall start until results of these tests have been submitted to the Architect and he has given his written approval to proceed with the work.

D. Provide test results for the stone to ascertain the compatibility of the silicone sealant with the stone.

3.5 SUBMITTALS

A. Shop Drawings: Submit shop drawings showing all joint conditions, indicating relation of adjacent materials, all sealant materials (sealant, bond breakers, backing, primers, etc.), and method of installation.

   i. Submit joint sizing calculations certifying that movement capability of sealant is not beingexceeded.

B. Samples: Submit the following:

   i. Color samples of structural silicone.
   ii. Color samples of weather silicone.
   iii. Color samples of non-staining silicones.
   iv. Sealant bond breaker and joint backing.

C. Product Data: Submit manufacturer's technical information and installation instructions for:

   i. Sealant materials have to be Dow corning 995 and 789.
   ii. Non staining silicone from Dow corning 991
   iii. Fire Stop silicone from Dow corning DC 700
   iv. Dow corning primer DC 1200
   v. HILTI Mastic Spray CFS-SP WB / STI Firestops – AS200 Series Elastomeric Spray
   vi. Backing rods.

D. Submit manufacturer's certification as required by Article 1.6 herein.

E. Submit results of testing required in Article 1.4 herein.

3.6 MANUFACTURER'S RESPONSIBILITY AND CERTIFICATION

A. Contractor shall require sealant manufacturer to review the Project joint conditions and details for this Section of the work. Contractor shall submit to the Architect written certification from the sealant manufacturer that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will

properly perform to provide permanent watertight, airtight or vapor tight seals (as applicable), and that materials supplied meet specified performance requirements.

3.7 ENVIRONMENTAL CONDITIONS

A. Temperature: Install all work of this Section when air temperature is above 20 degrees C. and below 40 degrees C, unless manufacturer submits written instructions permitting sealant use outside of this temperature range.

B. Moisture: Do not apply work of this Section on surfaces which are wet, damp, or have frost.

3.8 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section, before, during and afterinstallation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

C. Storage

i. Store sealant materials and equipment under conditions recommended by their manufacturer.

ii. Do not use materials stored for a period of time exceeding the maximum recommended shelflife of the material.

3.9 GUARANTEE

A. Provide a written, notarized guarantee from the manufacturer and the applicator stating that the applied sealants shall remain watertight for a period of ten (10) years.

B. Guarantee shall be in a form acceptable to the Owner and executed by an authorized individual.

C. Guarantee shall further state that installed sealant is guaranteed against:

i. Adhesive or cohesive failure of sealant joints.
ii. Crazing greater than 3 mils in depth developing on surface of material.
iii. Staining of surfaces adjacent to joints by sealants or primer by migration through buildingmaterials in contact with them.
iv. Chalking, or visible color change on surface of cured sealant.
v. Increase or decrease of "Shore A" durometer hardness (5 second reading) of sealant of more than 30 percent of 7 day value of "Shore A" durometer hardness of sealant.

D. Include in guarantee provision, agreement to repair and/or replace, at Contractor's expense, sealantdefects which develop during guarantee period, because of faulty labour and/or materials.

3.10 SEALANT MATERIALS

A. Exterior Wall Sealant: Provide one part non-sag sealant equal to No. 995 or 795 made by Dow Corning, Conforming to the minimum standards of ASTM C920, Type S, grade NS, Class 25.

B. Water repellency Sealant for Stone Cladding: Provide a solvent free silane / siloxane Dow corningZ - 6689.

C. Non – Staining silicone sealant for Stone cladding : Provide one part sealant DC991 Confirming tostandards in ASTM C920

D. Colors: Custom colors of sealants as selected by the Architect.

3.11 MISCELLANEOUS MATERIALS

A. Back-Up Materials: Provide back-up materials and preformed joint fillers, non-staining, non-absorbent, compatible with sealant and primer, and of a resilient nature, equal to "Soft-Rod", 25 percent wider than joint width. Materials impregnated with oil, bitumen or similar materials shall notbe used. Provide back-up materials only as recommended by sealant manufacturer in writing.

B. Provide bond breakers, where required, of polyethylene tape as recommended by manufacturer ofsealant.

C. Provide primers recommended by the sealant manufacturer for each material to receive sealant. Note that each exterior joint must be primed prior to sealing.

D. Provide solvent, cleaning agents and other accessory materials as recommended by the sealant manufacturer.

E. Materials shall be delivered to the job in sealed containers with manufacturer's original labels attached. Materials shall be used per manufacturer's printed instruction.

3.12 INSPECTION

A. Examine the areas and conditions where joint sealers are to be installed and correct any conditionsdetrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.13 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications and conditions required by this Project where more stringent installation requirements are specified herein, such requirements shall apply.

B. Sample Section of Sealant

i. During sealant installation work in exterior wall, the manufacturer of sealant shall send his representative to the site, under whose supervision a section of the wall (used as "control section") shall be completed for purposes of determining performance characteristics of sealant in joints. Architect shall be informed of time and place of such installation of controlsection.

ii. Control section shall be installed according to specification given herein and shall not be considered as acceptable until written acceptance is provided by the Architect.

iii. Accepted control section shall be standard to which all other sealant work must conform.

C. Supervision: Submit to the Architect/Owner written certification from the sealant manufacturer thatthe applicators have been instructed in the proper application of their materials. Use only skilled and experienced workmen for installation of sealant.

D. Apply sealant under pressure with a hand or power actuated gun or other appropriate means. Gunshall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed.Neatly point or tool joint to provide the contour as indicated on the drawings.

E. Preparation and Application

i. Thoroughly clean all joints, removing all foreign matter such as dust, oil, grease, water, surface dirt and frost. Sealant must be applied to the base surface. Previously applied film must be entirely removed.

ii. Stone, masonry and concrete surfaces to receive sealant shall be cleaned where necessaryby grinding, water blast cleaning, mechanical abrading, or combination of these methods asrequired to provide a clean, sound base surface for sealant adhesion.

a. Do not use any acid or other material which might stain surfaces.

b. Remove laitance by grinding or mechanical rading.

c. Remove loose particles present or resulting from grinding, abrading, or blast cleaning by blowing out joints with compressed air, oil and water free or vacuuming joints priorto application of primer or sealant.

F. Clean non-porous surfaces such as metal and glass chemically. Remove protective coatings on metallic surfaces by solvent that leaves no residue and is compatible with sealant. Use solvent withclean, lint free paper towels, and wipe dry with clean, dry lint free paper towels. Do not allow solvent to air dry without wiping. Clean joint areas protected with masking tape or strippable films as above after removal of tape film.

G. Do not seal joints until they are in compliance with drawings, or meet with the control section standard.

H. Joint Size and Sealant Size: Joints to receive sealant shall be at least 6mm wide. In joint 6mm to10mm wide, sealant shall be 6mm deep. In joints wider than 10mm and up to 25mm wide, sealantdepth shall be one half the joint width. For joints wider than 25mm, sealant depth shall be as recommended by the sealant manufacturer. Depth of joint is defined as distance from outside faceof joint to closest point of the filler.

I. Primer: Thoroughly clean joints and apply primer to all surfaces that will receive sealant. Apply primer on clean, dry surfaces, and prior to installation of joint backing. Completely wet both inner faces of the joint with primer. Mask adjacent surfaces of joint with non-staining masking tape priorto priming.

J. Joint Backing: In joints where depth of joint exceeds required depth of sealant, install joint backing(after primer is dry) in joints to provide backing and proper joint shape for sealant. Proper shape for sealant is a very slight "hourglass" shape, with back and front face having slight concave curvature. Use special blunt T-shaped tool or roller to install joint backing to the proper and uniformdepth required for the sealant. Joint backing shall be installed with approximately 25 percent compressions. Do not stretch, twist, braid, puncture, or tear joint backing. Butt joint backing at intersections.

K. Bond Breaker: Install bond breaker smoothly over joint backing so that sealant adheres only to thesides of the joint and not backing.

L. Sealant Application: Apply sealant in accordance with the manufacturer's application manual and manufacturer's instructions, using hand guns or pressure equipment, on clean, dry, properly prepared substrates, completely filling joints to eliminate air pockets

and voids. Mask adjacent surfaces of joint with non-staining masking tape. Force sealant into joint in front of the tip of the "caulking gun" (not pulled after it) and force sealant against sides to make uniform contact with sides of joint and to prevent entrapped air or pulling of sealant ff of sides. Fill sealant space solid with sealant.

M. Tooling: Tool exposed joints to form smooth and uniform beds, with slightly concave surface. Finished joints shall be straight, uniform, smooth and neatly finished. Remove masking tape immediately after tooling of sealant and before sealant face starts to "skin" over. Neatly remove any excess sealant from adjacent surfaces of joint, leaving the work in a neat, clean condition.

N. Replace sealant which is damaged during construction process.

4.0 FIRESTOPS AND SMOKESEALS

GENERAL

4.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of theContract Documents.

4.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete thefire stops and smoke seals as shown on the drawings and/or specified herein, including but not limited to, the following:

i. Penetrations through fire-resistance-rated floor and roof construction including both emptyopenings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

ii. Penetrations through fire-resistance-rated walls and partitions including both empty openingsand openings containing cables, pipes, ducts, conduits, and other penetrating items.

iii. Penetrations through smoke barriers and construction enclosing compartmentalized areasinvolving both empty openings and openings containing penetrating items.

iv. Sealant joints in fire-resistance-rated construction.

v. Penetrations at each floor level in shafts and/or stairwells.

vi. Construction joints, including those between top of fire rated walls and Underside of floors above; and those between exterior curtain walls and the outer perimeter edge of floor assemblies.

4.3 RELATED SECTIONS

A. Joint sealers - Section 07900

B. Aluminum curtain wall - Section 08920.

4.4 REFERENCES

A. ASTM E 814 "Standard Method of Fire Tests of Through-Penetration Firestops".

B. UL 1479, UBC 7-5 (Both are same as A. above).

C. ASTM E 119 "Standard Method of Fire Tests of Building Construction and Materials".

D. UL 263, UBC 7-1 (Both are same as C. above).

E. UL 2079 “Tests For Fire Resistance of Building Joint Systems”.

F. ASTM E 1399 “Test For Dynamic Movement Conditions”.

G. ASTM E 1966 (Same as E. above).

H. Published Through-Penetration Systems by recognized independent testing agencies.

i. UL Fire Resistance Directory, Volume II of current year.
ii. Warnock Hersey Certification Listings, current year.
iii. Omega Point Laboratories, current year.

4.5 SUBMITTALS

A. Submit manufacturer's product literature for each type of fire stop material to be installed. Literature shall indicate product characteristics, typical used, performance, limitation criteria, test data and indicate that products comply with specified requirements.

B. Submit shop drawings detailing materials, installation methods, and relationships to adjoining construction for each fire stop system, and each kind of construction condition penetrated and kind of penetrating item. Include fire stop design designation of qualified testing and inspection agency evidencing compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration fire stop configuration for constructionand penetrating items.

C. Material Safety Data Sheets: Submit MSDS for each fire stop product.

D. Submit qualifications of fire stop installer, including letter from fire stop manufacturer of products proposed to be installed, wherein manufacturer approves r recognizes as trained /or certifies installer for installation of that manufacturer's products.

4.6 QUALITY ASSURANCE

A. General: Provide fire stopping systems that are produced and installed to resist the spread offire, and the passage of smoke and other gases.

B. Fire stopping materials shall conform to Flame (F) and Temperature (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM E 814 orUL 1479. The F rating must be a minimum of one (2) hour but not less than the fire resistancerating of the assembly being penetrated. T rating, when required by code authority, shall bebased on measurement of the temperature rise on the penetrating item(s). The fire test shallbe conducted with a minimum positive pressure differential of 0.01 inches of water column.

C. Fire stopping products shall be asbestos free and free of any PCBs.

D. Do not use any product containing solvents or that requires hazardous waste disposal.

E. Do not use fire stop products which after curing, dissolve in water.

F. Do not use fire stop products that contain ceramic fibers.

G. Fire stopping Installer Qualifications: Fire stop application shall be performed by a single firestopping contractor who specializes in the installation of fire stop systems, whose personnelto be utilized have received specific training and certification or approval from the proposedrespective fire stop manufacturer, and fire stop installer shall have a minimum of three years' experience (under present company name) installing fire stop systems of the type herein specified.

H. Mock-Up: Prepare job site mock-ups of each typical Fire stop System proposed for use in theproject. Approved mock-ups will be left in place as part of the finished project and will constitute the quality standard for the remaining work.

I. For fire stopping exposed to view, traffic, moisture, and physical damage, provides productsthat do not deteriorate when exposed to these conditions.

a. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture- resistant through-penetration fire stop systems.

b. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide fire stop systems capable of supporting the floor loadsinvolved either by installing floor plates or by other means.

c. For penetrations involving insulated piping, provide through-penetration fire stop systems notrequiring removal of insulation.

4.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original unopened containers with manufacturer's name,product identification, and lot numbers, as applicable.

B. Store materials in the original, unopened containers or packages, and under conditionsrecommended by manufacturer.

C. All fire stop materials shall be installed prior to expiration of shelf life.

4.8 PROJECT CONDITIONS

A. Verify existing conditions and substrates before starting work

B. Do not use materials that contain solvents, show sign of damage or are beyond their shelflife.

C. During installation, provide masking and drop cloths as needed to prevent fire stoppingproducts from contaminating any adjacent surfaces.

D. Conform to ventilation requirements if required by manufacturer's installation instructions orMaterial Safety Data Sheet.

E. Weather Conditions: Do not proceed with installation of fire stop products when temperatures are in excess or below the manufacturer's recommendations.

F. Schedule installation of fire stop products after completion of penetrating item installation butprior to covering or concealing of openings.

G. Coordinate this work as required with work of other trades.

4.9 SEQUENCING AND SCHEDULING

A. Pre-Installation Conference: Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

B. Sequence: Perform work of this and other sections in proper sequence to prevent damage tothe fire stop systems and to ensure that their installation will occur prior to enclosing or concealing work.

C. Install all fire stop systems after voids and joints are prepared sufficiently to accept the applicable fire stop system.

D. Do not cover fire stop systems until they have been properly inspected and accepted by theauthority having jurisdiction.

4.10 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the followingmanufacturers:
   i. Dow Corning
   ii. Hilti

4.11 FIRESTOPPING, GENERAL

A. Compatibility: Provide fire stopping composed of components that are compatible with eachother, the substrates forming openings, and the items, if any, penetrating the fire stopping under conditions of service and application, as demonstrated by fire stopping manufacturer based on testing and field experience.

B. Accessories: Provide components for each fire stopping system that are needed to install fillmaterials. Use only components specified by the fire stopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems.Accessories include but are not limited to the following items:

   i. Permanent backing materials including the following:
      a. Rock wool insulation.
      b. Fire-rated form board.
      c. Joint fillers for joint sealants.

   ii. Temporary forming materials.

   iii. GI sheet.

C. Applications: Provide fire stopping systems composed of materials specified in this Section that comply with system performance and other requirements.

D. Smoke seals at top of partitions shall be flexible to allow for partition deflection.

4.12 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified inthis Section applicable to fire-resistive joint sealants.

Sealant Colors: Color of exposed joint sealants as selected by the Architect.

B. Single-Component, Neutral-Curing Silicone Sealant:
Exposure-related Use NT.

Additional Movement Capability: Provide sealant with the capability to withstand 33 percent movement in both extension and compression for a total of 66 percent movement.

C. Multi-Component, Non-Sag, Urethane Sealant: Exposure-related Use NT,

Additional Movement Capability: Provide sealant with the capability to withstand 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated.

D. Single-Component, Non-Sag, Urethane Sealant: Use NT.

4. 13 ROCK WOOL NON-COMBUSTIBLE INSTALLATION (FIRE SAFING)

A. Provide min. 80 kg/m^3 Rock wool as approved or equal to suit conditions and to comply with fire resistance and fire stop manufacturer's requirements.

B. Material shall be classified non-combustible per ASTM E119.

4.14 MIXING

A. For those products requiring mixing prior to application, comply with fire stopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce fire stopping products of uniform quality with optimum performance characteristics for application indicated.

4.15 EXAMINATION

A. Examine substrates and conditions with Installer present, for compliance with requirements for opening configuration, penetrating items, substrates, and other conditions affecting performance of fire stopping. Do not proceed with installation until unsatisfactory conditionshave been corrected.

4.16 PREPARATION

Surface Cleaning: Clean out openings and joints immediately prior to installing fire stoppingto comply with recommendations of fire stopping manufacturer and the following requirements:

i. Remove all foreign materials from surfaces of opening and joint substrates

and frompenetrating items that could interfere with adhesion of fire stopping.

ii. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with fire stopping. Remove loose particles remaining from cleaning operation.

iii. Remove laitance and form release agents from concrete.

4.17 CONDITIONS REQUIRING FIRESTOPPING

A. Building Exterior Perimeters

i. Where exterior facing construction is continuous past a structural floor and a space(i.e. construction joint) would otherwise remain open between the inner face of the wall construction and the outer perimeter edge of the structural floor, provide fire stopping to equal the fire resistance of the floor assembly.

a. If Rock wool is part of fire stop system, the Rock wool must be completelycovered by Bison Board of appropriate thickness

b. Refer to Article 3.6 herein for description of fire safing insulation.

ii. Fire stopping shall be provided whether or not there are any clips, angles, plates, or other members bridging or interconnecting the facing and floor systems, and whether or not such items are continuous.

iii. Where an exterior wall of composite type construction passes a perimeter structural member, such as a girder, beam, or strut, and the finish on the interior wall face doesnot continue up to close with the underside of the structural floor above, thus interrupting the fire-resistive integrity of the wall system, and a space would otherwise remain open between the interior face of the wall and lower edge of the structural member, provide fire stopping to continuously fill such open space.

B. Interior Walls and Partitions

i. Construction joints between top of fire rated walls and underside of floors above, shall be fire stopped.

ii. Fire stop system used shall allow for deflection of floor above.

C. Penetrations

i. Penetrations include conduit, cable, wire, pipe, duct, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.

ii. Except for floors on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide fire stoppingto fill such spaces in accordance with ASTM E-814.

iii. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, fire stop annular space, if any, between sleeve and wall of opening.

D. Provide fire stopping to fill miscellaneous voids and openings in fire rated construction in a manner essentially the same as specified herein before.

4.18 INSTALLING THROUGH PENETRATION FIRESTOPS

A. General: Comply with the through penetrations fire stop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross sectional shapes and depths required to achieve fire ratings of designated through penetration fire stop systems. After installing fill materials, remove combustible forming materials and other accessories.

C. Install fill materials for through penetration fire stop systems by proven techniques to producethe following results:

i. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

ii. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

iii. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

4.19 INSTALLING FIRE RESISTIVE JOINT SEALANTS

A. General: Comply with ASTM C-1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required toproduce the cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, andproviding uniform, cross sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool no sag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to producefire resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesionof sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do notuse tooling agents that discolor sealants or adjacent surfaces or are not approved by sealantmanufacturer.

4.20 INSTALLING FIRESAFING INSULATION

A. Install fire safing Rock wool insulation utilizing welded or screw applied galvanized steel.

B. Completely fill voids in areas where safing insulation is required. At spandrel conditions/flooredges, depth of insulation top to bottom shall be at least 102mm.

C. Cover top of all safing insulation with fire stop sealant or spray.

4.21 FIELD QUALITY CONTROL

A. Inspecting agency employed and paid by the Owner will examine completed fire stopping to determine, in general, if it is being installed in compliance with requirements.

B. Inspecting agency will report observations promptly and in writing to Contractor, Owner andArchitect.

C. Do not proceed to enclose fire stopping with other construction until reports of examinationsare issued.

D. Where deficiencies are found, Contractor must repair or replace fire stopping so that it complies with requirements.

4.22 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of fire stopping products and of products in which opening and joints occur.

B. Protect fire stopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated fire stopping immediately and install new materials to product fire stopping complying with specified requirements.

5.0 METAL WALL

PANELSGENERAL

5.1 SUMMARY

A. Section Includes: Composite fire rated metal panels.

i. Applications of composite fire rated panels include:

a. Exterior installation of composite fire rated metal panels.

5.2 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of thisspecification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. ASTM International:

i. ASTM C297 Standard Test Method for Tensile Strength on Flat Sandwich Constructions inFlat wise Plane.

ii. ASTM D1781 Standard Test Method for Climbing Drum Peel for Adhesives.

iii. ASTM D1929 Standard Test Method for Determining Ignition Temperature of Plastics.

iv. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

v. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.

C. American Architectural Manufacturers Association (AAMA):

i. AAMA 2605 Specification for High Performance Organic Coatings on Architectural Extrusionsand Panels.

D. Uniform Building Code (UBC):

i. UBC 26-3 Room Fire Test Standard for Interior of Foam Plastic Systems.

ii. UBC 26-9 Method of Test for the Evaluation of Flammability Characteristics of Exterior, No- load-bearing Wall Assemblies Containing Combustible Components Using the Intermediate-scale, Multistory Test Apparatus.

E. International Organization for Standardization (ISO):

i. ISO 9001-2000 Quality Management Systems - Requirements.

5.3 SYSTEM DESCRIPTION

A. Performance Requirements: Provide composite metal panels which have been manufactured, fabricated and installed to withstand loads from deflection and thermal movement and to maintainperformance criteria stated by manufacturer without defects, damage or failure.

B. Deflection and Thermal Movement: Provide systems that have been tested and certified to conform to the following criteria under wind loading of 2.1 kPa inward.

i. Normal Deflection: Deflection of perimeter framing member not to exceed L/175 normal toplane of the wall; deflection of individual panels not to exceed L/60.

ii. Anchor Deflection: At connection points of framing members to anchors, anchor deflection inany direction not to exceed 1.6 mm.

iii. Thermal Movements: Allow for free horizontal and vertical thermal movement, due toexpansion and contraction of components over a temperature range from 20-45˚C.

a. Buckling, opening of joints, undue stress on fasteners, failure of sealants, or any other detrimental effects of thermal movement will not be permitted.

b. Fabrication, assembly and erection procedures shall take into account the ambient temperature range at the time of the respective operation.

C. Water and Air Leakage: Provide systems that have been tested and certified to conform to the following criteria:

i. Air Leakage (ASTM E283): Not more than 0.06 cfm per ft^2 of wall area (0.003 (L/s m^2), whentested at 1.57 psf (0.075 kPa).

ii. Water Penetration: No water infiltration under static pressure when tested in accordance withASTM E331 at a differential of 10% of inward acting design load, 6.24 psf (0.299 kPa) minimum, after 15 minutes.

a. Water penetration is defined as the appearance of uncontrolled water in the wall.

b. Wall design shall feature provisions to drain to the exterior face of the wall any leakage of water at joints and any condensation that may occur within the construction.

D. Structural: Provide systems that have been tested in accordance with ASTM E330 at a design pressure of 2.1 kPa and have been certified to be without permanent deformation or failures of structural members.

E. Fire Performance: Provide composite fire rated panels which have been evaluated and are in compliance with regulatory code agency requirements specified herein.

5.4 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1Submittal Procedures Section.

B. Product Data: Submit product data, including manufacturer's SPEC-DATA® sheet, for specifiedproducts.

C. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors and textures.

i. Include details showing thickness and dimensions of the various system parts, fastening andanchoring methods, locations of joints and gaskets, and location and configuration of joints necessary to accommodate thermal movement.

D. Samples: Submit selection and verification samples for finishes, colors and textures.

i. Selected Samples: Manufacturer's color charts or chips illustrating full range of colors, finishes and patterns available for composite metal panels with factory-applied finishes.

ii. Verification Samples:

a. Structural: 300mm × 300 mm sample composite panels in thickness specified, from an available stock color, including clips, anchors, supports, fasteners, closures and other panel accessories, for assembly approval. Include panel assembly samples not less than 610mm × 610 mm, showing 4-way joint.

b. Include separate sets of draw down samples on aluminum substrate, not less than 76mm × 127 mm, of each color and finish selected, for color approval. Larger samples of standard colors are available with production applied coatings.

E. Quality Assurance Submittals: Submit the following:

i. Test Reports: Certified test reports showing compliance with specified

performancecharacteristics and physical properties.

ii. Certificates: Product certificates signed by manufacturer certifying materials comply withspecified performance characteristics and physical requirements.

iii. Manufacturer's Instructions: Manufacturer's installation instructions.

iv. Manufacturer's Field Reports: Manufacturer's field reports.

F. Closeout Submittals: Submit the following:

i. Warranty: Warranty documents specified herein.

5.5 QUALITY ASSURANCE

A. Qualifications:

i. Installer Qualifications: Installer experienced in performing work of this section who has specialized in the installation of work similar to that required for this project.

a. Certificate: When requested, submit certificate indicating qualification.

ii. Manufacturer Qualifications: Company with a minimum of 5 years of continuous experience manufacturing panel material of the type specified:

a. Able to provide specified warranty on finish.

b. Able to provide a list of 5 other projects of similar size, including approximate date of installation and name of Architect for each.

c. Able to produce the composite material without outsourcing of the coating or laminatingprocess.

d. Able to provide a certificate of registration to ISO 9001-2000.

iii. Fabricator Qualifications: Company with at least 3 years of experience on similar sized metalpanel projects and qualified by panel material manufacturer. Capable of providing field service representation during construction.

B. Mock-Ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner's and Architect's acceptance of finish color (draw down samples to be used for color approval of nonstandard coil coated colors), texture and pattern, and workmanship standard. Comply with Division 1 Quality Control (Mock-Up Requirements) Section.

i. Mock-Up Size: [2.8mx 3m).

ii. Maintenance: Maintain mock-up during construction for workmanship comparison; removeand legally dispose of mock-up when no longer required.

iii. Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.

C. Pre installation Meetings: Conduct pre installation meeting to verify project requirements, substrateconditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.

5.6 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoidconstruction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers withidentification labels intact.

i. Protection: Protect finish of panels by applying heavy duty removable plastic

film duringproduction.

ii. Delivery: Package composite wall panels for protection against transportation damage.Provide markings to identify components consistently with drawings.

iii. Handling: Exercise care in unloading, storing and installing panels to prevent bending,warping, twisting and surface damage.

D. Storage and Protection: Store materials protected from exposure to harmful weather conditionsand at temperature conditions recommended by manufacturer.

i. Storage: Store panels in well-ventilated space out of direct sunlight.

a. Protect panels from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation.

b. Slope panels to ensure positive drainage of any accumulated water.

c. Do not store panels in any enclosed space where ambient temperature can exceed 49degrees C.

ii. Damage: Avoid contact with any other materials that might cause staining, denting or othersurface damage.

5.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

5.8 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, andnot a limitation of, other rights Owner may have under the Contract Documents.

i. Warranty Period:

a. Panel Integrity: 10 years commencing on Date of Substantial Completion.

b. Finish: 10 years commencing on Date of Substantial Completion.

5.9 COMPOSITE FIRE RATED METAL PANELS

A. Manufacturer: ALCAN/MITSUBISHI/ALUCOPLA

B. Proprietary Product: ALUCOBOND/ALPOLIC/ALUCOPLA Composite Metal Panels, including:

i. ALUCOBOND/fr or ALPOLIC/fr/ALUCOPLA/fr composite fire rated metal panels.

5.10 PRODUCT SUBSTITUTIONS

A. Substitutions: No substitutions permitted.

5.11 COMPOSITE METAL PANEL MATERIALS

A. /fr or /fr Composite Fire Rated Metal Panels:

i. Panel Thickness: 4 mm.

ii. Core: Thermoplastic core material with inorganic fillers that meets performance characteristics specified when fabricated into composite assembly.

iii. Face Sheets: Aluminum alloy PERALUMAN -100 (AlMg 1)for ALUCOBOND /

Aluminium alloy 3005 H46 for Reynobond, 0.020 inch (0.51 mm) thick, and as follows:

a. Coil coated with a fluoropolymer paint finish that meets or exceeds values expressed inAAMA 2605 where relevant to coil coatings.

b. Spray coated with specified finish (quantities less than 7500 ft^2 (700 m^2)).

iv. Bond Integrity: Tested for resistance to delaminating as follows:

a. Bond Strength (ASTM C297): 427 psi (2.9 MPa) minimum.

b. Peel Strength (ASTM D1781): 27.6 in-lb/in (123 N-m/m) minimum.

c. No degradation in bond performance after 8 hours of submersion in boiling water andafter 21 days of immersion in water at 70 degrees F (21 degrees C).

d. Thermally bonded in a continuous process, under tension, to the core material.

v. Fire Performance:

a. Flame spread (ASTM E84): 0.

b. Smoke Developed (ASTM E84): 0 maximum.

c. Surface Flammability (Modified ASTM E108): Pass.

d. Ignition Temperature: Flash (ASTM D1929): 811 degrees F (433 degrees C), Ignition:837 degrees F (447 degrees C).

e. UBC 26-9 Intermediate Scale Multi-Story Apparatus Test: Passed.

f. UBC 26-3 Room Corner Test: Passed.

g. ASTM E119 One Hour and Two Hour Rated Walls: Passed.

h. UBC 17-2 Potential Heat Release: Less than 6000 Btu/ft^2.

i. CAN/ULC - 5134M (Canadian Full-Scale Test):

Passed.j.

B. Production Tolerances:

i. Width: +/- 0.04 inch/3 feet (1 mm/m).

ii. Length: +/- 0.04 inch/3 feet (1 mm/m).

iii. Thickness (4 mm Panel): +/- 0.008 inch (0.2 mm).

iv. Thickness (6 mm Panel): +/- 0.012 inch (0.3 mm).

v. Bow: Maximum 0.5% length or width.

vi. Square ness: Maximum 0.2 inch (5.1 mm).

vii. Edges of sheets shall be square and trimmed with no displacement of aluminum sheets orprotrusion of core material.

5.12 ACCESSORIES

A. General: Provide fabricator's standard accessories, including fasteners, clips, anchorage devicesand attachments for specific applications indicated on contract documents.

5.13 RELATED MATERIALS

A. General: Refer to other related sections in Related Sections paragraph specified herein for relatedmaterials, including cold-form metal framing, flashing and trim, joint sealers, aluminum windows, glass and glazing, and curtain walls.

5.14 FABRICATION

A. General: Shop fabricate to sizes and joint configurations indicated on the drawings.

i. Where final dimensions cannot be established by field measurements, provide allowance forfield adjustment as recommended by the fabricator.

ii. Form panel lines, breaks and angles to be sharp and true, with surfaces that are free fromwarp or buckle.

iii. Fabricate with sharply cut edges, with no displacement of aluminum sheet or protrusion ofcore.

5.15 FINISHES

A. Factory Finish: Lumiflon-based fluoropolymer resin coating that meets or exceeds values expressed in AAMA 2605 where relevant to coil coatings.

i. Color:

a. Type 1

b. Type 2

5.16 SOURCE QUALITY

A. Source Quality: Obtain composite panel products from a single manufacturer.

5.17 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins,product catalog installation instructions and product carton instructions.

5.18 EXAMINATION

A. Site Verification of Conditions: Verify that substrate conditions, which have been previouslyinstalled under other sections, are acceptable for product installation.

5.19 PREPARATION

A. Surface Preparation: Providing Air salt Barrier for the surface.

5.20 INSTALLATION

A. General:

i. Install panels plumb, level and true, in compliance with fabricator's recommendations.

ii. Anchor panels securely in place, in accordance with fabricator's approved shop drawings.

iii. Comply with fabricator's instructions for installation of concealed fasteners and with provisions of Section 07900 for installation of joint sealers.

iv. Installation Tolerances: Maximum deviation from horizontal and vertical alignment of installedpanels: 0.25 inch in 20 feet (6.4 mm in 6.1 m), no cumulative.

B. Related Products Installation Requirements: Refer to other sections in Related Sections paragraph herein for installation of related products.

5.21 FIELD QUALITY REQUIREMENTS

A. Field Quality Control: Comply with panel system fabricator's recommendations and guidelines forfield forming of panels.

B. Fabricator's Field Services: Upon Owner's request, provide fabricator's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with fabricator's instructions.

i. Site Visits: Until complete installation of Panels at site and Handover to owner.

5.22 ADJUSTING

A. Adjusting:

i. Repair panels with minor damage such that repairs are not discernible at a distance of 3m.

ii. Remove and replace panels damaged beyond repair.

iii. Remove protective film immediately after installation of joint sealers and immediately prior tocompletion of composite metal panel work.

iv. Remove from project site damaged panels, protective film and other debris attributable to work of this section.

5.23 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legallydispose of debris.

5.24 PROTECTION

A. Protection: Protect installed product's finish surfaces from damage during construction.

i. Institute protective measures as required to ensure that installed panels will not be damaged.

6.0 ALUMINUM LOUVERS

GENERAL

6.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

6.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the aluminum Louvers as shown on the drawings and/or specified herein, including but is not necessarily limited to the following:

i. Aluminium Louvers

6.3 RELATED SECTIONS

A. Sealant work -Section 07900.

6.4 QUALITY ASSURANCE

A. Performance Requirements

i. Structural Performance: Provide exterior metal Louvers capable of withstanding the effects of loads and stresses from wind and normal thermal movement without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatiguecaused by louver blade rattle or flutter or permanent damage to fasteners and anchors.

a. Wind Load: Uniform pressure (velocity pressure) of 2.1 Kpa, acting inward or outward.

ii. Thermal Movements: Provide Louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, and other detrimental effects.

a. Temperature Change (Range): 29˚C to 45˚C, ambient; 45˚C to 85˚C, material surfaces.

B. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details and installation procedures, except as otherwise indicated.

C. Field Measurements: Verify size, location and placement of louver units prior to fabrication.

D. Shop Assembly: Coordinate field measurements and shop drawings with fabrication and shop assembly to minimize field adjustments, splicing, mechanical joints and field assembly of units. Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

6.5 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, certified test data, where applicable, and installation instructions for required products, including finishes.

B. Shop Drawings: Submit shop drawings for fabrication and erection of louver units and accessories. Include plans, elevations and details of sections and connections to adjoining work. Indicate materials, finishes, fasteners, joinery and other information to determine compliance with specifiedrequirements.

C. Samples: Submit 1 sqft. Samples of each required finish. Prepare samples on metal of same gaugeand alloy to be used in work. Where normal color and texture variations are to be expected, include2 or more units in each sample showing limits of such variations.

6.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and afterinstallation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

6.7 LOUVREMATERIAL

A. Provide storm resistant extruded aluminum Louvers (ASTM B221), of profiles shown on drawingsand approved by Architect.

B. Heads, sills, jambs and mullions to be one piece structural members of 6063-T6, alloy, 20.04mm min. thick, with integral caulking slot and retaining beads. Blades to be minimum 20.04mm min. thick. Closed cell PVC compression gaskets to be provided between bottom of mullion or jamb and top of sill to insure lead tight connections. Concealed structural supports to be designed by the louver manufacturer to carry a wind load of not less than 2.1 Kpa. All fasteners shall be of stainlesssteel.

C. Finishes

1. Where not installed in curtain wall framing, provide anodized finish to match Architect'ssample.

D. Fastenings: Fasteners for exterior application shall be stainless steel. Provide types,

gauges and lengths to suit unit installation conditions. Use Phillips flat head machine screws for exposed fasteners, unless otherwise indicated.

E. Anchors and Inserts: Use non-ferrous metal or SS 316 grade anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use steel or lead expansion bolt devices for drilled in place anchors. Furnish inserts, as required, to be set into concrete or masonrywork.

6.8 FABRICATION, GENERAL

A. Fabricate frames including integral sills to suit adjacent construction with tolerances for installation,including application of sealants in joints between Louvers and adjoining work.

B. Include supports, anchorages, and accessories required for complete assembly.

C. Provide sill extensions made of same material as Louvers, where indicated, or required for drainageto exterior and to prevent water penetrating to interior.

D. Join frame members to one another and to stationary louver blades by welding, except where indicated otherwise or where field bolted connections between frame members are necessary by size of Louvers. Maintain equal blade spacing, including separation between blades and frames at headand sill, to produce uniform appearance.

6.9 INSPECTION

A. Examine the areas and conditions where aluminum Louvers are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

6.10 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions and directions for the installation ofanchorages which are to be embedded in masonry construction. Coordinate the delivery of such items to the project site.

6.11 INSTALLATION

A. Locate and place louver unit’s plumb, level and in proper alignment with adjacent work.

B. Use concealed anchorages wherever possible. Provide stainless steel 316 grade washers fitted toscrews where required to protect metal surfaces and to make a weather tight connection.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openingsfor sealants and joint fillers, as indicated.

D. Repair finishes damaged by cutting, welding, soldering and grinding operations required for fitting and jointing. Restore finishes and prime coats of paint so that there is no evidence of corrective work. Return items which cannot be refinished in the field to the shop, make the required alterations, and refinish the entire unit, or provide new units, at Contractor's option.

E. Protect aluminum surfaces from corrosion by application of a heavy coating of bituminous paint onsurfaces which will be in contact with concrete, masonry or dissimilar metals.

F. Provide concealed gaskets, flashings, joint fillers and insulations, and install as the work progressesto make the installations weather tight.

7.0 SHEET METAL FLASHING AND TRIM

GENERAL

7.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and SupplementaryConditions and Division 1 Specification Sections, apply to this Section.

7.2 SUMMARY

A. This Section includes sheet metal flashing and trim in the following categories:

i. Exposed trim, gravel stops, and fasciae.
ii. Copings.
iii. Metal flashing.
iv. Reglets.

B. Related Sections: The following Sections contain requirements that relate to this Section:

i. Section 07900- Sealants

7.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand, thermally induced movement, andexposure to weather without failing.

7.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1Specification Sections.

B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

C. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchoragedetails.

D. Samples of sheet metal flashing. Aluminums flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of2 or more units showing the full range of variations expected.

i. 300mm x 300mm- square Samples of specified sheet materials to be exposed as finishedsurfaces.

ii. 300mm- long Samples of factory-fabricated products exposed as finished work. Providecomplete with specified factory finish.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstratetheir capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

7.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Mockups: Prior to installing sheet metal flashing and trim, construct mockups indicated to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualitiesof materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.

i. Locate mockups on-site in the location and of the size indicated or, if not indicated, asdirected by Architect/Owner's Consultant.
ii. Notify Architect/ Owner's Consultant one week in advance of the dates and times whenmockups will be constructed.
iii. Demonstrate the proposed range of aesthetic effects and workmanship.
iv. Construct mockups for the following type of sheet metal flashing. Aluminums flashing andtrim:

a. Exposed trim, and fasciae.
b. Copings.

v. Obtain Architect's approval of mockups before start of final unit of Work.

7.6 PROJECT CONDITIONS

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materialsand finishes.

7.7 METALS

A. Aluminum Sheet: ASTM A 167, Type 316, soft annealed, mill finish, except where harder temper isrequired for forming or performance; minimum 2mm thick, unless otherwise indicated.

7.8 CONCEALED THROUGH-WALL SHEET METAL FLASHING

A. Material: Fabricate from the following metal:

i. Alum alloy 2.5mm thick.

A. General: Units of type, material, and profile indicated, formed to provide secure interlocking of separatereglet and counter flashing pieces and compatible with flashing indicated.

B. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with

neoprene or othersuitable weatherproofing washers and with channel for sealant at top edge.

C. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness ofapplied finish materials.

D. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.

E. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

F. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing inreglet where clearance does not permit use of standard metal counter flashing or where Drawings showreglet without metal counter flashing.

7.9 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended bysheet metal manufacturer. Match finish of exposed heads with material being fastened.

B. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur andcontaining no asbestos fibers, compounded for 15-mil dry film thickness per coat.

C. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, nondrying, non-migrating sealant.

D. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07900 – Joint Sealants.

E. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather- resistant seaming and adhesive application of flashing sheet metal.

F. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil- thick black polyethylene film, resistantto decay when tested according to ASTM E 154.

G. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions ofsurfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed,form seams, and weld.

E. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal withepoxy seam sealer. Rivet joints for additional strength.

F. Expansion Provisions: Space movement joints at maximum of 3m with no joints allowed within 600mm of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 25mm deep, filled with mastic sealant (concealed withinjoints).

G. Sealed Joints: Form non expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

H. Separate metal from non-compatible metal or corrosive substrates by coating concealed surfacesat locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

I. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

J. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

i. Size: As recommended by SMACNA manual or sheet metal manufacturer for applicationbut never less than thickness of metal being secured.

7.10 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

7.11 EXAMINATION

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactoryconditions have been corrected.

7.12 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight andweatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks andthat is true to line and levels indicated, with exposed edges folded back to form hems. Install sheetmetal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention DataSheet 1-49 for specified wind zone.

D. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches, except where pretinned surface would show in finished Work.

i. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint.Fill joint completely. Completely remove flux & spatter from exposed surfaces.

F. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.

ii. Use joint adhesive for nonmoving joints specified not to be soldered.

G. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal withepoxy seam sealer. Rivet joints for additional strength.

H. Separations: Separate metal from no compatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

I. Counter flashings: Coordinate installation of counter flashings with installation of assemblies to be protected by counter flashing. Install counter flashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counter flashing joints a minimum of 2 inches and bed with sealant.

J. Roof-Drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives,and anchors recommended by SMACNA's Manual or the item manufacturer, to drain roof in the most efficient manner. Coordinate roof-drain flashing installation with roof-drainage system installation. Coordinate flashing and sheet metal items for steep- sloped roofs with roofing installation.

K. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.

CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time ofSubstantial Completion.

PLUMBING WORK

GENERAL TECHNICAL CONDTIONS

1. SCOPE OF WORK

1.1 Work under this contract shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely furnish all the Plumbing and other specialized services as described hereinafter and as specified in the Schedule of Quantities and/or shown on the Plumbing & Fire Fighting Drawings.

This contract is an Item Rate Contract. All payments are made for the actual work executed. Any variation in the quantities will not have any extra cost implication on the quoted rates.

1.2 Without restricting to the generally of the foregoing Sanitary installations shall include the following:-

a) Sanitary Fixtures

b) Soil, Waste, Rain Water and Vent Pipes.

c) Internal Water supply.

d) Sewerage & Drainage works Around the Towers

1.3 Services rendered under sub-section 1.4 shall be done without any extra charge.

1.4 The Contractor must get acquainted with the proposed site for the works and study Specifications and Conditions carefully before tendering. The work shall be executed as per programme approved by the Project Manager. If part of site is not available for any reason or there is some unavoidable delay in supply of materials stipulated by the Owner, the programme of construction shall be modified accordingly and the Contractor shall have no claim for any extras or compensation on this account.

1.5 Works area shall be the area shown in the plan attached.

2. SPECIFICATIONS

2.1 Work under this contract shall be carried out strictly in accordance with Specifications attached with the tender.

2.2 Items not covered under these Specifications due to any ambiguity or misprints, or additional works, the work shall be carried out as per Specifications of the latest Central Public Works Department with latest amendments as applicable in the contract.

2.3 Works not covered above para 2.1 and 2.2. shall be carried out as per relevant Indian Standards Specifications or Codes of Practice and, if not available, as per British Standards specifications or Codes of Practice or unified Plumbing Code of U.S.A.

2.4 The work shall be carried out strictly as specified in Schedule of Quantities and Technical Specifications. In case of any ambiguity, the details of particular item as given in Schedule of Quantities shall supersedes the details in Specifications.

3. EXECUTION OF WORK

3.1 The work shall be carried out in conformity with the Plumbing & Fire Fighting drawings and within the requirements of Architectural, HVAC, Electrical, Structural and Other specialized services drawings.

3.2 The Contractor shall cooperate with all trades and agencies working on the site. He shall make provision for hangers, sleeves, structural openings and other requirements well in advance to prevent hold up of progress of the construction programme.

3.3. On award of the work, Contractor shall submit a programme of construction in the form of a Pert Chart or Bar Chart for approval of the Project Manager. All dates and time schedule agreed upon should be strictly adhered to, within the stipulated time of completion/commissioning along with the specified phasing, if any.

4. DRAWINGS

4.1 Plumbing & Fire Fighting drawings are diagrammatic but shall be followed as closely as actual construction permits. Any deviations made shall be in conformity with the Architectural and other services drawings.

4.2 Architectural drawings shall take precedence over Plumbing or other services drawings as to all dimensions.

4.3 Contractor shall verify all dimensions at site and bring to the notice of the Architects or Project Manager all discrepancies or deviations noticed. Architects decision shall be final.

4.4 Large size details and manufacturers dimensions for materials to be incorporated shall take precedence over small-scale drawings.

4.5 All drawings supplied with the tender shall be returned in good conditions along with the tender.

4.6 All drawings/sketches issued by the Architects/Consultant for the works are the property of the Architects/Consultant and shall not be lent, reproduced or used on any works other than intended without the written permission of the Architects/Consultant.

5. INSPECTION AND TESTING OF MATERIALS

5.1 Contractor shall be required, if requested, to produce manufacturers Test Certificate for the particular batch of materials supplied to him. The tests carried out shall be as per the relevant Indian Standards.

5.2 For examination and testing of materials and works at the site Contractor shall provide all Testing and Gauging Equipment necessary but not limited to the followings:-

a) Theodolite
b) Dumpy level
c) Steel tapes
d) Weighing machine
e) Plumb bobs, Spirit levels, Hammers
f) Micrometers
g) Thermometers, Stoves
h) Hydraulic test machine
i) Smoke test machine

5.3 All such equipment shall be tested for calibration at any approved laboratory, if required by the Project Manager.

5.4 All Testing Equipment shall be preferably located in special room meant for the purpose.

6. METRIC CONVERSION

6.1 All dimensions and sizes of materials and equipment given in the tender document are commercial metric sizes.

6.2 Any weights, or sizes given in the tender having changed due to metric conversion, the nearest equivalent sizes accepted by Indian Standards shall be acceptable without any additional cost.

7. REFERENCE POINTS

7.1 Contractor shall provide permanent Bench Marks, Flag Tops and other reference points for the proper execution of work and these shall be preserved till the end of the work.

7.2 All such reference points shall be in relation to the levels and locations given in the Architectural and Plumbing drawings.

8. REFERENCE DRAWINGS

8.1 The Contractor shall maintain one set of all drawings issued to him as reference drawings. These shall not be used on site.

All corrections, deviations and changes made on the site shall be shown on these reference drawings for final incorporation in the completion drawings. All changes to be made shall be initialed by the Project Manager.

9. SHOP DRAWINGS

9.1 Shop drawings shall be submitted under following conditions:-

(a) Typical details for Toilets & Fixtures required.

(b) Structural supports/hanging/laying and jointing details for all types of pipes as required.

(c) Plumbing layout plans as required and for any changes in the layout of Plumbing /Architectural Drawings.

(d) Equipment & piping layout for Mechanical and Electrical equipments as required, SLDs, mounting details of circuit breakers, location of panels, installation of terminals and faucets etc. w.r.t. finishes, surrounding levels & locations.

(e) Manufacturer's and Contractor fabrication drawings

10. CONTRACTORS RATES

10.1 Rates quoted in this tender shall be inclusive of cost of materials, labour, supervision, erection, tools, plant, scaffolding, service connections, transport to site, taxes, octroi and levies, breakage, wastage, sales tax on works contract and all such expenses as may be necessary and required to completely do all the items of work and put them in a working condition.

10.2 Rates quoted are for all heights and depths required for this work.

10.3 All rates quoted must be for complete items inclusive of all such accessories, Fixtures and fixing arrangements, nuts, bolts, hangers as are a standard part of the particular item except where specially mentioned otherwise.

10.4 All rates quoted are inclusive of cutting holes and chases in walls and floors and making good the same with cement mortar/concrete of appropriate mix and strength as directed by Project Manager. Contractor shall provide holes, sleeves and recesses in the concrete and masonry work as the work proceeds.

10.5 Rates quoted shall be inclusive of cost incurred in testing, commissioning of works and materials.

11. TESTING

11.1 Piping and drainage works shall be tested as specified under the relevant clauses of the specifications.

11.2 Tests shall be performed in the presence of the Project Manager/ Consultant.

11.3 All materials and equipment found defective shall be replaced and whole work tested to meet the requirements of the specifications.

11.4 Contractor shall perform all such tests as may be necessary and required by the local authorities to meet Municipal or other bye-laws in force.

11.5 Contractor shall provide all labour, equipment and materials for the performance of the tests.

11.6 Contractor shall afford all the expenses for the offsite testing of material and equipments.

12. SITE CLEARANCE AND CLEANUP

12.1 The Contractor shall, from time to time clear away all debris and excess materials accumulated at the site.

12.2 After the Fixtures, equipment and appliances have been installed and commissioned, Contractor shall clean-up the same and remove all plaster, paints stains, stickers and other foreign matter of discoloration leaving the same in a ready to use condition.

12.3 On completion of all works, Contractor shall demolish all stores, remove all surplus materials and leave the site in a broom clean condition, failing which the same shall be done at Contractors risk and cost.

13. LICENSE AND PERMITS

13.1 Contractor must hold a valid Plumbing license issued by the Municipal Authority or other competent authority under whose jurisdiction the work falls.

13.2 Contractor must keep constant liaison with all relevant authorities and shall be responsible for obtaining all approvals relating to water supply, sewerage, drainage system. He shall also be responsible for co-ordination for getting the approval, with other agencies working on the project relating to their scope of work.

13.3 Contractor shall obtain No Objection Certificate before commencement of work, from the local authorities all related to his work as required for the building.

13.4 Contractor shall obtain, from the local authorities all related completion certificates with respect to his work as required for occupation of the building.

13.5 All inspection fees or submission fees paid by the Contractor shall be reimbursed by the Owner on production of valid official receipts.

14. MATERIALS

14.1 All materials used in the works shall conform to the tender specifications.

14.2 As far as possible materials bearing I.S. certification marks shall be used with the approval of the Project Manager.

14.3 Unless otherwise specified and expressly approved in writing by the Project Manager, materials of makes and specifications mentioned with tender shall be used.

15. MOCK UP

The Contractor shall install all pipes, Fixtures, clamps and accessories and fixing devices in mock-up shaft and room so constructed as directed by Project Manager without any extra cost. The materials used in the mock-up may be reused in the works if found undamaged.

Any tiles or finished surfaces or floors damaged by the Contractor while doing his work shall be made good with new tiles or other finishing material. No payment shall be admissible for such repairs. The Project Manager may, at his discretion get the damaged work repaired by other agencies and debit the cost of such repairs to the Contractor.

TECHNICAL SPECIFICATIONS

SECTION – I SANITARY FIXTURES

1. SCOPE OF WORK

1.1 Work under this section shall consist of furnishing all labour materials necessary and required to completely install all sanitary fixtures, chromium plated fittings and accessories required by the drawings and specified hereinafter or given in the schedule of quantities.

1.2 Without restricting to the generality of the foregoing the sanitary fixtures shall include all sanitary fixtures, C.P. fittings and accessories, etc., necessary and required for the building.

1.3 Whether specifically mentioned or not all fixtures and appliances shall be provided with all fixing devices, nuts, bolts, screws, hangers as required.

1.4 All exposed pipes within toilets and near fixtures shall be chromium plated brass or copper unless otherwise specified.

2. GENERAL REQUIREMENTS

2.1 Sanitary fixtures shall be of the best quality approved by the engineer-in-charge. Wherever particular makes are mentioned, the choice of selection shall remain with the engineer-in-charge.

2.2 All fixtures and fittings shall be provided with all such accessories as are required to complete the item in working condition whether specifically mentioned in the schedule of quantities, specifications or drawings or not.

2.3 All fixtures and accessories shall be fixed in accordance with a set pattern matching the tiles or interior finish as per architectural/interior designer's requirements. Wherever necessary, the fittings shall be centered to dimensions and pattern desired.

2.4 Fixing screws shall be half round head chromium plated brass screws with C.P. washers wherever required as per directions of engineer-in-charge.

2.5 All fittings and fixtures shall be fixed in a neat work manlike manner true to level at shown on drawings and in accordance with the manufacturer's recommendations. Care shall be taken to fix all inlet and outlet pipes at correct positions. Faulty locations shall be made good and any damage to the finished floor, tiling or terrace shall be made good at contractor's cost.

2.6 When directed contractor shall install fixtures and accessories in a mock up room for the approval of the engineer-in-charge. Sample room fixtures may be re-used on the works if undamaged, but no additional payment for fixing or dismantling shall be admissible.

3. EUROPEAN W.C. SET

3.1 European W.C. shall be wash down type floor/ wall mounted set of best quality flushed by means of flushing cisterns as given in the schedule of quantities.

3.2 Each W.C seat shall be so fixed that it remains absolutely stationery in vertical position without falling down on the W.C. and colour shall be as given in the schedule of quantities.

3.3 Where fixtures or trim come in contact with wall and/or floor, joint shall be made watertight with white silicone base non-hardening caulking compound, finished in a neat manner.

4. LAVATORY BASIN

4.1 Lavatory basins shall be coloured or white glazed vitreous china of best quality, size, shape and type specified in the schedule of quantities.

4.2 Each basin shall be with R.S. or C.I brackets and clips and the basin securely fixed to wall. Placing of basin over the brackets without secure fixing shall not be accepted.

4.3 Each basin shall be provided with 32 mm dia. C.P. waste with overflow, popup waste or rubber plug and chain 32 mm dia. C.P. brass bottle trap and angle valves with C.P. pipe wall and flange as given in the schedule of quantities.

4.4 Each basin shall be provided with mixing fitting or pillar tap as specified in the schedule of quantities.

5. SINKS

5.1 Sinks shall be stainless steel as specified in the schedule of quantities.

5.2 Each sink shall be provided with R.S. or C.I. brackets and clips and securely fixed. Counter top sinks shall be fixed with suitable angle iron clips or brackets as recommended by the manufacturer. Each sinks shall be provided with 40 mm dia. C.P. waste with chain and plug or PVC waste. Waste shall be rigid PVC pipes concealed or exposed. Fixing shall be done as directed by engineer-in-charge.

5.3 Supply fittings for sinks shall be fittings or C.P. taps as specified in the schedule of quantities.

6. SHOWER SET

6.1 Shower set shall comprise of wall mounted mixing arrangements as specified in the schedule of quantities.

6.2 Each shower set shall be provided with a C.P. shower rose of approved quality and arm with wall flange as specified in the schedule of quantities.

6.3 Concealed wall mixer shall be so fixed as to keep the wall flange cleared off the finished wall. Wall flanges embedded in the finishing shall not be accepted.

7. BATH TUBS

Bath tub shall be fixed as per manufacturer's specification The tub shall have built in mixing fitting, spout, overflow cum drain connections etc.

8. ACCESSORIES

8.1 Contractor shall install all chromium plated and porcelain accessories as shown on the drawings directed by engineer-in-charge, and given in the schedule of quantities.

8.2 All C.P. accessories shall be fixed with C.P. brass half round head screws and cut washer in wall with rawl plugs and shall include cutting and making good as directed by engineer-in-charge.

8.3 Porcelain accessories shall be fixed in walls and set in cement mortar 1:2 (1 cement 2 fine sand) and fixed in relation to the tiling work.

9. MEASUREMENT

9.1 Rate for fixing of sanitary fixtures, accessories shall include all items and operations stated in the respective specifications and schedule of quantities, and nothing extra is payable.

9.2 Rates for all items under specifications para above shall be inclusive of cutting holes and chases and making good the same, C.P. screws, nuts, bolts and any fixing arrangement required and recommended by manufacturers, testing and commissioning.

SOIL, WASTE & VENT PIPES

1. SCOPE OF WORK

1.1 Work under this section shall consist of furnishing all labour, materials, equipments and appliances necessary and required to completely install all soil, waste, vent and rainwater pipes as required by the drawings, specified hereinafter and given in the Schedule of Quantities.

1.2 Without restricting to the generally of the foregoing, the soil, waste, vent and rainwater pipes system shall include the followings:-

a) Vertical and horizontal Soil, Waste and Vent Pipes, Rainwater Pipes and Fittings, Joints Clamps and connections to Fixtures.

b) Connection of pipes to Gully Traps & Manholes around the building etc.

c) Floor and urinal traps, cleanout plugs, inlet fittings and rainwater heads as specified.

d) Waste pipes connections from all Fixtures e.g. wash basins, sinks, urinals and kitchen equipment's.

e) Testing of all pipes.

2. GENERAL REQUIREMENTS

2.1 All materials shall be new of the best quality conforming to specifications and subject to the approval of Engineer-in-Charge.

2.2 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workmanlike manner.

2.3 Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.

2.4 Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals specified.

2.5 Access doors for fittings and cleanouts shall be so located that they are easily accessible for repair and maintenance.

2.6 All works shall be executed as directed by Engineer-in-Charge.

3. uPVC Pipes and Fittings

The pipes shall be round and shall be supplied in straight lengths with socketed ends. The internal and external surfaces of pipes shall be smooth, clean, free from groovings and other defects. The ends shall be cleanly cut and square with the axis of the pipe. The pipes shall be designed by external diameter and shall conform to IS:13592, IS:4985-1981. The pipes shall be of Type- A (4 Kg/sqm), Type-B & Class-III; 6 Kg/sqm pressure rating.

3.1 Fittings

Fittings shall be of the same make as that of pipes, injection moulded and shall conform to Indian Standard.

3.2 Laying and Jointing

The pipes shall be laid and clamped to wooden plugs fixed above the surface of the wall. Alternatively plastic clamps of suitable designs shall be preferred. Provision shall be made for the effect of thermal movement by not gripping or disturbing the pipe at supports between the

anchors for suspended pipes. The supports shall allow the repeated movements to take place without abrasion.

Jointing for UPVC pipes shall be made by means of solvent cement for horizontal lines and 'O' rubber ring for vertical line. The type of joint shall be used as per site conditions / direction of the CLIENT's site representative. Where UPVC pipes are to be used for rain water pipes, the pipe shall be finished with GI adopter for insertion in the RCC slab for a water proof joint complete as directed by CLIENT's site representative.

3.3 Supports

UPVC pipes require supports at close intervals. Recommended support spacing for unplasticised PVC pipes is 1400 mm for pipes 50 mm dia and above. Pipes shall be aligned properly before fixing them on the wooden plugs with clamps. Even if the wooden plugs are fixed using a plumb line, pipe shall also be checked for its alignment before clamping, piping shall be properly supported on, or suspended from clamps, hangers as specified and as required. The Tenderer shall adequately design all the brackets, saddles, anchors, clamps and hangers and be responsible for their structural sufficiency. Pipe supports shall be primer coated with rust preventive paint.

3.4 Repairs

While temporary or emergency repairs may be made to the damaged pipes, permanent repairs shall be made by replacement of the damaged section. If any split or chipout occur in the wall of the pipe, a short piece of pipe of sufficient length to cover the damaged portion of the pipe is cut. The sleeve is cut longitudinally and heated sufficiently to soften it so that it may be slipped over the damaged hard pipe.

3.5 Fixing

3.5.1 All vertical pipes shall be fixed by M.S. clamps truly vertical. Branch pipes shall be connected to the stack at the same angle as that of the fittings. No collars shall be used on vertical stacks. Each stack shall be terminated at top with a Cowl (terminal guard).

3.5.2 Horizontal pipes running along ceiling shall be fixed on structural adjustable clamps of special design shown on the drawings or as directed. Horizontal pipes shall be laid to uniform slope and the clamps adjusted to the proper levels so that the pipes fully rest on them.

3.5.3 Contractor shall provide all sleeves, openings, hangers, inserts during the construction. He shall provide all necessary information to the building Contractor for making such provisions in the structure as necessary. All damages shall be made good to restore the surface.

4.0 CLAMPS

4.1 M.S. clamps shall be of standard design and fabricated from M.S. flat 40x3mm thick. They shall be painted with two coats of black bitumen paint before fixing.

4.2 Where M.S. clamps are to be fixed on RCC columns or slotted angles, walls or beam they shall be fixed with 40x3mm flat iron "U" type clamps with anchor fasteners of approved design or 6mm nuts and bolts.

4.3 Structural clamps shall be fabricated from M.S. Structural members e.g. rods, angles, channels flats as per detailed drawing or as directed. Contractor shall provide all nuts, bolts, welding material and paint the clamps with one coat of red oxide and two or more coats of black Enamel paint. Wooden saddles, where required shall be provided free of cost.

4.4 Slotted angle/channel supports on walls shall be provided wherever shown on drawings. Angles/channels shall be of sizes shown on drawings or specified in Schedule of Quantities, angles/channels shall be fixed to brick walls with bolts embedded in cement concrete blocks

and to RCC walls with suitable anchor fasteners. The spacing of support bolts horizontally shall not exceed 1 m.

4.5 Wherever M.S. clamps are required to be anchored directly to brick walls, concrete slabs, beams or columns, nothing extra shall be payable for clamping arrangement and making good with cement concrete 1:2:4 mix (1 cement: 2 coarse sand: 4 mm stone aggregate 20mm nominal size) as directed by the Engineer-in-Charge.

5. TRAPS

5.1 Floor traps shall be uPVC deep seal with an effective seal of 50 mm. The trap and waste pipes shall be set in cement concrete blocks firmly supported on the structural floor. The blocks shall be in 1:2:4 mix (1 cement: 2 coarse sand: 4 stone aggregate 20 mm nominal size) and extended to 40 mm below finished floor level. Contractor shall provide all necessary shuttering and centering for the blocks. Size of the block shall be 30x30 cm of the required depth.

5.2 Floor Trap Inlet

Bath room traps and connections shall ensure free and silent flow of discharging water. Where specified, Contractor shall provide a special type inlet hopper without or with one, two or three inlet sockets to receive the waste pipe. Hopper shall be connected to uPVC trap with at least 50 mm seal (Hopper and traps shall be paid for separately.) floor trap inlet hoppers and the traps shall be set in cement concrete blocks as specified in Para above without extra charge.

5.3 C.P./Stainless Steel/ Bronze Chrome Plated Gratings

Floor and Urinal Traps shall be provided with 100-150 mm square or round C.P/Stainless steel grating, with rim of approved design and shape. Minimum thickness shall be 4-5 mm or as specified in the Schedule of Quantities.

6.0 CLEANOUT PLUGS

Contractor shall provide brass/plastic cleanout plugs as required. Cleanout plugs shall be threaded and provided with key holes for opening. Cleanout plugs shall be fixed to the pipe by a male threaded adaptor.

7. WASTE PIPE FROM APPLIANCES

7.1 Waste pipe from appliances e.g. wash basins, sinks, urinals, bathtubs, water coolers shall be of uPVC as given in the Schedule of Quantities or as shown on the drawings.

7.2 All pipes shall be fixed in gradient towards the outfalls of drains. Pipes inside a toilet room shall be in chase unless otherwise shown on drawings. Where required pipes may be run at ceiling level in suitable gradient and supported on structural clamps. Spacing for clamps for such pipes shall be as follows:-

	Vertical	Horizontal
uPVC pipes	140 cms	90 cms

7.3 Galvanized Iron Pipes

Pipes shall be galvanized iron tubes conforming to IS: 1239-1979 (heavy class) and quality certificates shall be furnished. Pipes shall be provided with all required fittings e.g. Tees, Couplings, Bends, Elbows, Unions, Reducers, Nipples, and Plugs. All G.I. waste pipes shall be terminated at the point of connection with the appliance with an outlet of suitable diameter.

8.0 CEMENT CONCRETE

8.1 uPVC Soil and Waste pipes under floors in sunken slabs and in wall chases (When cut specially for the pipe) shall be encased in cement concrete 1:2:4 mix (1 cement: 2 coarse

sand: 4 stone aggregate 12 mm size) 75 mm in bed and all-round. When pipes are running well above the structural slab, the encased pipes shall be supported with suitable cement concrete pillars of required height and size at intervals as directed by Engineer-in-Charge.

9.0 PAINTING

9.1 Wherever CI pipes are used, it shall be painted with two or more coats of synthetic enamel paint to give an even shade.

9.2 Paint shall be of approved quality and shade, pipes shall be painted in accordance with approved pipe colour code.

9.3 Waste pipes in chase shall be painted with two coats of Bitumen paint, covered with polythene tape and a final coat of bitumen paint. Exposed pipes shall be painted with two or more coats of Synthetic enamel paint.

9.4 uPVC pipes below ground and covered in cement concrete shall not be painted.

10.0 CUTTING AND MAKING GOOD

10.1 Pipes shall be fixed and tested as buildings proceeds. Contractor shall provide all necessary holes cutouts and chases in structural members as building work proceeds. Wherever holes are cut or left originally, they shall be made good with cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 stone aggregate 20 mm nominal size) or cement mortar 1:2 (1 cement: 2 coarse sand) and the surface restored as in original condition.

11.0 INSPECTION & TESTING

11.1 Inspection

Work should be inspected during installation and tests applied on completion, care being taken that, all work which is to be encased for concealed is tested before it is finally enclosed.

Inspection should be carried out to ensure the following:

(a) Work accords with the drawing and specifications.

(b) All pipe brackets, clips etc. are securely fixed.

(c) Fixtures are correctly spaced.

(d) Pipe is protected where necessary by Thermal Insulation.

(e) Embedded pipe work is properly protected before sealing-in

(f) All access covers, caps or plugs.

- Are accessible
- Are so made that the internal faces truly complete in internal bore.
- Cause no obstruction in the pipe bore
- Are well joined.

11.2 Testing

The soil, waste piping system and rain water should be tested after installation as follows:

(a) Water Test
The pipes shall be tested after installation & before the appliances are connected, preferably in sections so as to limit the static head of 4.5m. The pipe shall be filled with water for at least 10 minutes. After filling, pipes shall be struck with a hammer and inspected for blow holes and cracks. Then it will be necessary to seal all openings and leaks at joints immediately as observed during the test and all defective pipes shall be

rejected and removed from the site. Pipes with minor sweating shall be accepted at the discretion of the Engineer-in-Charge.

(b) Smoke Test
Alternatively, the Contractor may test all Soil, Waste and Rainwater stacks by smoke testing machine. The smoke test shall be carried out as under:

Smoke shall be pumped into the stack after plugging all inlets and connections at the lowest points from a smoke testing machine which consists of a bellow & burner. The material usually burnt is greasy cotton waste which gives out a clear pungent smoke which is easily detected by sight as well as by smell, if there is leak at any points of the pipe. The top end shall however be left open. The stack shall then be observed for leakness and all defective pipes and fittings removed or repaired as directed by the Engineer-in-Charge.

11.3 A test register shall be maintained and all entries shall be signed and dated by Contractors and Engineer-in-Charge.

12.0 MEASUREMENTS

12.1 General

12.1.1 Rates for all items quoted shall be inclusive of all work and items given in the above mentioned specifications and Schedule of Quantities and applicable for the work under floor, in shafts or at ceiling level at all heights and depths.

12.1.2 All rates are inclusive of cutting holes and chases in RCC and masonry work and making good the same.

12.1.3 All rates are inclusive of pre testing and on site testing of the installations, materials and commissioning.

12.2 Pipes (Unit of measurement. Linear meter to the nearest centimeter)

12.2.1 uPVC pipes shall be measured along the center line when fixed, correct to a centimeter including all fittings along its length.

12.2.2 uPVC pipes shall be measured overall along the center line correct to a centimeter including all fittings along its length. The rate for these pipes shall be inclusive of all fittings, holder bat clamps, lead caulked joints and all other items described in the Schedule of Quantities. Traps structural clamps and cement concrete shall however be paid separately under the relevant item.

12.2.3 G.I. & S.C.I pipe shall be measured per running meter correct to a centimeter for the finished work, which shall include fittings e.g. Bends, Tees, Elbows, Reducers, Crosses, Sockets, Nipples and Nuts but exclude brass or Gunmetal Taps (Cocks), Valves lead connection pipes and shower rose. The length shall be taken along center line of the pipes and fittings. All pipes and fittings shall be classified according to their diameter, method of jointing and fixing substance, quality and finish. The diameter shall be nominal diameter of internal bore. The pipes shall be described as including all cutting and waste. In case of fittings of unequal bore, the largest bore shall be measured.

12.3 Cement concrete around pipes shall be measured along the center of the pipe line measured per linear meter and include any Masonry Supports, Shuttering and Centering Cutting complete as described in the relevant specifications.

12.4 Slotted angles/channels shall be measured per linear metre of finished length and shall include support bolts and nuts embedded in masonry walls with cement concrete blocks and nothing extra will be paid for making good the same.

12.5 Painting: Painting of pipes shall be measured per running metre and shall be inclusive of all fittings and clamps. No deduction for fittings shall be made.

12.6 Excavation for soil pipes: No extra payment shall be admissible with respect to excavation, refilling and disposal of surplus earth for uPVC Soil and Waste Pipes.

SECTION - III WATER SUPPLY SYSTEM

1. SCOPE OF WORK

1.1 Work under this section consists of furnishing all labour, materials, equipment and appliances necessary and required to completely install the water supply system as required by the drawings, specified hereinafter and given in the schedule of quantities.

1.2 Without restricting to the generality of the foregoing, the water supply system shall include the following:

a. Rising main from all external water supply line to overhead tanks.

b. Insulation of hot and cold water pipe lines.

c. Control valve, masonry chambers and other appurtenances.

d. Cold water supply, Flushing water supply and Hot water supply.

e. Connections to all plumbing fixtures, pantries and overhead tanks.

f. Excavation and refilling of pipe trenches.

g. Pipe protection and painting.

2. GENERAL REQUIREMENTS

2.1 All materials shall be new of the best quality conforming to specifications. All works executed shall be to the satisfaction of the engineer-in-charge.

2.2 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workman like manner.

2.3 Short or long bends shall be used on all main pipe lines as for as possible. Use of elbows shall be restricted for short connections. As for as possible all bends shall be formed by means of hydraulic pipe bending machine for pipes up to 65 mm dia.

2.4 Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages, etc.

2.5 Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals specified.

2.6 Valves and other appurtenances shall be located to provide easy accessibility for operation, maintenance and repairs.

3. G.I. PIPES, FITTINGS AND VALVES

3.1 All water supply pipes and where specified, outside the building shall be galvanized steel tubes conforming to IS 1239-1979 of class specified When class is not specified they shall be medium class.

3.2 Fittings shall be malleable iron galvanized fittings of approved make. All fittings shall have manufacturer's trade mark stamped on it. Fittings of G.I. pipes shall include couplings, bends, tees, nipples, reducers, unions, bushes. Fittings shall be I.S. 1979 (part I to X) 1987 / equivalent local standard.

3.3 Pipes and fittings shall be joined with screwed fittings. Care shall be taken to remove butt from the end of the pipe after cutting by a round file. Genuine red lead with grumet and a few strands of fine hemp shall be applied. All pipes shall be fixed in accordance with layout and alignment shown on the drawings. Care shall be taken to avoid air pocket. G.I. pipes inside

toilets shall be fixed in wall chases well above the floor. No pipes shall be run inside as sunken floor as for as possible. Pipes may be run under the ceilings or floors and other areas as shown on drawings.

4. CLAMPS

4.1 G.I. pipes in shafts and other locations shall be supported by M.S. clamps of design approved by the engineer-in-charge. Pipes at ceiling level shall be supported on structural clamps fabricated on M.S. structural Pipes in typical shaft shall be supported on slotted angles/channels as specified elsewhere.

5. UNIONS

5.1 Contractor shall provide adequate number of flanges on all larger diameter pipes to enable dismantling later. Unions shall be provided for smaller diameter pipes at appropriate locations and required and/or directed by engineer-in-charge.

6. FLANGES

6.1 Flanged connections shall also be provided on all equipment connections as necessary and required or as directed by the engineer-in-charge. Flanges shall be of forged type and not casted. Connections shall be made by the correct number and size of the bolts and made with 3 mm thick insertion rubber washer.

7. TRENCHES

7.1 All G.I. pipes below ground level shall be laid in trenches shall have a minimum cover of 60cms. Excavation for trenches shall be done as specified in subsequent pages of this tender but the width and depth of the trenches shall be as follows:

Dia.of pipes	Width of trenches	Depth of trenches
15 mm to 50 mm	30 cms	75 cms
65 mm to 100 mm	45 cms	100 cms

7.2 Where specified all G.I. pipes in trenches shall be protected with fine sand 15 cms alround before filling in the trenches.

8. PIPE PROTECTION

8.1 Where specified in the schedule of quantities all pipes in chase or below ground shall be protected against corrosion by applying one coats of bitumen paint, wrapping with multilayered non-woven polyester mat as per manufacturer's specifications.

9. VALVES

9.1 Valves up to 80 mm dia. shall be ball valves with cast iron body and stainless steel ball. Valves 80 mm dia. and above shall be cast iron butterfly valves with epoxy coated disc carbon steel shaft and lever actuator. Valves shall be tested at manufacturer’s place and their name stamped on it.

9.2 All valves shall be approved by the engineer-in-charge before they are allowed to be used on work. However the final responsibility of the quality of material lies with the contractor.

10. AIR VALVES

10.1 Air valves shall be provided in all high points in the system to prevent air locks, as shown on the drawings or directed by engineer-in-charge.

10.2 Air valves shall be of single acting heavy duty brass spring type as specified in the schedule of quantities.

11. SCOUR VALVES

11.1 Scour valves shall be provided at all low points in the system as shown on the drawings or directed by engineer-in-charge. Valves shall be SS ball valves for sizes 50 mm dia. and below and butterfly valve 65 mm dia. and above.

12. CPVC PIPES AND FITTINGS

12.1 All pipes within the shaft and toilets (in chases or under the floor) shall be CPVC (Chlorinated Polyvinyl Chloride) pipes as per IS 15778 : 2007

12.2 All fittings are solvent welded and conforming to ASTMD-2846.

12.3 Pipes shall be cut with either a wheel type plastic pipe cutter or hacksaw blade and care shall be taken to make a square cut which provides optimal bonding area within the joint. Dry cloth shall be used to wipe dirt and moisture from the fitting sockets and tubing ends. The tubing should make contact with the socket wall 1/3 or 2/3 of the way into the fitting socket. Only CPVC solvent should be used for joining the pipe with fittings. An even coat of solvent cement should be applied on the pipe end and a thin coat inside the fitting socket, otherwise too much of cement solvent can cause clogged water ways.

12.4 After applying the solvent cement on both pipe and fitting socket, pipe should be inserted into the fitting socket within 30 seconds and rotating the pipe ¼ to ½ turn while inserting so as to ensure even distribution of solvent cement with the joint. The assembled system should be held for 10 seconds approximately in order to allow the joint to set up. Solvent cement shall conform to ASTM - F 493.

13.0 uPVC PIPES AND FITTINGS

13.1 Definition
uPVC pipe means unplasticised Polyvinyl Chloride pipe , confirming to IS: 49813.
It has density of Approx. 1.43 g / Cm3 as such it is less then 1/6 th the weight of C.I. and steel pipes, therefore easier to handle during installation and transportation.

13.2 The uPVC Pipes to be used for Portable water to be odorless and hygienic, and should have inside surface mirror smooth.

13.3 The Pipes should have high corrosion resistance and should be immune to chemical electrolytic and galvanic action.

13.4 These Pipes should be longer lasting because of corrosion resistance property.

13.13 Handling guidelines
Pipes should be kept on an even surface while storing. They should be properly supported and should not be stacked for heights more then 1.13 meters for longer duration.

13.6 Jointing

13.6.1 Jointing Instructions

The uPVC Pipes are of two types i.e. Selfit and Ringfit.

13.6.1.1 The following procedure may be adopted while jointing the Pipes : -

Selfit Pipes

a) Cut the Pipes as square as possible and ensure fitment of Pipes with socket of fitting is correct. Total length of insertion of sockets to be marked from the Pipe.

b) The Pipe and the socket should be clean and dry. Dust, Oil, water, grease etc. should be wiped out with dry cloth or cleaner from the surfaces to be coated with Solvent Cement.

c) Roughen the outside of Pipe and inside of Socket using sand Paper up to the entry mark. Stir adhesive i.e. Solvent Cement thoroughly.

d) Apply thick coat of Solvent Cement using a flat clean brush evenly on the inside of the socket mouth for full length of insertion and then outside of the Pipe end up to the marked line.

e) After application of Solvent Cement, insert the Pipe within one minute in to the Socket. Hold the Joint for few seconds and ensure that the Pipe does not come out of the fittings. Wipe off extra cement and allow it to dry for at least 24 Hours. The PVC Pipe with joint is ready for use.

13.7 Consumption of Solvent Cement

Diameter of Pipe (mm)	20	213	32	40	130	63	713	90	110	160	200	2130	3113	400
Approx. No: of joints which can be made per litre of Solvent cement	324	270	2213	180	130	1213	103	79	134	27	113	9	13	2

a) Clean the inside of Socket. Remove all traces of mud, dirt, grease, gravel and also clean sealing ring.

b) Form the EPDM ring into heart shape by pinching a portion of ring inside. Insert it into the socket and release to seat in to the groove.

c) Mark the insertion depth on spigot portion of the pipe. Clean and apply lubricant to insertion depth before pushing in to the Socket. Ensure that no sand or dirt adheres to the lubricated surface of the Pipe.

d) Push the Spigot into the Socket until it reaches the depth of entry mark, taking care not to over insert. This can be done manually. Make sure that the insertion of Spigot end inside the socket should be at correct angle. The Pipe and Joint are ready for use.

e) In case of large diameter Pipes if crow bar does not give sufficient leverage, use of jointing jack may be helpful.

Pracautions:-

1. uPVC Pipes and Fittings should not be cleaned by Solvent Cement.

2. For large diameter and Higher class Pipes (10 kgf/cm2 & above), use heavy duty Solvent cement.

3. uPVC pipes and fittings to be used of same Brand and Manufacturer.

14. MANHOLE FRAMES AND COVER FOR WATER TANKS

14.1 Each tank shall be provided with adequate number of lockable type manhole frames and covers fabricated from M.S. sheet or standard cast iron tank covers as specified in schedule of quantities. Manhole covers shall be of sizes shown on drawings.

14.2 Concrete tanks

a. Contractor shall provide puddle flanges fabricated from M.S./G.I. pipes of required sizes and lengths and welded to 14 mm M.S. plates. All puddle flanges must be fixed in true alignment and level and shall be welded to the reinforcement to prevent movement during concreting.

b. Contractor shall make connection of pipe lines laid and fixed by him to concrete, masonry or steel tanks as required at site. No additional payment shall be allowed for making connections.

15 INSULATION

15.1 All pipes in the toilets shall be insulated with 6 mm thick nytryl rubber as per manufacturer's specifications and finishing with 6 mm thick rough plaster.

16. TESTING

16.1 All pipes, fittings and valves shall be tested by hydrostatic pressure of 10.13 kg/sqcm. Pressure shall be maintained for a period of atleast120 minutes without any drop in the pressure after fixing at site.

A test register shall be maintained and all entries shall be signed and dated by contractor(s) and engineer-in-charge.

16.2 In addition to the sectional testing carried out during the construction, contractor shall test the entire installation after connections to the overhead tanks or pumping system or mains. He shall rectify all leakages, and shall replace all defective materials in the system. Any damage done due to carelessness, open or burst pipes or failure of fittings, to the building, furniture and fixtures shall be made good during the defects liability period without any extra cost.

16.3 After commissioning of the water supply system, contractor shall test each valve by closing and opening it a number of times to observe if it is working efficiently. Valves which do not effectively operate shall be replaced by new ones at no extra cost and the same shall be tested as above.

17. MEASUREMENT

17.1 G.I. Pipes

Pipes above ground shall be measured per linear meter (to the nearest cm) and shall be inclusive of all fittings eg. Couplings, tees, bends, elbows, unions, flanges. Deduction for values shall be made. Rate quoted shall be inclusive of all fittings, excavation, back filling and disposal of surplus earth, cutting holes and chases and making good and all items mentioned in the specifications and schedule of quantities.

17.2 Cast Iron S/S pipe shall be measured per linear meter (to the nearest cm). Deduction of fittings shall be made. Pipe going into the socket shall not be measured. Rate shall be inclusive of laying, fixing, cutting holes, chases and making good the same and shall include all items mentioned in the specifications and schedule of quantities.

17.3 Cast iron double flanged pipes shall be measured per linear meter (to the nearest cm.) Deduction for fittings shall be made. No extra payment shall be allowed for pipes of nonstandard lengths. Rate shall be inclusive of all items mentioned in the specifications and schedule of quantities.

17.4 Fittings and valves

Fittings of S/S pipes, double flanged pipes, puddle flanged gunmetal valves, cast iron valves, air and scour valves and all other similar items mentioned in the schedule of quantities shall be measured by number and shall include all items mentioned in the specifications.

17.13 Insulation

Insulation for hot water pipes shall be measured per linear meter (to the nearest cm) along with centre line of pipe and shall be measured over all fittings and flanges. No separate or additional payment shall be made for insulation of bends, tees, flanges or other fittings. The rate shall include all items specified in the schedule of quantities and given in the specifications.

17.6 Structural support for tanks

R.S. joists or other MS structural supports for storage tanks shall be paid by weight of actual length of member fixed at site multiplied by its theoretical weight given in the manufacturer's catalogue. Rate shall be inclusive of hoisting, cutting and making good the walls and all items described in the schedule of quantities and specifications.

17.7 Brick masonry pillars of sizes mentioned in the schedule of quantities or shown on drawings shall be measured by volume of the finished pillar and shall be paid per cu.m.

17.8 Cement plaster for brick pillars etc., shall be measured by area of the finished surface.

17.9 Painting

a. For painting pipes with enamel or black bitumastic paint no separate payment shall be admissible.

b. Protection to pipes with polythelene tape shall be measured per linear meter and shall be inclusive of all fittings and valves.

SECTION - IV **EXTERNAL WORKS**

1.0 SCOPE OF WORK

1.1 Work under this section shall consist of furnishing all Labour, Materials, Equipments and Appliances necessary and required to completely finish Sewerage/Drainage system as required by the drawings and specified hereinafter or given in the Schedule of Quantities.

1.2 Without restricting to the generality of the foregoing, the sewerage/drainage system shall include:

a) Sewer/drainage works around the building.

b) Excavations including refilling etc.

c) Construction of Collection Chambers, Manholes and Drop Connections.

2.0 GENERAL REQUIREMENTS

2.1 All materials shall be new of the best quality conforming to specifications and subject to the approval of the Engineer-in-Charge.

2.2 Drainage lines shall be laid to the required gradients and profiles.

2.3 All drainage work shall be done in accordance with the local Municipal byelaws.

2.4 Location of all manholes, catch basins etc., shall be got confirmed from the Contractor from the Engineer-in-Charge before the actual execution of work at site.

2.13 All works shall be executed as directed by Engineer-in-Charge.

3.0 ALIGNMENT AND GRADE

The sewer pipes shall be laid to alignment and gradient shown on the drawings but subject to such modifications as shall be ordered by the Engineer-in-Charge from time to time to meet the requirements of the works. No deviations from the lines, depths of cutting or gradients of sewers shown on the plans and sections shall be permitted except by the express direction in writing of the Engineer-in-Charge.

4.0 SALT GLAZED STONEWARE PIPES

4.1 Stoneware pipes shall be of first class quality salt glazed and free from rough texture inside or outside and straight. All pipes shall have the manufacturers name marked on it and shall comply to IS: 6131-1971 and shall be of approved makes.

4.2 Laying and Jointing of Stoneware Salt Glazed Pipes

a) Pipes are liable to be damaged in transit and notwithstanding tests that may have been made before dispatch each pipe shall be examined carefully on arrival at site. Each pipe shall be rung with a wooden hammer or mallet and those that do not ring true and clear shall be rejected. Sound pipes shall be carefully stacked to prevent damage. All defective pipes should be segregated, marked in a conspicuous manner and their use in the works prevented.

b) The pipes shall be laid with sockets leading uphill and should rest on solid and even foundations for the full length of the barrel. Socket holes shall be formed in the foundation sufficiently deep to allow the pipe jointer room to work right round the pipe and as short as practicable to admit the socket and allow the joint to be made.

c) Where pipes are not bedded on concrete the trench bottom shall be left slightly high and carefully bottomed up as pipe laying proceeds so that the pipe barrels rest on firm ground.

If excavation has been carried too low it shall be made up with cement concrete 1:13:10 mix at the Contractor's cost and charges.

d) If the bottom of the trench consists of rock or very hard ground that cannot be easily excavated to a smooth surface, the pipes shall be laid on cement concrete bed of 1:13:10 mix to ensure even bearing.

4.3 Jointing of Pipes

a) Tarred gaskin shall first be wrapped round the spigot of each pipe and the spigot shall then be placed into the socket of the pipe previously laid, the pipe shall then be adjusted and fixed in its correct position and the gaskin caulked tightly home so as to fill not more than one quarter of the total length of the socket.

b) The remainder of the socket shall be filled with stiff mix of cement mortar (1 cement: 1 clear sharp washed sand). When the socket is filled, a fillet should be formed round the joint with a trowel forming an angle of 413 degrees with the barrel of the pipe. The mortar shall be beaten up and used after it has begun to set.

c) After the joint has been made any extraneous materials shall be removed from inside of the joint with a suitable scraper or "Badger". The newly made joints shall be protected until set from the sun, drying winds, rain or dust. Sacking or other materials, which can be kept damp, shall be used. The joints shall be exposed and space left all rounds the pipes for inspection by the Engineer-in-Charge. The inside of the sewer must be left absolutely clear in bore and free from cement mortar or other obstructions throughout its entire length, and shall efficiently drain and discharge.

5. uPVC PIPES AND FITTINGS

5.1. Definition

uPVC pipe means unplasticised Polyvinyl Chloride pipe , confirming to IS: 49813.
It has density of Approx. 1.43 g / Cm3 as such it is less then 1/6 th the weight of C.I. and steel pipes, therefore easier to handle during installation and transportation.

5.2. The uPVC Pipes to be used for Portable water to be odorless and hygienic, and should have inside surface mirror smooth.

5.3. The Pipes should have high corrosion resistance and should be immune to chemical electrolytic and galvanic action.

5.4. These Pipes should be longer lasting because of corrosion resistance property.

1 Handling guidelines

Pipes should be kept on an even surface while storing. They should be properly supported and should not be stacked for heights more then 1.13 meters for longer duration.

5.5. Jointing

Jointing Instructions

The uPVC Pipes are of two types i.e. Selfit and Ringfit.

The following procedure may be adopted while jointing the Pipes : -

Selfit Pipes

a) Cut the Pipes as square as possible and ensure fitment of Pipes with socket of fitting is correct. Total length of insertion of sockets to be marked from the Pipe.

b) The Pipe and the socket should be clean and dry. Dust, Oil, water, grease etc. should be wiped out with dry cloth or cleaner from the surfaces to be coated with Solvent Cement.

c) Roughen the outside of Pipe and inside of Socket using sand Paper up to the entry mark. Stir adhesive i.e. Solvent Cement thoroughly.

d) Apply thick coat of Solvent Cement using a flat clean brush evenly on the inside of the socket mouth for full length of insertion and then outside of the Pipe end up to the marked line.

e) After application of Solvent Cement, insert the Pipe within one minute in to the Socket. Hold the Joint for few seconds and ensure that the Pipe does not come out of the fittings. Wipe off extra cement and allow it to dry for at least 24 Hours. The PVC Pipe with joint is ready for use.

5.5 Consumption of Solvent Cement

Diameter of Pipe (mm)	20	213	32	40	130	63	713	90	110	170	200	2130	317	400
Approx. No: of joints which can be made per litre of Solvent cement	324	270	2213	180	130	1213	103	79	134	27	17	9	13	2

Ring-fit Pipes

a) Clean the inside of Socket. Remove all traces of mud, dirt, grease, gravel and also clean sealing ring.

b) Form the EPDM ring into heart shape by pinching a portion of ring inside. Insert it into the socket and release to seat in to the groove.

c) Mark the insertion depth on spigot portion of the pipe. Clean and apply lubricant to insertion depth before pushing in to the Socket. Ensure that no sand or dirt adheres to the lubricated surface of the Pipe.

d) Push the Spigot into the Socket until it reaches the depth of entry mark, taking care not to over insert. This can be done manually. Make sure that the insertion of Spigot end inside the socket should be at correct angle. The Pipe and Joint are ready for use.

e) In case of large diameter Pipes if crow bar does not give sufficient leverage, use of jointing jack may be helpful.

Pracautions:-

1. uPVC Pipes and Fittings should not be cleaned by Solvent Cement.

2. For large diameter and Higher class Pipes (6 kgf/cm2 & above), use heavy duty Solvent cement.

4. uPVC pipes and fittings to be used of same Brand and Manufacturer.

6.0 GULLY TRAPS

6.1 Gully traps shall be of the same quality as described for stoneware pipes in Clause 13.

6.2 Gully traps shall be fixed in cement concrete 1:13:10 mix (1 cement: 13 coarse sand: 10 stone aggregate 40mm nominal size) and a brick masonry chamber 30x30 cms inside in cement mortar 1:3 with 10 x 10 cms grating inside and 30x30 cms C.I. sealed cover and frame weighting not less than 7.2 kg to be constructed as per standard drawing. Where necessary, sealed cover shall be replaced with C.I. grating of the same size.

7.0 CAST IRON PIPES FOR DRAINAGE

7.1 All drainage lines passing under building, floors and roads with heavy traffic, in exposed position above ground e.g. service floor and basement ceiling shall be cast iron pipes conforming to IS:3989. Position of such pipes shall generally be shown on the drawings.

7.2 Cast iron pipes shall be centrifugally spun iron pipes conforming to I.S: 1736-1967. Quality certificates shall be furnished.

7.3 Fittings and Inspection Chambers

a) Fittings used for C.I. drainage pipe shall conform to I.S: 1738-1967. Wherever possible junction from branch pipes shall be made by a 'Y tee'.

b) Cleanout plugs shall be provided on head of each drain and at location indicated on plans or directed by Engineer-in-Charge. Cleanout plugs shall be of size matching the full bore of the pipe. Plugs shall be made out with G.I. coupling caulked into the socket of the pipe or fittings. The end shall be provided with a brass screwed plug with suitable key for opening.

7.4 Laying

a) All cast iron pipes and fittings shall be jointed with best quality soft Pig Lead (conforming to IS: 27-1977) which shall be free from impurities. In wet trenches joints shall be made from Lead Wool. Nothing extra will be paid for Lead Wool joints. Depth of pig lead and weight for joints shall be as given in I.S.code.

b) The spigot of pipe or fittings shall be centered in the adjoining socket by caulking. Sufficient turns of tarred gaskin to leave unfilled the required depth of socket for depth of 413mm when the gaskin has been caulked tightly home. Jointing ring shall be placed round the barrel and against the face of the socket. Molten Pig Lead shall then be poured to fill the remainder of the socket. This shall then be done in one pouring. The lead shall then be solidly caulked with suitable tools and hammers weighting not less than 2 kg.

c) For lead wool joints the socket shall be caulked with tarred gaskin, as explained above. The lead wool shall be inserted into the sockets and tightly caulked home skein by skein with suitable tools and hammers of not less than 2 kg weight until joint is filled.

7.13 Testing

a) All lengths of the sewer and drain shall be fully tested for water tightness by means of water pressure maintained for not less than 30 minutes. Testing shall be carried out from manhole. All pipes shall be subjected to a test pressure of at least 1.13 metre head of water. The test pressure shall, however, not exceed 1.13 metre head at any point. The pipes shall be plugged preferably with standard design rubber plugs on both ends. The upper end shall, however, be connected to a pipe for filling with water and getting the required head. The tolerance figure of two liters per centimeter of dia per kilometer may be allowed during a period of ten minutes. Subsidence of the test water may be due to one or more of the following causes.

(i) Absorption by pipes and joints

(ii) Sweating of pipe or joints

(iii) Leakage at joints or from defective pipes

b) Trapped Air

Allowance shall be made for (i) by adding water until absorption has ceased after which the test proper should commence. Any leakage will be visible and the defective part of the work should be cut out and made good. A slight amount of sweating which is uniform may be overlooked, but excessive sweating from a particular pipe or joint shall be watched for and taken as indicating a defect to be made good.

c) Sewer and Drain Pipelines shall be tested for straightness by:

(i) Inserting a smooth ball 12mm less than the internal diameter of the pipe. In the absence of obstructions such as yarn or mortar projecting at the joints the ball should roll down the invent of the pipe and emerge at the lower end.

(ii) Means of a mirror at one end and a lamp at the other end. If the pipe line is straight the full circle of light will be seen otherwise obstruction of deviation will be apparent.

d) The Contractor shall give a smoke test to the drains and sewer at his own expense and charges, if directed by the Engineer-in-Charge.

e) A test register shall be maintained which shall be signed and dated by Contractor, Engineer-in-Charge and representative of Architects/ Consultants.

8.0 RCC pipes

All pipes shall be centrifugally spun RCC pipes NP2. Pipes shall be true and straight with uniform bore throughout. Cracked, warped pipes shall not be used on the work. All pipes shall be tested by the manufacturer and the Tenderer shall produce, prior to use on site, a certificate to that effect from the manufacturer.

The pipes shall be with or without reinforcement as required and of the class as specified. These shall conform to IS:4138-1971.

All pipes shall be true to shape, straight, perfectly sound and free from cracks and flaws. The external and internal surface of the pipes shall be smooth and hard. The pipes shall be free from defects resulting from imperfect grading of the aggregate mixing or moulding.

Laying
RCC spun pipes shall be laid on cement concrete bed of cradles as specified and shown on the detailed drawings. The cradles may be precast and sufficiently cured to prevent cracks and breakage in handling. The invert of the cradles shall be left 12 mm below the invert level of the pipe and properly placed on the soil to prevent any disturbance. The pipe shall then be placed on `the bed concrete or cradles and set for the line and gradient by means of sight rails and boning rods, etc. Cradles or concrete bed may be omitted, if directed by the Project Manager.

Jointing
Semi flexiable type collar joint.

Hemp rope soaked in neat cement wash shall be passed round the joint and inserted in it by means of caulking tool. More skein of yarn shall be added and rammed home. Cement mortar with one part of cement and two part of sand and with minimum water content but on no account soft or sloppy, shall be carefully inserted, punched and caulked into the collar and more cement mortar added until the space of the collar has been filled completely with tightly caulked mortar. Provision of rubber sealing ring in the collar joint shall also be made. The joint shall then be finished off neatly outside the socket at an angle of 413 deg.

Curing

The joint shall be cured for at least seven days. Refilling at joints will be permitted only on satisfactory completion of curing period.

Cement Concrete for Pipe Supports:

a. Unless otherwise directed by the Project Manager cement concrete for bed, all round or in haunches shall be in the mix 1:4:8(1cement : 4 coarse sand :8 graded stone aggregate 40 mm nominal size):

Description	Upto 1.4 m Depth (13')	Upto 3 m Depth (10')	Beyond 3 m Depth (10')
Pipes in open ground (no sub soil water)	all round	in haunches	all round
RCC/C.I pipes in sub soil water	all round	in haunches	in haunches
RCC/C.I pipes (in all Conditions)	all round	in haunches	in haunches
RCC/C.I pipes under Road or building	all round	all round	all round

b. R C C pipes or CI pipes may be supported on brick masonry or precast RCC or in situ cradles. Cradles shall be as shown on the drawings.

c. Pipes in loose soil or above ground shall be supported on brick or stone masonry pillars as shown on the drawings.

Measurement:

a. Excavation

Measurement for excavation of pipes trenches shall be made per linear meter.

b. Trenches shall be measurement between outside walls of manholes at top and the depth shall be the average depth between the two ends to the nearest cm. The rate quoted shall be for a depth upto 1.13 metre or as given in the Bill of Quantities.

Payment for trenches more than 1.13 m in depth shall be made for extra depth as given in the Bill of Quantities and above the rate for depth upto 1.13 m.

c. RCC pipes shall be measured for length of the pipe line per linear meter.
   i. Length between manholes shall be recorded from inside of one manhole or inside of other manhole.
   ii. Length between gully trap and manhole shall be recorded between socket of pipe near gully trap and inside of manhole.

9.0 CEMENT CONCRETE AND MASONRY WORKS FOR MANHOLES AND CHAMBERS ETC.

9.1 Materials

a) Water
Water used for all the construction purposes shall be clear and free from Oil, Acid, Alkali, Organic and other harmful matters, which shall deteriorate the strength and/or durability of the structure. In general, the water suitable for drinking purposes shall be considered good enough for construction purpose.

b) Aggregate for Concrete
The aggregate for concrete shall be in accordance with I.S. 383 and I.S. 1317 in general, these shall be free from all impurities that may cause corrosion of the reinforcement. Before actual use these shall be washed in water, if required as per the direction of Engineer-in-Charge. The size of the coarse aggregate shall be done as per I.S.383.

c) Sand

Sand for various constructional purposes shall comply in all respects with I.S 6130 and I.S. 2117. It shall be clean, coarse hard and strong, sharp, durable, uncoated, free from any mixture of clay, dust, vegetable matters, mica, iron impurities soft or flaky and elongated particles, alkali, organic matters, salt, loam and other impurities which may be considered by the Engineer-in-Charge as harmful for the construction.

d) Cement
The cement used for all the constructional purposes shall be ordinary Portland cement or rapid hardening Portland cement conforming to I.S. 269.

e) Mild Steel Reinforcement
The mild steel for the reinforcement bars shall be in the form of round bars conforming to all requirements of I.S. 432 (Grade I).

f) Bricks
Bricks shall have uniform colour, thoroughly burnt but not over burnt, shall have plan rectangular faces with parallel sides and sharp right angled edges. They should give ringing sound when struck. Brick shall not absorb more than 20% to 22% of water, when immersed in water for 24 hours. Bricks to be used shall be approved by the Engineer-in-Charge.

g) Other Materials
Other materials not fully specified in these specifications and which may be required in the work shall conform to the latest I.S. All such materials shall be approved by the Engineer-in-Charge before use.

9.2 Cement Concrete (Plain or Reinforced)

a) Cement concrete pipes bedding, cradles, foundations and RCC slabs for all works shall be mixed by a Mechanical mixer where quantities of the concrete poured at one time permit. Hand mixing on properly constructed platforms may be allowed for small quantities by the Engineer-in-Charge. Rate for cement concrete shall be inclusive of all shuttering and centering at all depth and heights.

b) Concrete work shall be of such thickness and mix as given in the Schedule of Quantities.

c) All concrete work shall be cured for a period of at least 7 days. Such work shall be kept moist by means of gunny bass at all times. All pipe trenches and foundations shall be kept dry during the curing period.

9.3 Masonry Work
Masonry work for manholes, chambers, brick masonry pipe trench and such other works as required shall be constructed from 1st class bricks or 2nd class as specified in the Schedule of Quantities in cement mortar 1:13 mix (1 cement: 13 coarse sand). All joints shall be properly raked to receive plaster.

9.4 Cement Concrete for Pipe Support

a) Wherever specified or shown on the drawings, all pipes shall be supported in concrete bed all round or in haunches. The thickness and mix of the concrete shall be given in the Schedule of Quantities. Type of the bedding is as described as follows:

b) Unless otherwise directed by the Engineer-in-Charge cement concrete for bed, all round or in haunches shall be laid as follows:-

Description	Upto 1.13 M depth	1.13M – 3M	Above 3M
Pipes in open ground (No sub soil water) (SW/RCC)	All round (1:4:8)	In haunches (1:4:8)	All round (1:4:8)

Pipes (all) in sub soil water condition (SW/RCC)	All round (1:4:8)	In haunches (1:4:8)	In haunches (1:4:8)
Pipes under the building or at road crossing or under public places (RCC/CI)	All round (1:3:6)	All round (1:3:6)	All round (1:3:6)
C.I Pipes in all Conditions	All round (1:4:8)	In haunches (1:4:8)	In haunches (1:4:8)

(1=1 cement, 2-13=coarse sand, 4-10 stone aggregate 40mm nominal size)

c) R.C.C. pipes or C.I. pipes ,may be supported on brick masonry or precast R.C.C or Cast insitu cradles. Cradles shall be as shown on the drawings.

d) Pipes in loose soil or above ground shall be supported on brick or RCC anchor blocks as shown on the drawings.

10.0 MANHOLES AND CHAMBERS

10.1 All manholes, chambers and other such works as specified shall be constructed in brick masonry in cement mortar 1:4 (1 cement: 4 coarse sand) or as specified in the Schedule of Quantities.

10.2 All Manholes, Chambers, etc., shall be supported on base of cement concrete of such thickness and mix as given in the Schedule of Quantities or shown on the drawings.

Where not specified, Manholes may be constructed as follows:-

(All dimensions internal clear in cms)

Size of Manhole Type	90x80 Rect.	120x90 Rect.	1220 dia Circular	1400 dia Circular
Maximum depth	100	2413	2413	Any depth beyond 2413
Average thickness of R.C.C slab	10	17	--	--
Size of cover and frame (Internal dia)	61x413.13	130 dia	136 dia	136 dia
Weight of cover and frame	38 Kg. or as specified	117 Kg. or 170 Kg. or 208 Kg. or as specified in BOQ	117 Kg. or 170 Kg. or 208 Kg. or as specified in BOQ	117 Kg. or 170 Kg. or 208 Kg. or as specified in BOQ
Type of Cover & Frame	SFRC	C.I. or SFRC as specified in BOQ.	C.I. or SFRC as specified in BOQ.	C.I. or SFRC as specified in BOQ.

10.3 All manholes shall be provided with cement concrete benching in 1:2:4 mix (1 cement: 2 coarse sand: 4 stone aggregate 20mm nominal size). The benching shall have a slope of 10cm towards the channel. The depth of the channel shall be full diameter of the pipe. Benching shall be finished with a floating cost of neat cement.

10.4 All manholes shall be plastered with 12mm thick cement mortar 1:3 (1 cement: 3 coarse sand) and finished with a floating coat of neat cement inside. Manhole shall be plastered outside as above but with rough plaster.

10.13 All manholes with depths greater than 1 M. shall be provided with plastic encapsulated 20mm square or 213mm round rods foot rungs set in cement concrete blocks 213 x 10 x 10cms in 1:2:4 mix 30cms vertically and staggered. Foot rests shall be coated with coal tar before embedding.

10.6 All manholes shall be provided with cast iron covers and frames and embedded in reinforced cement concrete slab or SFRC precast concrete covers as per instructions of the Engineer-in-Charge. Weight of cover, frame and thickness of slab shall be as specified in the Schedule of Quantities or as given above.

10.7 All catch basins shall be having C.I. grating or SFRC precast Gully Grating as per instructions of Engineer-in-Charge. The grating along with frame shall be of approved design and quality as per instruction of Engineer-in-Charge.

11.0 MAKING CONNECTIONS

Contractor shall connect the new sewer line to the existing manhole by cutting the walls, benching and restoring them to the original condition. A new channel shall be cut in the benching of the existing manhole for the new connection. Contractor shall remove all sewage and water if encountered in making the connection without additional cost.

12.0 MEASUREMENT

12.1 Stoneware Pipes/R.C.C. Pipes/C.I. Pipes/uPVC Pipes

Stoneware pipes/R.C.C. pipes/C.I. pipes shall be measured for the finished length of the pipe line per linear metre i.e. (a) lengths between Manholes shall be recorded from inside of one manhole to inside of other manhole, (b) length between socket of pipe near gully trap and inside of manhole. Rate shall include all items given in the Schedule of Quantities and specifications.

12.2 Gully Traps
Gully traps shall be measured by the number and rate shall include all Excavation, Foundation, Concrete Brick Masonry, Cement Plaster inside and outside, C.I. Grating and sealed cover and frame.

12.3 Manholes

(a) All manholes shall be measured by numbers and shall include all items specified above and necessary Excavation, Refilling & Disposal of surplus earth.

(b) Manholes with depths greater than specified under the main item shall be paid for under “extra depth” and shall include all items as given for manholes. Measurement shall be done to the nearest cm. Depth of the manholes shall be measured from top of the manhole cover to bottom of Channel.

12.4 Drop Connections

Drop connections shall be measured by number for a depth of 60 cms or part thereof between invert levels. Additional depth shall be paid for as extra per metre depth as per the actual length of the drop connection, measured to the nearest cm.

12.13 Making Connections

Item for making connection to municipal sewer shall be paid for by number and shall include all items given in the Schedule of Quantities and Specifications.

12.6 Masonry Drains

Payment for masonry drains shall be made under individual items of Masonry, Cement concrete and plaster by volume or area as given in the Schedule of Quantities.

12.7 Brick Masonry and Cement Concrete shall be measured per cubic metre and shall include all items as given in the Schedule of Quantities.

12.8 Cement Plaster shall be measured per square metre area.

ELECTRICAL WORK

WIRING

1 GENERAL

Technical Specifications in this section cover the Internal Wiring Installations comprising of :

- Wiring for lights and convenience socket outlets etc. in concealed/surface conduit/raceways.
- Wiring for telephone outlets.
- Submain wiring.

2 STANDARDS AND CODES

The following Indian Standard Specifications and Codes of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable.

BIS certified equipment shall be used as a part of the Contract in line with Government regulations. Necessary test certificates in support of the certification shall be submitted prior to supply of the equipment.

It is to be noted that updated and current Standards shall be applicable irrespective of those listed below.

660/1100 V grade PVC insulated wires.	IS 694: 1990
Rigid steel conduits for electrical wiring.	IS 9537: Part I 1980 IS 9537 : Part II 1981
Accessories for rigid steel conduits	IS 3837 : 1990
Flexible steel conduits for electrical wiring	IS 3480 : 1990
Switch socket outlets	IS 4615 : 1990
Switches for domestic and similar purposes	IS 3854 : 1997
Boxes for the enclosure of electrical accessories	IS 5133 : Parts I &II 1969
Code of practice for personal hazard fire safety of buildings	IS 1644: 1998
Code of practice for electrical installation fire safety of buildings	IS 1646 : 1997
Code of practice for electrical wiring installations	IS 732 : 1989

3 CONDUITS

3.1 Steel Conduits

These shall be of mild steel 16 gauge upto 32mm and 14 gauge for sizes above 32mm, electric resistance welded (ERW), electric threaded type having perfectly circular tubing. Conduits shall be precession welded ERW and shall be fabricated from tested steel strips of thickness as per ISS by high frequency induction weld process. Weld shall be smooth and of consistent of high quality to ensure crack proof bending. The conduits shall be black enamel painted inside and outside in its manufactured form. Wherever so specified, the conduit shall be galvanized. All conduits used in this work shall be ISI embossed.

3.2 Steel Conduit Connections

Connections between steel conduits shall be with screwed couplers of approved quality and finish, ensuring screwed metal to metal contact. Length of threads shall be as per ISS and sufficient to accommodate pipes to full threaded portion of couplers or accessories. Threads and sockets shall be free from grease and oil. Conduits shall be connected to outlet boxes by means of M.S. hexagon check-nuts fixed both inside and outside the box. Conduit edges shall be free of burrs and provided with screwed PVC bushes to avoid damage to insulation of conductors while pulling them through the conduits. Connections between M.S. and PVC conduits, if required, shall be through a junction box and never directly.

3.3 PVC conduits

All conduiting for Electrical, Telephone, SMATV system shall be in PVC conduit. Wiring shall be carried out in separate conduits for lighting, power, telephone, SMATV system.

These shall be manufactured as per IS: 9537 (Part-1 & III) as well as ISI embossed. Colour of conduits shall be ivory and suitable to stand heavy duty mechanical stress for sizes upto 32mm. Conduits shall be suitable for working temperature upto -5 to +70 0C. High quality PVC shall be used and shall be of self extinguishing type and provide tensile strength upto 390-420kg/cm2. Dielectric strength of PVC shall not be less than 36kV/mm with good insulation resistance (more than 100 ohms).

3.4 Bends

Large right angle bends (more than 75 mm radius) or non right angle bends in conduit runs shall be made by means of conduits bending machines carefully so as not to cause any crack in the conduit. Small right angle bends in conduits runs can be made by standard conduit accessories (solid/inspection bends/elbows) no run of conduits shall have more than four right angle bends from outlet to outlet. Bends in multi runs of conduits shall be parallel to each other and neat in appearance, maintaining the same distance as between straight runs of conduits.

3.5 Conduit Accessories.

3.5.1 Standard accessories

Heavy duty black enamel painted standard conduit fittings and accessories like standard/extra-deep circular boxes, looping in boxes, junction boxes, normal/ inspection bends, solid/inspection elbows, solid/inspection tees, couplers, nipples, saddles, check nuts, earth clips, ball socket joints etc. shall be of superior quality and of approved makes. Heavy duty covers screwed with approved quality screws shall be used. Superior quality screwed PVC bushes shall be used Samples of all conduits fittings and accessories shall be got approved by Owners/Architects before use.

3.5.2 Fabricated accessories

Where ever required, outlet/junction boxes of required sizes shall be fabricated from 1.6 mm thick MS sheets excepting ceiling fan outlet boxes which shall be fabricated from minimum 2 mm thick sheets. The outlet boxes shall be of approved quality, finish and manufacture. Suitable means of fixing connectors etc., if required, shall be provided in the boxes. The boxes shall be protected from rust by zinc phosphate primer process. Boxes shall be finished with minimum 2 coats of enamel paint of approved colour. A screwed brass stud shall be provided in all boxes as earthing terminal.

3.5.2.1 Outlet Boxes For Light Fittings.

These shall be minimum 75mm x 75mm x 50mm deep and provided with required number of threaded collars for conduit entry. For ceiling mounted florescent fittings, the boxes shall be provided 300 mm off centre for a 1200 mm fitting and 150 mm off centre for a 600 mm fitting so that the wiring is taken directly to the down rod. 3 mm thick perspex/hylam sheet cover of matching colour shall be provided.

3.5.2.2 Outlet Boxes For Ceiling

Outlet boxes for ceiling fans shall be fabricated from minimum 2 mm thick MS sheet steel. The boxes shall be hexagonal in shape of minimum 100 mm depth and 60 mm sides. Each box shall be provided with a recessed fan hook in the form of one 'U' shaped 15 mm dia rod welded to the box and securely tied to the top reinforcement of the concrete slab for a length of minimum 150 mm on either side. 3 mm thick Perspex/hylam sheet cover of matching colour shall be provided.

3.5.3 Modular Wiring Accessories

3.5.3.1 Switch Boxes - Modular Type

Switch boxes suitable to house modular type switches of required ratings, and fan regulators as required shall be provided. In case the number of switches in one box is not tallying with that available in standard manufacture, the box accomodating the next higher number of switches shall be provided without any extra cost. In case fan regulator/regulators is /are to be provided at a later dated, suitable provision for accomodating such regulators shall be made in the switch boxes and blank off covers shall be provided without any extra cost.

Switch boxes shall be so designed that accessories are mounted on a grid plate with tapped holes for brass machine screws leaving ample space at the back and on the sides for accommodating conductors, check-nuts and screwed bushes at conduit entries etc... The grid plates and M.S. boxes shall be fitted with a brass earth terminal. Boxes shall be attached to conduits by means of check-nuts on either sides of their walls. Moulded front covers made from high impact resistant, flame retardant and ultra violet stabilised engineering plastics shall be fixed by means of counter sunk chromium plated brass machine screws. No timber shall be used for any supports. Switch boxes shall be located with bottom at 1200 mm above floor level unless otherwise indicated.

3.5.3.2 Switch & Socket (Modular type)

GENERAL

All light & power accessories (switch/ socket) shall be of Modular plate type & shall meet the requirement of IS: 3851 & IS: 1293.

3.5.3.3 LIGHT SWITCHES

All switches for control of light shall be of 6Amp unless otherwise stated. All switches shall be modular plate type and shall be ISI marked. The switches shall be of rocker mechanism type with silver contact. All switches shall be of white finish or as approved by project architect.

3.5.3.4 6 & 16 AMP SWITCHED SOCKET OUTLET

Switch socket outlet on lighting circuit shall be of 3 pin 6Amp outlet and shall have safety shutters. The switch shall be of rocker mechanism type with silver safety contact. Switch and socket outlet shall be separate unit in modular range and shall be plate type and of white finish.

Switch socket outlet on power circuit shall be of 6 pin 16/6Amp outlet and shall have safety shutters. The switch shall be of rocker mechanism type with silver contacts. Switch and socket outlet shall be separate unit in modular range and shall be plate type and of white finish.

3.5.3.5 25 AMP HEAVY DUTY SOCKET OUTLET

25Amp 3 Pin heavy duty socket unit with in built single phase motor starter shall be provided for A/C.

3.5.3.6 Modular Type Boxes For Socket/ Telephone/Call Bell Outlets

Outlet boxes shall be suitable for housing modular type switched socket outlets/ telephone outlets/ buzzers and any other outlet as required. These shall be so designed that accessories are mounted on a grid plate with tapped holes for brass machine screws leaving ample space at the back and on the sides for accommodating conductors, checknuts and screwed bushes at conduit entries etc. The grid plates and M.S. boxes shall be fitted with a brass earth terminal. These shall be attached to conduits by means of check nuts on either sides of their walls. Moulded front covers made from high impact resistant, flame retardant and ultra violet stabilized engineering plastics shall be used to mount the outlets and shall be fixed to the outlet M.S. boxes by means of counter sunk chromium plated brass machine screws. No timber supports shall be used. Boxes shall be located at skirting level or bottom at

1200 mm from floor or inside raceways on laboratory work tables., as indicated in drawings and/or as directed.

3.6 Cross Section

The conduits shall be of ample sectional area to facilitate simultaneous drawing of wires and permit future provision also. Total cross section of wires measured overall shall not normally be more than half the area of the conduit. Maximum number of PVC insulated 660/1100 Voltage grade copper conductor cable conforming to IS - 694 - 1990 as per table give below.

Maximum no of PVC insulated 660/1100 V grade aluminium/copper Conductor cable conforming to IS : 694 - 1990

Normal Cross Sectional area of conductor in sq. mm	20 mm		25 mm		32 mm		38 mm		51 mm		64 mm	
	S	B	S	B	S	B	S	B	S	B	S	B
1	2	3	4	5	6	7	8	9	10	11	12	13
1.50	5	4	10	8	18	12	-	-	-	-	-	-
2.50	5	3	8	6	12	10	-	-	-	-	-	-
4	3	2	6	5	10	8	-	-	-	-	-	-
6	2	-	5	3	4	8	7	-	-	-	-	-
10	2	-	4	3	6	5	8	6	-	-	-	-
16	-	-	2	2	3	3	6	5	10	7	12	8
25					3	2	5	3	8	6	9	7
35							3	2	6	5	8	6
50									5	3	6	5
70									4	3	5	4

Note :

1. The above table shows the maximum capacity of conduits for a simultaneous drawing in of cables.

2. The columns headed 'S' apply to runs of conduits which have distance not exceeding 4.25 m between draw boxes and which do not deflect form the straight by an angle of more than 15 degrees. The columns headed 'B' apply to runs of conduit which deflect form the straight by an angle of more than 15 degrees.

3. Conduits sizes are the nominal external diameters.

4. WIRES

Wiring shall be carried out with PVC insulated 660/1100 volt grade unsheathed single core wires with electrolytic annealed stranded copper (unless otherwise stated) conductors and conforming to IS 694/1990. All wire rolls shall be ISI marked. All wires shall bear manufacturer's label and shall be brought to site in new and original packages. Manufacturer's certificate, certifying that wires brought to site are of their manufacture shall be furnished as required.

5 COAXIAL CABLES

The coaxial cables shall be of wideband type with operation up to 300 MHz capability. Aging resistance shall comply with DIM 472.52 part 2 e.i. maximum 5% increase in attenuation at

200 MHz measured by artificial aging (14 days at 80o C) cables shall meet all exceed following specifications

Center core Dia	0.8 mm
Diaelectric Dia	4.8 mm
Dielectric	PE
Outer Conductor Dia	5.4 mm
Outer Dia	7.0 mm
Bending radius	more than 30 mm
Impedance	75 ohms
D.C Resistance	50 ohms/KM
Screening factor	more than 50
Attenuation	
50 Mhz	6.5
100 Mhz	9
200 Mhz	13
300 Mhz	16

6 LAYING OF CONDUITS

- Conduits shall be laid either recessed in walls and ceilings or on surface on walls and ceilings or partly recessed and partly on surface, as required.
- Same rate shall apply for recessed and surface conduiting in this contract.
- Stranded copper conductor insulated wire of size as per schedule of quantities shall be provided in entire conduiting for loop earthing.
- GI wire of suitable size to serve as a fish wire shall be left in all conduit runs to facilitate drawing of wires after completion of conduiting.

6.1 Recessed Conduiting

Conduits recessed in concrete members shall be laid before casting, in the upper portion of slabs or otherwise as may be instructed, so as to embedd the entire run of conduits and ceiling outlet boxes with a cover of minimum 12 mm concrete. Conduits shall be adequately tied to the reinforcement to prevent displacement during casting at intervals of maximum 1 meter. No reinforcement bars shall be cut to fix the conduits. Suitable flexible joints shall be provided at all locations where conduits cross expansion joints in the building.

Conduits recessed in brick work shall be laid in chases to be cut by electrical Contractor in brick work before plastering. The chases shall be cut by a chase cutting electric machine. The chases shall be of sufficient width to accommodate the required number of conduits and of sufficient depth to permit full thickness of plaster over conduits. The conduits shall be secured in the chase by means of heavy duty pressed steel clamps screwed to MS flat strip saddles at intervals of maximum 1 meter. The chases shall then be filled with cement and coarse sand mortar (1:3) and properly cured by watering.

Entire recessed conduit work in concrete members and in brick work shall be carried out in close coordination with progress of civil works. Conduits in concrete members shall be laid before casting and conduits in brick work shall be laid before plastering. Should it become necessary to embedd conduits in already cast concrete members, suitable chase shall be cut in concrete for the purpose. For minimising this cutting, conduits of lesser diameter than 25 mm and outlet boxes of lesser depth than 50 mm could be used by the Contractor for such extensions only after obtaining specific approval from Architects/Owners. For embedding conduits in finished and plastered brick work, the chase would have to be made in the finished brick work. After fixing conduit in chases, chases shall be made good in most workmanlike manner to match with the original finish.

Cutting chases in finished concrete or finished plastered brick work for recessing conduits and outlet boxes etc shall be done by the Contractors without any extra cost.

6.2 Surface Conduiting

Wherever so desired, conduit shall be laid in surface over finished concrete and/or plastered brickwork. Suitable spacer saddles of approved make and finish shall be fixed to the finished structural surface along the conduit route at intervals not exceeding 600 mm. Holes in concrete or brick work for fixing the saddles shall be made neatly by electric drills using masonry drill bits. Conduits shall be fixed on the saddles by means of good quality heavy duty MS clamps screwed to the saddles by counter sunk screws. Neat appearance and good workmanship of surface conduiting work is of particular importance. The entire conduit work shall be in absolute line and plumb.

6.3 Fixing of conduit fittings and accessories

For concealed conduiting work, the fittings and accessories shall be completely embedded in walls/ceilings leaving top surface flush with finished wall/ceiling surface in a workman like manner.

Loop earthing wire shall be connected to a screwed earthstead inside outlet boxes to make an effective contact with the metal body.

6.4 Protection of Conduits

To safeguard against filling up with mortar/plaster etc. all the outlet and switch boxes shall be provided with temporary covers and plugs which shall be replaced by sheet/plate covers as required. All screwed and socketed joints shall be made fully water tight with white lead paste.

6.5 Cleaning of Conduit Runs

The entire conduit system including outlets and boxes shall be thoroughly cleaned after completion of erection and before drawing in of cables.

6.6 Protection Against Dampness

All outlets in conduit system shall be properly drain and ventilated to minimise chances of condensation/sweating.

6.7 Expansion Joints

When crossing through expansion joints in buildings, the conduit sections across the joint shall be through approved quality heavy duty metal flexible conduits of the same size as the rigid conduit.

6.8 Loop Earthing

Loop earthing shall be provided by means of insulated stranded copper conductor wires of sizes as per Schedule of Quantity laid alongwith wiring inside conduits for all wiring outlets and sub-mains. Earthing terminals shall be provided inside all switch boxes, outlet boxes and draw boxes etc.

7 LAYING AND DRAWING OF WIRES

7.1 Bunching of Wires

Wires carrying current shall be so bunched in conduits that the outgoing and return wires are drawn into the same conduit. Wires originating from two different phases shall not be run in the same conduit.

7.2 Drawing of Wires

The drawing of wires shall be done with due regard to the following precautions:-

- No wire shall be drawn into any conduit, until all work of any nature, that may cause injury to wire is completed. Burrs in cut conduits shall be smoothen before erection of conduits. Care shall be taken in pulling the wires so that no damage occurs to the insulation of the wire. Approved type bushes shall be provided at conduit terminations.

- Before the wires are drawn into the conduits, conduits shall be thoroughly cleaned of moisture, dust, dirt or any other obstruction by forcing compressed air through the conduits if necessary.

- While drawing insulated wires into the conduits, care shall be taken to avoid scratches and kinks which cause breakage of conductors.

- There shall be no sharp bends.

- The Contractor shall, after wiring is completed, provide a blank metal/sunmica plate on all switch / outlet / junction boxes for security and to ensure that wires are not stolen till switches / outlets etc.. are fixed at no extra cost the contractor shall be responsible to ensure that wires and loop earthing conductors are not broken and stolen. In the event of the wire been partly / fully stolen , the contractor shall replace the entire wiring alongwith loop earthing at no extra cost to the Owners. No joint of any nature whatsoever shall be permitted in wiring and loop earthing .

7.3 Termination /Jointing of Wires

- Sub-circuit wiring shall be carried out in looping system. Joints shall be made only at distribution board terminals, switches/buzzers and at ceiling roses/connectors/lamp holders terminals for lights/fans/ socket outlets. No joints shall be made inside conduits or junction/draw/inspection boxes.

- Switches controlling lights, fans or socket outlets shall be connected in the phase wire of the final sub circuit only. Switches shall never be connected in the neutral wire.

- Wiring conductors shall be continuous from outlet to outlet. Joints where unavoidable, due to any special reason shall be made by approved connectors. Specific prior permission from Architect/Owners in writing shall be obtained before making such joint.

- Insulation shall be shaved off for a length of 15 mm at the end of wire like sharpening of a pencil and it shall not be removed by cutting it square or wringing.

- Strands of wires shall not be cut for connecting terminals. All strands of wires shall be twisted round at the end before connection..

- Conductors having nominal cross sectional area exceeding 4 sq. mm shall always be provided with crimping sockets.

- At all bolted terminals, brass flat washer of large area and approved steel spring washers shall be used.

- Brass nuts and bolts shall be used for all connections.

- The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less.

- Switches controlling lights, fans, socket outlets etc. shall be connected to the phase wire of circuits only.

- Only certified valid license holder wiremen shall be employed to do wiring / jointing work.

7.4 Load Balancing

Balancing of circuits in three phase installation shall be planned before the commencement of wiring and shall be strictly adhered to.

7.5 Colour Code of Conductors

Colour code shall be maintained for the entire wiring installation - red, yellow, blue for three phases, black for neutral and green for earth.

8. MEASUREMENT AND PAYMENT OF WIRING

Wiring for lights, fans, convenience socket outlets and telephone outlets etc. shall be measured and paid for on POINT BASIS as itemized schedule of quantities and as elaborated as below unless otherwise stated.

8.1 Primary and Secondary light point wiring

In respect of group control of lights (more than one light controlled by one switch or MCB), wiring upto the first light in the group shall be measured and paid for as a primary light point. Wiring for other lights looped in one group for switch controlled as also MCB controlled lights shall be measured and paid for as secondary light points. Primary light points for switch controlled lights shall include the cost of control switch whereas primary light points controlled by MCBs shall not include the switch cost. The cost of MCB controlling such lights shall not be included in the primary light point rate since the MCB shall be paid for in the item of DB.

The point wiring basis shall assume average wiring length and average conduiting length per point based on parameters stipulated in para 8.2 below. The average wiring length and average conducting length forming the basis of point wiring payment, shall take the electrical layouts of the entire project into consideration. Tenderers are advised to seek clarifications, if they so desire, on this aspect before submitting their tenders. No claim for extra payment on account of electrical layouts in part or whole of the project requiring larger average wiring and conduiting length per point, whether specifically shown in tender drawings or not, shall be entertained after the award of contract.

8.2 Parameters: Wiring shall be carried out as per following parameters in recessed/ surface conduit system.

- Only looping system of wiring shall be adopted throughout. No joints excepting at wiring terminals shall be permitted.
- All accessories shall be flush type unless otherwise stated.
- For estimation of load, following loads per point shall be assumed.

Light points	60 Watts.
6 amps socket outlet points	100 Watts.
Fan points	60 Watts.
Exhaust fan points	80 Watts or as specified.
16 amp socket outlet points	500 Watts.

- Lights, fans and 6 amp socket outlets may be wired on a common final such circuit. Such circuit shall not normally have more than a total of ten lights, fans or socket outlets or a load of 800 watts whichever is lesser.
- Power circuits shall normally have maximum one 16 amps socket outlet unless otherwise stated. Separate circuit shall be run for each geyser, kitchen equipment, window air conditioners and similar appliances.
- Wiring rates shall include painting of conduits and other accessories as required.
- Wiring rates shall include cleaning of dust, splashes of colour wash or paint from all fixtures, fans, fittings etc. at the time of taking over of the installation.
- Wiring rates shall include blanking of outlet boxes to prevent damage/pilferage of wires as elaborated in para 7.2.

8.3 Definitions

8.3.1 Wiring for Lights

Primary Light Points : Wiring for primary light points, as defined in para 8.1 above, shall commence at the Distribution Board terminals and shall terminate at the ceiling rose/connector in ceiling box/lamp holder via the control switch (for switch controlled lights).

Rates for primary light point wiring shall be deemed to be inclusive of the cost of entire material and labour require for completion of primary light point thus defined including : .

- Recessed / surface conduting system with all accessories, junction/draw/inspection boxes, bushes, check nuts etc. complete as required,
- Wiring with stranded copper conductor PVC insulated 660/1000 volt grade wires including terminations etc. complete as required.
- Control switch with switch box and cover plate of specified type including fixing screws, earth terminal etc. complete as required. Cost of this switch is applicable only for switch controlled points. This cost shall not be applicable for DB controlled points.
- Loop earthing with insulated copper wires.

Secondary Light points :
Secondary light points, as defined in para 8.1 above, shall cover the cost of interconnection wiring between group controlled light fittings and shall be deemed to be inclusive of the cost of entire materials and labour required for completion of the secondary light point thus defined including

- Recessed / surface conduting system with all accessories, junction/draw/inspection boxes, bushes, check nuts etc. complete as required,
- Wiring with stranded copper conductor PVC insulated 660/1000 volt grade wires including terminations etc. complete as required.
- Loop earthing with insulated copper wires.

8.3.2 Wiring for Ceiling Fans
Wiring for ceiling fan points shall be same as for primary light points and shall, in addition, include ceiling outlet box with recessed fan hooks and provision in the switch box for mounting the fan regulator.

8.3.3 Wiring for Exhaust/Bracket Fans
Wiring for exhaust fan points shall be same as for primary light points and shall in addition include the cost of providing a 3/5 pin 6 amp socket outlet near the fan and a 6 amp control switch at convenient location near the room entry.

8.3.4 Wiring for Call Bell Points
Wiring for call bell points shall be the same as for primary light points and shall in addition include the cost of a call bell/buzzer of approved type and make in the required location and a call bell in lieu of the control switch at a convenient location as required.

8.3.5 Wiring for Telephone Outlets

Wiring for telephone outlets points shall include the entire wiring and conduiting from the telephone tag block to the telephone outlet complete as required and as itemized in the Schedule of Quantities

8.3.6 Wiring for Convenience Socket Outlets

3/5 pin 6 amps and 3/6 pin 16 amps single phase switched convenience socket outlets shall be provided in the building as indicated in the layout drawings.

Wiring for 3/5 pin 6 amps convenience socket outlets

Point wiring for 3/5 pin 6 amps socket outlets on point wiring basis shall be the same as primary light point defined in para 8.3.1 and shall in addition include 3/5 pin 6 amp socket

outlet with 6 amp control switch in MS box with cover including loop earthing of the third pin complete as required as itemised in scheduled of quantities.

Wiring for 3/6 pin 16 amps convenience socket outlets

Point wiring for 3/6 pin 16 amps socket outlets (in locations other than over the laboratory work tables) on point wiring basis shall be the same as primary light point defined in para 8.3.1 and shall in addition include 3/6 pin 16 amp socket outlet with 16 amp control switch in MS box with cover including loop earthing of the third pin complete as required as itemized in scheduled of quantities.

9. ROUTINE AND COMPLETION TESTS

9.1 Installation Completion Tests

At the completion of the work, the entire installation shall be subject to the following tests:

1. Wiring continuity test
2. Insulation resistance test
3. Earth continuity test
4. Earth resistivity test

Besides the above, any other test specified by the local authority shall also be carried out. All tested and calibrated instruments for testing, labour, materials and incidentals necessary to conduct the above tests shall be provided by the contractor at his own cost.

9.2 Wiring Continuity Test

All wiring systems shall be tested for continuity of circuits, short circuits, and earthing after wiring is completed and before installation is energized.

9.3 Insulation Resistance Test

The insulation resistance shall be measured between earth and the whole system conductors, or any section thereof with all fuses in place and all switches closed and except in concentric wiring all lamps in position of both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure provided that it does not exceed 1100 volts for medium voltage circuits. Where the supply is derived from AC three phase system, the neutral pole of which is connected to earth, either direct or through added resistance, pressure shall be deemed to be that which is maintained between the phase conductor and the neutral. The insulation resistance measured as above shall not be less than 50 megaohms divided by the number of points provided on the circuit the whole installation shall not have an insulation resistance lower than one megaohm.

The insulation resistance shall also be measured between all conductors connected to one phase conductor of the supply and shall be carried out after removing all metallic connections between he two poles of the installation and in those circumstances the insulation shall not be less than that specified above.

The insulation resistance between the frame work of housing of power appliances and all live parts of each appliance shall not be less than that specified in the relevant Standard specification or where there is no such specification, shall not be less than half a megohm or when PVC insulated cables are used for wiring 12.5 megohms divided by the number of outlets. Where a whole installation is being tested a lower value than that given by the above formula subject to a minimum of 1 Megohms is acceptable.

9.4 Testing Of Earth Continuity Path

The earth continuity conductor including metal conduits and metallic envelopes of cable in all cases shall be tested for electric continuity and the electrical resistance of the same alongwith

the earthing lead but excluding any added resistance of earth leakage circuit breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

9.5 Testing Of Polarity Of Non-Linked Single Pole Switches

In a two wire installation a test shall be made to verify that all non-linked single pole switches have been connected to the same conductor throughout, and such conductor shall be labeled or marked for connection to an outer or phase conductor or to the non-earthed conductor of the supply. In the three of four wire installation, a test shall be made to verify that every non-linked single pole switch is fitted to one of the outer or phase conductor of the supply. The entire electrical installation shall be subject to the final acceptance of the Architect as well as the local authorities.

9.6 Earth Resistivity Test

Earth resistivity test shall be carried out in accordance with IS Code of Practice for earthing IS 3043.

9.7 Performance

Should the above tests not comply with the limits and requirements as above the contractor shall rectify the faults until the required results are obtained. The contractor shall be responsible for providing the necessary instruments and subsidiary earths for carrying out the tests. The above tests are to be carried out by the contractor without any extra charge.

9.8 Tests And Test Reports

The Contractor shall furnish test reports and preliminary drawings for the equipment to the Architect/owners for approval before commencing supply of the equipment. The Contractor should intimate with the tender the equipment intended to be supplied with its technical particulars. Any test certificates etc., required by the local Inspectors or any other Authorities would be supplied by the Contractor without any extra charge.

TECHNICAL SPECIFICATIONS

MEDIUM VOLTAGE CABLES

1. GENERAL

Technical specifications in this section covers supplying and laying of medium voltage cables.

2. STANDARDS AND CODES

All equipments, components, materials and entire work shall be carried out in conformity with applicable and relevant Bureau of Indian Standards and Codes of Practice, as amended upto date and as below. In addition, relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and /or IEC Standards shall be applicable.

Equipments certified by Bureau of Indian Standards shall be used in this contract in line with government regulations. Test certificates in support of this certification shall be submitted, as required.

It is to be noted that updated and current standards shall be applicable irrespective of dates mentioned along with ISS's in the tender documents.

PVC insulated heavy duty cables	IS 1554 - 1988
Cross link polyethylene insulated PVC (sheathed XLPE cables)	IS 7098 - 1985
Code of practice for installation and maintenance of power cables	IS 1255 - 1983
Conductors for insulated electrical cables	IS 8130 - 1984
Drums for electrical cable	IS 10418 - 1982
Methods of test for cables	IS 10810 - 1988
Recommended current rating	IS 3961 - 1987
Recommended short circuit rating of high voltage PVC cables	IS 5891 - 1970

3. CABLES

3.1. Medium Voltage Cables

The L.T. Power cables shall be XLPE insulated PVC sheathed type aluminium conductor armoured cable conforming to IS : 7098 : 1988 (Part-I) with uptodate ammendments where as control cable shall be XLPE insulated and PVC sheathed copper conductor armoured / unarmoured cable conforming to IS : 7098 : 1988 (Part-I). All cables shall be FRLS type

Medium voltage cables shall be aluminium conductor XLPE insulated, PVC sheathed armoured conforming to IS : 7098 : 1988 (Part-I) with uptodate ammendments where as control cable shall be XLPE insulated and PVC sheathed copper conductor armoured / unarmoured cable conforming to IS : 7098 : 1988 (Part-I). All cables shall be FRLS type & rated for a 1100 Volts. The conductor of cables from 16 Sq. mm. to 50 Sq. mm. shall be stranded. Sector shaped stranded conductors shall be used for cables of 50 sq. mm and above. Conductors shall be made of electrical purity aluminium 3/4 H or H temper. The outer sheath shall bear the manufacturer's name and trade mark at every meter length. Cores shall be provided with following colour scheme of PVC insulation.

1 Core	:	Red/Black/Yellow/Blue
2 Core	:	Red and Black
3 Core	:	Red, Yellow and Blue
3.5/4 Core	:	Red, Yellow, Blue and Black

Current ratings shall be based on the following conditions.

a) Maximum conductor temperature 70 ºC
b) Ambient air temperature 45 ºC

c) Ground temperature 30 ºC
d) Depth of laying 1000 mm

Short circuit rating of cables shall be as specified in IS 1554 Part-I.

Cables have been selected considering conditions of maximum connected loads, ambient temperature, grouping of cables and allowable voltage drop. However, the contractor shall recheck the sizes before cables are fixed and connected to service.

4. DELIVERY, STORAGE AND HANDLING

Cable drum shall be stored on a well drained, hard surface, preferably of concrete, so that the drums do not sink in ground causing rot and damage to the cable drum. The cable drum shall conform to IS 10418. During storage, periodical rolling of drums, in the direction of arrow marked on the drum, shall be done once in 3 month through 90ºC Both ends of cables shall be properly sealed to prevent moisture ingress Drums shall be stored in well ventilated area protected from sun and rain. Drums shall always be rested on the flanges and not on flat sides. Damaged battens of drums etc. shall be replaced. Movement of drums shall always be in direction of the arrow marked on the drum. For transportation over long distance, the drums shall either be mounted on drum wheels and pulled by ropes or they shall be mounted on trailers etc. drums shall be unloaded preferably by crane otherwise they shall be rolled down carefully on suitable ramps. While transferring cable form 1 drum to another, the barrel of the new drum shall have diameter not less than the original drum. Cables with kinks or similar visible defects like defective armouring etc shall be rejected. Cables shall be supplied at site in cut pieces as per actual requirements.

5. LAYING OF CABLES

Cables shall be so laid that the maximum bending radius is 12 times the overall diameter of the cable for medium voltage cables. Cables shall be laid in masonry trenches, directly on walls/cable trays, directly buried in ground or in pipes/ducts as elaborated below. Cables of different voltages and also power and control cables shall be laid in different trenches with adequate separation. Wherever available space is restricted such that this requirement cannot be met, medium voltage cables shall be laid above HT cables.

5.1 In Masonry Trenches

Wherever so specified, cables shall be laid in indoor/outdoor masonry/RCC trenches to be provided by Owners. Cables shall be laid on MS supports fabricated from minimum 38mm x 38mm x 6mm painted / galvanized angle iron supports grouted in trench walls at intervals not exceeding 600 mm. If required, cables shall be arranged in tier formation inside the trench. Suitable clamps, hooks and saddles shall be used for securing the cables in position and dressing properly so that the clear spacing between the cables shall not be less then the diameter of the cable. Trenches shall be provided with chequered plate/RCC covers. Wherever so specified, trenches shall be filled with fine sand.

5.2 On Trays/Walls

Wherever so specified, cables shall be laid along walls/ceiling or on cable trays. Cable shall be secured in position and dressed properly by means of suitable clamps, hooks, saddles etc. such that the minimum clear spacing between cables is diameter of the cable. Clamping of cables shall be at minimum intervals as below.

Type of cables	Size	Clamping by	Fixing intervals
MV	Upto and including 25 sq mm	Saddles 1 mm thick	45 cm
MV	35 sq mm to 120 sq mm	Clamps 3 mm thick 25 mm wide	60 cm
MV	150 sq mm and above	Clamps 3 mm thick 40 mm wide	60 cm

Note: The fixing intervals specified apply to straight runs. In the case of bends, additional clamping shall be provided at 30 cm from the center of the bend on both sides.

Cable trays, of sizes as per schedule of quantities and drawings shall be of perforated doubled bend channel/ladder design unless otherwise stated. Cable trays shall be fabricated from minimum 2 mm thick sheet steel and shall be complete with tees, elbows, risers, and all necessary hardware. Cable trays shall comply with the following:

Trays shall have suitable strength and rigidity to provide proper support for all contained cables. Trays shall not have sharp edges, burrs or projections injurious to cable insulation. Trays shall include fittings for changes in direction and elevation. Cable trays and accessories shall be painted with one shop coated of red oxide zinc chromate primer and two side coats of aluminium alkyd paint or approved equivalent. Cable trays shall not have sharp edges, burrs or projection that may damage the insulation jackets of the wiring. Cable trays shall have side rails or equivalent structural members.

Unless otherwise specifically noted on the relevant layout drawing, all cable tray mounting works to be carried out ensuring the following :

Cable tray mounting arrangement type to be as marked on layout drawing. Assembly of tray mounting structure shall be supplied fabricated, erected & painted by the electrical contractor. Tray mounting structures shall be welded to plate inserts or to structural beams as approved by the Owners/Architects. Wherever embedded plates & structural beams are not available for welding the tray mounting structure electrical contractor to supply the MS plates & fix them to floor slab by four anchor fasteners of minimum 16 mm dia having minimum holding power of 5000 Kg at no extra cost. Maximum loading on a horizontal support arm to be 120 Kg. metre of cable run. Width of the horizontal arms of the tray supporting structures to be same as the tray widths specified in tray layout drawings, plus length required, for welding to the vertical supports. The length of vertical supporting members for horizontal tray runs shall be to suit the number of tray tiers shown in tray layout drawings. Spacing between horizontal supports arms of vertical tray runs to be 300 mm. Cable trays will be welded to their mounting supports. Minimum clearance between the top most tray tier and structural member to be 300 mm. Cables in vertical race ways to be clamped by saddle type clamps to the horizontal slotted angels. Clamps to be fabricated from 3 mm thick aluminium strip at site by the electrical contractor to suit cable groups. The structural steel (standard quality) shall be according to latest revision of IS : 226 & 808. Welding shall be as per latest revisions of IS : 816. All structural steel to be painted with one shop coat of red oxide and oil primer followed by a finishing coat of aluminium alkyd paint where any cuts or holes are made on finished steel work these shall be sealed against oxidation by red oxide followed by the same finishing paint. Steel sheet covers wherever indicated to be similarly painted. Trays shall be erected properly to present a neat and clean appearance. Trays shall be installed as a complete system. Trays shall be supported adequately by means of painted MS structural members secured to the structure by dash fasteners or by grouting. The entire cable tray system shall be rigid. Each run of cable tray shall be completed before laying of cables. Cable trays shall be erected so as to be exposed and accessible.

5.3 Buried Directly In Ground

5.3.1 General

Cables shall be so laid that they will not interfere with under ground structures. All water pipes, sewage lines or other structures which become exposed by excavation shall be properly supported and protected from injury until the filling has been rammed solidly in places under and around them. Any telephone or other cables coming in the way are to be properly shielded as directed by Architects/Owners. Surface of the ground shall be made good so as to conform in all respects to the surrounding ground to the satisfaction of Architects/ Owners.

5.3.2 Routing of cables

Before cable laying work is undertaken, the route of the cables shall be decided with the Architects/Owners. While shortest practicable route shall be preferred, cable runs shall follow fixed development such as roads, footpaths etc with proper off-sets so that future maintenance and identification are rendered easy. Whenever cables are laid along well

demarcated or established roads, the LV/MV cables shall be laid further from the kerb line than HV cables. Cables of different voltages and also power and control cables shall be kept in different trenches with adequate separation. Where available space is restricted, LV/MV cables shall be laid above HV cables. Where cables cross one another, the cables of higher voltage shall be laid at a lower level than the cables of lower voltage. Power and communication cables shall as far as possible cross at right angles. Where power cables are laid in proximity to communications cables the horizontal and vertical clearances shall not normally be less than 60 cm.

5.3.3 Width Of Trench

The width of trench shall be determined on the following basis. The minimum width of trench for laying single cables shall be 350 mm. Where more than one cable is to be laid in the same trench in horizontal formation, the width of trench shall be increased such that the inter-axial spacing between the cables except where otherwise specified shall be at least 200 mm. There shall be a clearance of at least 150 mm between axis of the end cables and the sides of the trench.

5.3.4 Depth Of Trench

The depth of trench shall be determined on the following basis:

- Where cables are laid in single tier formation, the total depth of the trench shall not be less than 750 mm for cables upto 1.1 kV and 1250 mm for cables above 1.1 kV.
  When more than one tier of cables is unavoidable and vertical formation of laying is adopted, the depth of trench shall be increased by 300 mm for each additional tier to be formed.

5.3.5 Excavation Of Trenches

The trenches shall be excavated in reasonably straight lines. Wherever there is a change in direction, suitable curvature of 12 times the overall diameter of the largest cable shall be provided. Where gradients and changes in depths are unavoidable these shall be gradual. Excavation should be done by any suitable manual or mechanical means. Excavated soil shall be stacked firmly by the side of the trench such that it may not fall back into the trench. Adequate precautions shall be taken not to damage any existing cables, pipes or other such installations during excavation. Wherever bricks, tiles or protected covers or bare cables are encountered, further excavation shall not be carried out without the approval of the Architects/ Owners. Existing property exposed during trenching shall be temporarily supported or propped adequately as directed by the Architects/ Owners. The trenching in such cases shall be done in short lengths, necessary pipes laid for passing cables therein and the trench refilled as required. If there is any danger of a trench collapsing or endangering adjacent structures the sides shall be well shored up with timbering and/or sheathing as the excavation proceeds. Where necessary these may even be left in place when back filling the trench. Excavation through lawns shall be done in consultation with the Architects/ Owners. Bottom of the trench shall be level and free from stone, brick, etc. The trench shall then be provided with a layer of clean dry sand cushion of not less than 80 mm in depth.

5.3.6 Laying Of Cable In Trench

The cable drum shall be properly mounted on jacks or on a cable wheel at a suitable location. It should be ensured that the spindle, jack etc are strong enough to carry the weight of the drum without failure and that the spindle is horizontal in the bearings so as to prevent the drum creeping to one side while rotating. The cable shall be pulled over rollers in the trench steadily and uniformly without jerks or strains. The entire cable length shall, as far as possible, be laid in one stretch. However when this is not possible the remainder of the cable shall be removed by flaking i.e. making one long loop in the reverse direction. After the cable is uncoiled and laid over the rollers, the cable shall be lifted slightly over the rollers beginning from one end by helpers standing about 10 metres apart and drawn straight. The cable should then be taken off the rollers by additional helpers lifting the cables and then laid in the trench in a reasonably straight line. For short runs and cable sizes upto 50 sq mm 1.1 kV grade the alternative method of direct handling can be adopted with the prior approval of the Architects/ Owners. If two or more cables are laid in the same trench care should be taken to preserve relative position. All the cables following the same routes shall be laid in the same trench. Cables shall not cross each other as far as possible. When the cable has been properly straightened the cores shall be tested for continuity and insulation resistance. The cable shall be measured thereafter. Suitable moisture sealing compound/tape shall be used

for sealing of the ends. Cable laid in trenches in a single tier formation shall have a covering of clean dry sand of not less than 170 mm above the base cushion of sand before the protective cover is laid. In the case of vertical multi-tier formation after the first cable has been laid a sand cushion of 300 mm shall be provided over the initial bed before the second tier is laid. If additional tiers are formed each of the subsequent tiers also shall have a sand cushion of 300 mm. The top most cable shall have a final sand covering not less than 170 mm before the protective cover is laid. A final protection to cables shall be laid to provide warning to future excavators of the presence of the cable and also to protect the cables against accidental mechanical damage. Such protection shall be with second class bricks of not less than 200 mm x 100 mm x 100 mm (normal size) laid breadth wise for the full length of the cable to the satisfaction of the Owners /Architects. Where more than one cable is to be laid in the same trench this protective covering shall cover all the cables and project at least 50 mm over the sides of the end cables. In addition bricks on edge shall be placed along the entire run on either side of the cable run. The trenches shall then be back filled with excavated earth free from stones or other sharp edged debris and shall be rammed and watered in successive layers not exceeding 300 mm. Unless otherwise specified a crown of earth not less than 50 mm in the centre and tapering towards the side of the trench shall be left to allow for subsidence. The crown of earth should however not exceed 100 mm so as not to be a hazard to vehicular traffic. Where road berms or lawns have been cut or kerb stones displaced the same shall be repaired and made good to the satisfaction of the Clients and all surplus earth and rocks removed to places as specified.

5.3.7 Laying In Pipes/Closed Ducts

In locations such as road crossings, entry to buildings/poles in paved areas etc., cables shall be laid in pipes or closed ducts. Spun reinforced concrete pipes shall be used for such purposes and the pipe shall not be less than 100 mm in diameter for a single cable and not less than 150 mm for more than one cable. These pipes shall be laid directly in ground without any special bed. Sand cushioning and/or brick tiles need not be used in such installations. Unless otherwise specified the top surface of pipes shall be at a minimum depth of 1000 mm from the ground level when laid under roads, pavements etc. The pipes for road crossings shall preferably be on the skew to reduce the angle of bend as the cable enters and leaves the crossing. Pipes shall be continuous and clear of debris or concrete before cable is drawn. Sharp edges at ends shall be smoothened to prevent injury to cable insulation or sheathing. No deduction shall be made for sand and bricks not used for cables passing through RCC Hume pipes or for parts of vertical cables at the lighting poles. Wherever so required, cables shall be laid at the bed of the lake through existing PVC pipe as itemized in bill of quantities.

5.3.8 Laying of Cables In Floors

Laying of cables directly in floors shall be avoided and GI pipes of adequate size shall be used wherever necessary. However if the cables have to be laid direct in the floor specific written approval of architect/ Owners shall be obtained and the Contractor shall cut chases, lay the cables and make good the chases to original finish.

5.3.9 Cable Entry Into Buildings

Cable entry into buildings shall be made through RCC pipes recessed in the floor. RCC Hume pipes shall be provided well in advance for service cable entries. The pipe shall be filled with sand and sealed at both ends with bitumen mastic to avoid entry of water. Suitable size manholes shall be provided wherever required to facilitate drawing of cables as per requirements.

6 TERMINATION/JOINTING OF CABLES

Soldered jointing/termination shall be totally avoided. Solderless terminations by using Dowel crimping tools and suitable legs shall be adopted for all cable terminations. Any terminations may without use of proper crimping tool is shall be liable to be rejected. In the case of aluminium conductors, it is to be ensured that the conductor oxidation is cleaned by means of emery paper and then a thin coat of tin is applied before pinching into any equipment. Heat shrinkable Raychem type or approved equivalent terminations shall be provided for High Voltage cables and Siemens make or approved equivalent make brass double compression glands shall be provided for Medium Voltage cable terminations. Straight through jointing of Medium Voltage or High Voltage cable shall normally be totally avoided. If absolutely

unavoidable, such jointing shall be carried out as per procedure to be got specifically approved from Architect/Owners.

7. MEASUREMENT OF CABLE RUNS

The cable runs shall be measured upto the outer end of the boxes without any allowances for over lap in joints. The actual run of the cables shall be measured and the rate shall include all the above mentioned material, labour etc for laying as required.

8. CABLE LOOPS

At the time of the installation approximately 3 meters of surplus cable shall be left
- at each end of the cable
- on each side of underground straight through/tee/termination joints.
- at entries to buildings
- and such other places as may be decided by the architects/owners.

This cable shall be left in the form of a loop.

Wherever long runs of cable length are installed cable loops shall be left at suitable intervals as specified by the architect/owners.

9. BONDING OF CABLES.

Where a cable enters any piece of apparatus it shall be connected to the casting by means of an approved type of armoured clamp or gland. The clamps must grip the armouring firmly to the gland or casting, so that in the event of ground movement no undue stress is placed on to the cable conductors.

10. TESTING

10.1 Tests At Manufacturer's Work
The cables shall be subjected to shop test in accordance with relevant standards to prove the design and general qualities to the cables as below (as per IS 10810) :

- Routine test on each drum of cables.
- Acceptance tests on drums chosen at random for acceptance of the lot.
- Type test on each type of cables, inclusive of measurement of armour DC resistance of power cables.

10.2 Site Testing
- All cables before laying shall be tested with a 500 V megger for 1.1 kV grade. The cables cores shall be tested for continuity, absence of cross phasing, insulation resistance to earth/sheath/armour and insulation resistance between conductors.
- All cables shall be subject to above mentioned test during laying, before covering the cables by protective covers and back filling and also before the jointing operations.
- After laying and jointing, the cable shall be subjected to a 1.5 minutes AC/DC pressure test.
- In the absence of facilities for pressure testing in accordance with clause above it is sufficient to test for one minute with 1000 V megger for cables of 1.1 kV grade.

10.3 Test Witness

Tests shall be performed in presence of representative of Owners/Architect. The Contractor shall give at least fifteen (15) days advance notice of the date when the tests are to be carried out.

TECHNICAL SPECIFICATIONS

MEDIUM VOLTAGE DISTRIBUTION BOARDS

1 GENERAL

This section covers specification of Distribution Board.

2. STANDARDS AND CODES

The following Indian Standard Specifications and Codes of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable.

BIS certified equipment shall be used as a part of the Contract in line with Government regulations. Necessary test certificates in support of the certification shall be submitted prior to supply of the equipment.

It is to be noted that updated and current Standards shall be applicable irrespective of those listed below.

Miniature Air Circuit Breakers for AC circuits	IS 8828 : 1978
Degrees of Protection provided by enclosures for low voltage switchgear	IS 2147 : 1962
Code of Practice for installation and maintenance of switchgear not exceeding 1000 volts	IS 10118 : 1982
General requirements for switchgear and controlgear for voltages not exceeding 1000 volts	IS 4237 : 1982

3. MINIATURE CIRCUIT BREAKERS

- The MCB's shall be of the completely moulded design suitable for operation at 240/415 Volts 50 Hz system.
- The MCB's shall have a rupturing capacity of 10 KA at 0.5 p.f.
- The MCB's shall have inverse time delayed thermal overload and instantaneous magnetic short circuit protection. The MCB time current characteristic shall coordinate with H.R.C. fuse/PVC cable characteristic.
- Type test certificates from independent authorities shall be submitted with the tender.

4. FINAL DISTRIBUTION BOARDS

- Final distribution boards shall be flush mounting, totally enclosed, dust and vermin proof and shall comprise of miniature circuit breakers, earth leakage circuit breakers, neutral link etc as detailed in the schedule of quantities.
- The distribution equipment forming a part of the Distribution Boards shall comply to the relevant Standards and Codes of the Bureau of Indian Standards and as per detailed specifications included in this tender document.
- The board shall be fabricated from 14 gauge CRCA sheet steel and shall have a hinged lockable spring loaded cover. All cutouts and covers shall be provided with synthetic rubber gaskets. The entire construction shall give a IP 42 degree of protection.
- The bus-bar shall be of electrical grade copper having a maximum current density of 1.6 ampere per square mm and PVC insulated throughout the length.

- All the internal connections shall be with either solid copper PVC insulated or copper conductor PVC insulated wires of adequate rating.

- All the internal connections shall be concealed by providing a hinged protective panel to avoid accidental contact with live points.

- All outgoing equipment shall be connected direct to the bus bar on the live side. The equipment shall be mounted on a frame work for easy removal and maintenance.

- The sheet steel work shall undergo a rigorous rust proofing process, two coats of filler oxide primer and final powder coated paint finish.

- All the circuits shall have an independent neutral insulated wire, one per circuit, and shall be numbered and marked as required by the Owners.

- A sample of the completed board is to be got approved by the architects/owners before commencement of supply and erection.

5 SHEET STEEL TREATMENT AND PAINTING

- Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognised phosphating process. The steel work shall then receive two costs of oxide filler primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.

- All sheet steel shall after metal treatment be given powder coated finish painted with two coats of shade 692 to IS 5 on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns.

6. NAME PLATES AND LABELS

- Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

TECHNICAL SPECIFICATIONS

MEDIUM VOLTAGE SWITCHGEAR

1. GENERAL

This section covers specification of Medium Voltage Switchboards incorporating items of switchgear like Circuit Breakers, SFUs, metering and protection

2 STANDARDS AND CODES

The following Indian Standard Specifications and Codes of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable.

BIS certified equipment shall be used as a part of the Contract in line with Government regulations. Necessary test certificates in support of the certification shall be submitted prior to supply of the equipment.

It is to be noted that updated and current Standards shall be applicable irrespective of those listed below.

Low Voltage switchgear & controlgear	IS 13947 : 1993
Part I : General rules	
Part II : Circuit Breakers	
Part III : Switches, disconnectors, switch disconnectors and fuse combination units	
Part IV : Contactors and Motor starters	
Part V : Control circuit devices and switching elements	
Marking of Switchgear busbars	IS 11353 : 1985
Degree of Protection of Enclosures for low voltage switchgear.	IS 2147 : 1962
Electrical relays for power system protection	IS 3231 : 1986
Code of Practice for selection, installation and Maintenance of switchgear & controlgear	IS 10118 : 1982
Low voltage switchgear & controlgear assemblies	IS 8623 : 1993

3. SWITCHGEAR

3.1. Moulded Case Circuit Breakers

Moulded case circuit breakers (MCCB) or fuse free breakers, incorporated in switchboards wherever required, shall conform to IS 13947 : 1993 in all respects. MCCBs shall be suitable either for single phase 240 Volts or 3 Phase 415 Volts AC 50 HZ supply.

MCCB cover and case shall be made of high strength heat resisting and flame retardant thermosetting insulating material. Operating handle shall be quick make/break, trip - free type. Operating handle shall have suitable ON, OFF and TRIPPED indicators. Three phase MCCBs shall have a common handle for simultaneous operation and tripping of all the three phases. Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be of thermal/magnetic type provided on each pole and connected by a common tripe bar such that tripping of any one pole causes three poles to open simultaneously. Thermal/magnetic tripping device shall have IDMT characteristics for sustained over loads and short circuits.

Contact trips shall be made of suitable arc resistant sintered alloy. Terminals shall be of liberal design with adequate clearances.

MCCBs shall be provided with following accessories, if specified in drawings/schedule of quantities :

- Under voltage trip
- Shunt trip
- Alarm switch
- Auxiliary switch

MCCBs shall be provided with following interlocking devices for interlocking the door a switch board.

- Handle interlock to prevent unnecessary manipulations of the breaker.
- Door interlock to prevent door being opened when the breaker is in ON position
- Deinterlocking device to open the door even if the breaker is in ON position.

MCCBs shall have rupturing capacity as specified in drawings/schedule of quantities.

All MCCB shall be provided with adapter terminal for facilitates higher sizes of cable/ links

3.2. Metering, Instrumentation And Protection.
Ratings, type and quantity of meters, instruments and protective devices shall be as per drawings and schedule of quantities.

Current Transformers
C/Ts shall confirm to IS 2705 (part -I, II and III) in all respects. All C/Ts used for medium voltage application shall be rated for 1 kV. C/Ts shall have rated primary current, rated burden and class of accuracy as specified in schedule of quantities/drawings. Rated secondary current shall be 5A unless otherwise stated. Minimum acceptable class for measurement shall be class 0.5 to 1 and for protection class 10. C/Ts shall be capable of withstanding magnetic and thermal stresses due to short circuit faults of 31 MVA on medium voltage. Terminals of C/Ts shall be paired permanently for easy identification of poles. C/Ts shall be provided with earthing terminals for earthing chassis, frame work and fixed part of metal casing (if any). Each C/T shall be provided with rating plate indicating :

- Name and make
- Serial number
- Transformation ratio
- Rated burden
- Rated voltage
- Accuracy class

CTs shall be mounded such that they are easily accessible for inspection, maintenance and replacement. Wiring for CT shall be with copper conductor PVC insulated wires with proper termination works and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.

Potential Transformer
PTs shall confirm to IS 3156 (Part-I,II and III) in all respects.

Measuring Instruments
Direct reading electrical instruments shall conform to IS 1248 or in all respects. Accuracy of direct reading shall be 1.0 of voltmeter and 1.5 for ammeters. Other instruments shall have accuracy of 1.5. Meters shall be suitable for continuous operation between -10o C and +500C. Meters shall be flush mounting and shall be enclosed in dust tight housing. The housing shall be of steel or phenolic mould . Design and manufacture of meters shall ensure prevention of fogging of instrument glass. Pointer shall be black in colour and shall have Zero position adjustment device operable from out side. Direction of deflection shall be from left to right. Selector switches shall be provided for ammeters and volt meters used in three phase system.

Ammeters
Ammeters shall be of Digital type. Moving part assembly shall be with jewel bearings. Jewel bearings shall be mounted on a spring to prevent damage to pivot due to vibrations and shocks. Ammeters shall be manufacture and calibrated as per IS 1248

Ammeters shall normally be suitable for 5 A secondary of current transformers.

Ammeters shall be capable of carrying substantial over loads during fault conditions.

Voltmeters
Voltmeters shall be Digital type range of 3 phase 415 volt voltmeters shall be 0-500. Volt meters shall be provided with protection fuse.

Watt meter
Wattmeter shall be of 3 phase Digital type and shall be provided with a maximum demand indicator if required.

Contactor:

Contactor shall be of AC -1 rating with wide band coil voltage. Contactor coil should be suitable for operation of low voltages and operating limit of coil shall be 50-140% of rated voltage (415Volt). Numbers of pole shall be as described in bill of quantity.

4. MEDIUM VOLTAGE SWITCH BOARDS / LT PANEL

4.1 General

- All medium voltage switchboards shall be suitable for operation at three phase/three phase 4 wire, 415 volt, 50 Hz, neutral grounded at transformer system with a short circuit level withstand of 25 MVA at 415 volts or as per schedule of quantities.

- The Switch Boards shall comply with the latest edition with upto date amendments of relevant Indian Standards and Indian Electricity Rules and Regulations.

4.2 Switch Board Configuration

- The Switch Board shall be configured with MCCB's, MCCBs and other equipment as called for in the Schedule of Quantities.
- The Switch Boards shall be of adequate size with a provision of 25% spare space to accommodate possible future additional switch gear.

4.3 Equipment Specifications
All equipment used to configure the Switch Board shall comply to the relevant Standards and Codes of the Bureau of Indian Standards and to the detailed technical Specifications as included in this tender document.

4.4 Constructional Features

- The Switch Boards shall be metal enclosed, sheet steel cubicle pattern, extensible, dead front, floor mounting type and suitable for indoor mounting.

- The Switch Boards shall be totally enclosed, completely dust and vermin proof. Synthetic rubber gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust and vermin proof to provide a degree of protection of IP 54. All doors and covers shall also be fully gasketed with synthetic rubber and shall be lockable.

- The Switch Board shall be fabricated with CRCA Sheet Steel of thickness not less than 2.0 mm and shall be folded and braced as necessary to provide a rigid support for all components. The doors and covers shall be constructed from CRCA sheet steel of thickness not less than 1.6 mm. Joints of any kind in sheet metal shall be seam welded and all welding slag ground off and welding pits wiped smooth with plumber metal.

- All panels and covers shall be properly fitted and square with the frame. The holes in the panel shall be correctly positioned.

- Fixing screws shall enter holes tapped into an adequate thickness of metal or provided with hank nuts. Self threading screws shall not be used in the construction of the Switch Boards.

Panel mounted lock to be proved on each compartment.

4.5 Switchboard Dimensional Limitations

- A base channel 75 mm x 5 mm thick shall be provided at the bottom.
- A minimum of 200 mm blank space between the floor of switch board and bottom most unit shall be provided.
- The overall height of the Switch Board shall be limited to 2300 mm
- The height of the operating handle, push buttons etc shall be restricted between 300 mm and 2000 mm from finished floor level.

4.6 Switch Board Compartmentalization

The Switch Board shall be divided into distinct separate compartments comprising

- A completely enclosed ventilated dust and vermin proof bus bar compartment for the horizontal and vertical busbars.
- Each circuit breaker, and MCCB shall be housed in separate compartments enclosed on all sides.
- Sheet steel hinged lockable doors for each separate compartment shall be provided and duly interlocked with the breaker/switch fuse unit in "on" and "off" position.
- For all Circuit Breakers separate and adequate compartments shall be provided for accommodating instruments, indicating lamps, control contactors and control fuses etc. These shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, busbars and connections.
- A horizontal wire way with screwed cover shall be provided at the top to take interconnecting control wiring between vertical sections.
- Separate cable compartments running the height of the Switch Board in the case of front access Boards shall be provided for incoming and outgoing cables.
- Cable compartments shall be of adequate size for easy termination of all incoming and outgoing cables entering from bottom or top.
- Adequate and proper support shall be provided in cable compartments to support cables.

4.7 Switch Board Bus Bars

- The Bus Bar and interconnections shall be of Aluminium and of rectangular cross sections suitable for full load current for phase bus bars and half rated current for neutral bus bar. Aluminium shall be 1 amp per Sq. mm. and suitable to withstand the stresses of a 25 MVA fault level or at 415 volts for 1 second or as per schedule of quantities. .
- The bus bars and interconnections shall be insulated with insulation tape/ fiber glass.
- The bus bars shall be extensible on either side of the Switch Board.
- The bus bars shall be supported on non-breakable, non-hygroscopic insulated supports at regular intervals, to withstand the forces arising from a fault level of 31 MVA at 415 volts for 1 second.
- All bus bars shall be colour coded.
- All bus bar connections in Switch Boards shall be bolted with brass bolts and nuts. Additional cross section of bus bars shall be provided wherever holes are drilled in the bus bars.

4.8 Switch Board Interconnections

- All connections between the bus bars/Breakers/cable terminations shall be through solid copper strips of adequate size to carry full rated current and PVC/fibre glass insulated.

- For unit ratings upto 100 amps PVC insulated copper conductor wires of adequate size to carry full load current shall be used. The terminations of all such interconnections shall be crimped.

4.9 Drawout Features

Air Circuit Breakers shall be provided in fully drawout cubicles. These cubicles shall be such that drawout is possible without disconnection of the wires and cables. The power and control circuits shall have self aligning and self isolating contacts. The fixed and moving contacts shall be easily accessible for operation and maintenance. Mechanical interlocks shall be provided on the drawout cubicles to ensure safety and compliance to relevant Standards. The MCCB's shall be provided in fixed type cubicles.

4.10 Instrument Accommodation

- Instruments and indicating lamps shall not be mounted on the Circuit Breaker Compartment door for which a separate and adequate compartment shall be provided and the instrumentation shall be accessible for testing and maintenance without danger of accidental contact with live parts of the Switch Board.

- For MCCB's instruments and indicating lamps can be provided on the compartment doors.

- The current transformers for metering and for protection shall be mounted on the solid copper/aluminium busbars with proper supports.

4.11 Wiring

All wiring for relays and meters shall be with PVC insulated copper conductor wires. The wiring shall be coded and labelled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 1.5 sq. mm.

4.12 Cable Terminations

- Knockout holes of appropriate size and number shall be provided in the Switch Board in conformity with the location of incoming and outgoing conduits/cables.

- The cable terminations of the Circuit Breakers shall be brought out to terminal cable sockets suitably located at the rear of the panel.

- The cable terminations for the MCCB's shall be brought out to the rear in the case of rear access switchboards or in the cable compartment in the case of front access Switch Boards.

- The Switch Boards shall be complete with tinned brass cable sockets, tinned brass compression glands, gland plates, supporting clamps and brackets etc for termination of 1100 volt grade aluminium conductor PVC/PVCA cables.

4. 13 Space Heaters

The Switch Board shall have in each panel thermostatically controlled space heaters with a controlling 15 amp 230 volt switch socket outlet to eliminate condensation.

4.14 Earthing

A main earth bar of G.I./copper as required shall be provided throughout the full length of the Switch Board with a provision to make connections to earths on both sides.

4.15 Sheet Steel Treatment And Painting

- Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognised phosphating process. The steel work shall then receive two costs of oxide filler primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.

- All sheet steel shall after metal treatment be spray or powder painted with two coats of shade 692 to IS 5 on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns.

4.16 Name Plates And Labels

Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

4.17 Installation

The foundations prepared as per the manufacturers drawings shall be levelled, checked for accuracy and the Switch Board installed. All bus bar connections shall be checked with a feeler gauge after installation. The able end boxes shall be sealed to prevent entry of moisture.

A 15 mm thick rubber matting of approved make on a 100 mm high timber platform shall be provided in front of and along the full length of the Switch Board. The width of the matting shall be 1000 mm. The rubber mat shall withstand 15 KV for 1 minute and leakage current shall not exceed 160 mA/sq. metre.

After installation the Switch Board shall be tested as required prior to commissioning.

ROUTINE AND COMPLETION TESTS

1 INSTALLATION COMPLETION TESTS

At the completion of the work, the entire installation shall be subject to the following tests:

1. Wiring continuity test
2. Insulation resistance test
3. Earth continuity test
4. Earth resistivity test

Besides the above, any other test specified by the local authority shall also be carried out. All tested and calibrated instruments for testing, labour, materials and incidentals necessary to conduct the above tests shall be provided by the contractor at his own cost.

2 WIRING CONTINUITY TEST

All wiring systems shall be tested for continuity of circuits, short circuits, and earthling after wiring is completed and before installation is energized.

3 INSULATION RESISTANCE TEST

The insulation resistance shall be measured between earth and the whole system conductors, or any section thereof with all fuses in place and all switches closed and except in concentric wiring all lamps in position of both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure provided that it does not exceed 1100 volts for medium voltage circuits. Where the supply is derived from AC three phase system, the neutral pole of which is connected to earth, either direct or through added resistance, pressure shall be deemed to be that which is maintained between the phase conductor and the neutral. The insulation resistance measured as above shall not be less than 50 megohms divided by the number of points provided on the circuit the whole installation shall not have an insulation resistance lower than one megohm.

The insulation resistance shall also be measured between all conductors connected to one phase conductor of the supply and shall be carried out after removing all metallic connections between he two poles of the installation and in those circumstances the insulation shall not be less than that specified above.

The insulation resistance between the frame work of housing of power appliances and all live parts of each appliance shall not be less than that specified in the relevant Standard specification or where there is no such specification, shall not be less than half a me ohm or when PVC insulated cables are used for wiring 11.5 me ohms divided by the number of outlets. Where a whole installation is being tested a lower value than that given by the above formula subject to a minimum of 1 Me ohms is acceptable.

4 TESTING OF EARTH CONTINUITY PATH

The earth continuity conductor including metal conduits and metallic envelopes of cable in all cases shall be tested for electric continuity and the electrical resistance of the same alongwith the earthing lead but excluding any added resistance of earth leakage circuit breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

5 TESTING OF POLARITY OF NON-LINKED SINGLE POLE SWITCHES

In a two wire installation a test shall be made to verify that all non-linked single pole switches have been connected to the same conductor throughout, and such conductor shall be labeled or marked for connection to an outer or phase conductor or to the non-earthed conductor of the supply. In the three of four wire installation, a test shall be made to verify that every non-linked single pole switch is fitted to one of the outer or phase conductor of the supply. The

entire electrical installation shall be subject to the final acceptance of the Architect as well as the local authorities.

6 EARTH RESISTIVITY TEST

Earth resistivity test shall be carried out in accordance with IS Code of Practice for earthing IS 3043.

7 PERFORMANCE

Should the above tests not comply with the limits and requirements as above the contractor shall rectify the faults until the required results are obtained. The contractor shall be responsible for providing the necessary instruments and subsidiary earths for carrying out the tests. The above tests are to be carried out by the contractor without any extra charge.

8 TESTS AND TEST REPORTS

The Contractor shall furnish test reports and preliminary drawings for the equipment to the Architect/owners for approval before commencing supply of the equipment. The Contractor should intimate with the tender the equipment intended to be supplied with its technical particulars. Any test certificates etc., required by the local Inspectors or any other Authorities would be supplied by the Contractor without any extra charge.

TECHNICAL SPECIFICATIONS

EARTHING

1. GENERAL

All the non-current carrying metal parts of electrical installation shall be earthed properly. All metal conduits, trunking, cable sheaths, switchgear, distribution fuse boards, light fittings and all other parts made of metal shall be bonded together and connected by means of specified earthing conductors to an efficient earthing system. All earthing shall be in conformity with Indian Electricity Rules.

The Earthing System shall in totally comprise the following:-

a) Earth Electrodes
b) Earthing Leads
c) Earth Conductors

All three phase equipment shall have two separate and distinct body earths and single phase equipment shall have a single body earth.

2. STANDARDS

All equipments, components, materials and entire work shall be carried out in conformity with applicable and relevant Bureau of Indian Standards and Codes of Practice, as amended upto date and as below. In addition, relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and /or IEC Standards shall be applicable.

Equipments certified by Bureau of Indian Standards shall be used in this contract in line with government regulations. Test certificates in support of this certification shall be submitted, as required.

It is to be noted that updated and current standards shall be applicable irrespective of dates mentioned along with ISS's in the tender documents.

3. EARTHING MATERIAL

Materials of which the protective system is composed shall be resistant to corrosion or be adequately protected against corrosion. The material shall be as specified in the schedule of quantities and shall comply to the following requirements:

- Copper - When solid or stranded copper wire is used it shall be of the grade ordinarily required for commercial electrical work generally designated as being of 98% conductivity when annealed, conforming to Indian standard specifications.
- Galvanised Steel - Galvanised steel used shall be thoroughly protected against corrosion by hot dipped Zinc coating. The material coating shall withstand the test specified in IS 2309:1969.
- The strips to be used shall be in maximum lengths available as manufactured normally avoiding unnecessary joints.

4 EARTH ELECTRODES

- Plate Earth Electrode

The plate electrodes shall be of copper/ GI as called for in the schedule of quantities. The minimum dimensions of the electrodes shall be 600 mm x 600 mm. Thickness of copper electrodes shall not be less than 3 mm and of GI electrodes not less than 6 mm.

The electrode shall be buried in ground with its face vertical and top not less than 4 meters below ground level.

- Earth Electrode Pit
  Method Of Installing Watering Arrangement

  In the case of plate earth electrode, a watering pipe of 20 mm dia of medium class G.I. Pipe shall be provided and attached to the electrode. A funnel with mesh shall be provided at the top of this pipe for watering the earth. The watering funnel attachment shall be housed in masonry enclosure of not less than 1000 x 500 x 600 mm. A precast RCC frame & cover shall be suitably embedded in the masonry enclosure.

  Location Of Earth Electrode
  The following guidelines shall be followed for locating the earth electrodes

  An earth electrode shall not be situated less than 5 metres from any building.

  The excavations for electrode shall not affect the column footings or foundations of the buildings. In such cases electrode may be further away from the building.

  The location of the earth electrode shall be such where the soil has reasonable chance of remaining moist, as far as possible.

  Entrances, pavements and road ways shall not be used for locating the earth electrode.

  Number Of Earth Electrodes
  In all cases the relevant provision of rule 33, 61 & 67 of the Indian Electricity Rules 1956 as amended shall be complied with.

  Metallic covers or supports of all medium or H.T. apparatus or conductors shall, in all cases be connected to not less than two separate and distinct earth electrodes.

5. EARTHING LEADS

The strip earthing leads shall be connected to the Earth Electrode at one end and to the metallic body of the main equipment at the other end. The earthing lead shall connect to the earthing network in the installation.

- Earthing Lead Sizes
  Strip earthing leads shall be of copper/GI and as per specifications.

- Earthing Lead Installation
  The length of buried strip earthing lead shall be not less than 15 metres and shall be buried in trench not less than 0.5 m deep.

  If conditions necessitates use of more than one earthing lead they shall be laid as widely distributed as possible preferably in a single straight trench or in a number of trenches radiating from one point.

- Method Of Connecting Earthing Lead To Earth Electrode
  In the case of plate earth electrode the earthing lead shall be securely bolted to the plate with two bolts, nuts, checknuts and washers as required by IS 3043 : 1987.

  All materials used for connecting the earth lead with electrode shall be GI in case of GI Pipe and GI plate earth electrodes or tinned brass in case of Copper plate electrode.

- Protection Of Earthing Lead
  The earthing lead from electrode onwards shall be suitably protected from mechanical injury and corrosion by a 15 mm dia GI pipe in case of wire and 100/40 mm dia medium class GI Pipe

  The portion of the G.I. pipe within ground shall be buried at least 30 cm deep (to be increased to 60 cm in case of road crossing or pavements). The portion within the building shall be recessed in walls and floors to adequate depth.

6. EARTHING CONDUCTORS

Earthing conductors shall form the earthing network throughout the installation for earthing of all non- carrying metal parts.

- Connection Of Earthing Conductors
  - Main earthing conductors shall be taken from the earth connections at the main switch boards to all other switchboards in the network.
  - Sub-mains earthing conductors shall run from the main switch board to the sub distribution boards and to the final distribution boards.
  - Loop earthing conductors shall run from the distribution boards and shall be connected to any point on the main/sub-main earthing conductor, or its distribution board or to an earth leakage circuit breaker.
  - Metal conduits, cable sheathing and armouring shall be earthed at the ends adjacent to switch boards at which they originate, or otherwise at the commencement of the run by an earthing conductor in effective electrical contact with cable sheathing, Switches, accessories, lighting fitting etc shall be effectively connected to the Loop Earthing Conductors. These though rigidly secured in effective electrical contact with a run of metallic conduit shall not be considered earthed, even though the run of metallic conduit is earthed.

- Earthing Conductor Installation

  The earthing conductors inside the building wherever exposed shall be properly protected from mechanical injury by running the same in GI pipe of adequate size.

  Joints shall be revetted and brazed in approved manner.

  Sweated lugs of adequate capacity and size shall be used for termination. Lugs shall be bolted to the equipment body to be earthed after the metal body is cleaned of paint and other oily substances and properly tinned.

- Sizing Of Earthing Conductors

All fixtures, outlet boxes and junction boxes shall be earthed with Bare copper wires as specified.

All 3 phase switches and distribution boards upto 60 amps rating shall be earthed with 2 Nos. distinct and independent 4 mm dia copper/6 mm dia GI wires. All 3 phase switches and distribution boards upto 100 amps rating shall be earthed with 2 Nos. distinct and independent 6 mm dia copper/8 mm dia GI wires. All switches, bus bar, ducts and distribution boards of rating 200 amps and above shall be earthed with a minimum of 2 Nos. separate and independent 25 mm x 3 mm copper/25mm x 6 mm GI tape.

7. PROHIBITED CONNECTIONS

Neutral conductor, sprinkler pipes, or pipes conveying gas, water, or inflammable liquid, structural steel work, metallic enclosures, metallic conduits and lighting protection system conductors shall not be used as a means of earthing an installation or even as a link in an earthing system.

8. RESISTANCE TO EARTH

No earth electrode shall have a greater ohmic resistance than 3 ohms as measured by an approved earth testing apparatus. In rocky soil the resistance may be upto 5 ohms. The electrical resistance measured between earth connection at the main switchboard and any other point on the completed installation shall be low enough to permit the passage of current necessary to operate fuses or circuit breakers, and shall not exceed 1 ohm.

SPECIAL INSTRUCTIONS TO TENDERERS

1 GENERAL

- Only the preferred makes of material as stipulated shall be accepted.
- For any fixtures and fittings required to be fixed to the RCC slab, the Contractor shall drill the required holes with the use of an appropriate drilling machine with drill bits and no extra charges shall be payable on this account.
- The rates quoted shall be for work to be carried out at all heights and levels as at site and no extra payment shall be made for the same.
- The rates quoted for wiring shall be applicable for concealed or surface conduiting as required

2 CONDUITING

The rates to be quoted by tenderers shall include any or all of the following. No additional costs shall be paid for tools etc. as required to complete the work.

- All cutting of chassis in brick walls shall be with chase cutting tools.
- Whenever required chases shall be cut in stone walls with a chase cutting machine and with specific tools as required prior to plastering.
- In case of exposed stone walls the conduits shall be laid alongwith the construction of the wall and co-ordinated with civil activity.

3 POINT WIRING

- The Point Wiring shall commence from the Distribution Board and shall include the circuit wiring of length as required via the switch to the fitting/socket outlet as called for unless otherwise specified.
- The rates for all point wiring shall include the supplying and fixing of:

  a) ISI approved & marked GI conduits.
  b) Conduit accessories conforming to IS
  c) MS draw, inspection and junction boxes.
  d) Zinc chromate passivated switch boxes, outlet boxes etc.
  e) All fixing accessories such as clips, brass screws etc.
  f) Embedding conduits and accessories in walls and floors etc during construction and/or cutting chases and making good as necessary in the case of concealed conduit work and/or providing and fixing saddles, hangers, stirrups etc. and grouting of the same as required for surface conduiting.
  g) Switches, wiring accessories and moulded cover plate as required.
  h) Painting all conduits, outlet boxes and junction boxes.
  i) Providing and fixing PVC connector at outlet box/junction box provided for light points.
  j) Providing PVC cover at outlet box/ junction box provided for light points.

4 SWITCHES, OUTLETS AND ACCESSORIES

All switches, socket outlets and other accessories shall be approved by the Owners prior to installation. The Contractor shall furnish samples of all materials within 7 days of the award of the work.

5 mains and sub-mains
6 The rate for all items shall include:

a) ISI approved & marked GI conduits.
b) Conduit accessories conforming to IS
c) MS draw, inspection and junction boxes.
d) Providing and fixing approved saddles, hangers, trays, etc., and grouting the same as required for exposed conduits.
e) Embedding conduits and accessories in walls and floors etc during construction and/or cutting chases and making good as necessary in the case of concealed conduit work and/or providing and fixing saddles, hangers, stirrups etc. and grouting of the same as required for surface conduiting.
f) Providing and fixing junction boxes with 3-mm thick Perspex sheet covers including painting covers on inner side to match the colour of the surrounding walls.
g) Effecting adequate and proper connections at termination.
h) Providing all fixing accessories such as clamping devices, nuts, bolts and screws.
i) Providing sealing compound thimbles, crimping etc., at joints and terminations as called for.

6 EARTHING

The rates for earthing items include:

a) All fixing accessories such as brass saddles, brass screws rawl plugs, etc.
b) Jointing by riveting and soldering.
c) Cutting chases, holes and making good the same wherever required.
d) Effecting adequate and proper interconnections.
e) Excavation of earth, refilling, watering and ramming and making good as approved.

7 FIXING OF LIGHTING FIXTURES

The rates shall include the following:

1. All components that may be required to make the installation complete in all respects such as:

   a) Suitable length of down rod, hanger and connecting wires where called for. The Down rod shall be paid for separately on a running metre basis.
   b) Internal wiring between accessories.
   c) Wiring for connecting the fixtures to the point through connection blocks.
   d) All metal blocks to serve as base of fixtures.
   e) Bonding with earth wires.

2. Drilling holes in supports where required.

3. Fixing clamps, GI bolts and nuts, brass screws, saddles, rawl bolts and other fixing accessories as required.

8 DRAWINGS

General Arrangement drawings with constructional details shall be submitted to the Architects/ Engineer-in-charge for all Distribution Boards etc and their approval obtained prior to commencement of fabrication. Equipment shall not be accepted unless the drawings have been approved by the Architects/Engineer-in-charge. These drawings shall be prepared and submitted within one month of the award of work.

9 WIRES AND CABLES

ALL WIRES AND CABLES USED SHALL BE OF THE STIPULATED MAKE. THE CONTRACTOR SHALL PROVIDE A CERTIFICATE FROM THE MANUFACTURER.

We confirm that the Special Instructions to Tenderers have been understood and our tender complies to the above in its entirety.

BOQ FOR RESTORATION OF DAMAGES FOR EXTERNAL SERVICES WORKS

AT

GLOBAL GATEWAY

M.G ROAD, GURUGRAM

CLIENT

UNITECH LTD
8th & 13th Floor, Tower-B
Signature Tower, South City -1Gurugram

PMC

Rudrabhishek Enterprises ltd
A-6, Sector-58, Noida, U.P-201301

INDEX

COST ESTIMATE - GENERAL ABSTRACT				
PROPOSED RESTORATION OF DAMAGES IN EXTERNAL WORK AT GLOBAL GATEWAY, GURUGRAM				
S.NO	**DESCRIPTION**	**(PART -A) DSR AMOUNT (in INR)**	**(PART -B) NSR AMOUNT (in INR)**	**TOTAL (A+B)**
1	BALANCE CIVIL WORKS	84,09,778.00	22,05,604.00	1,06,15,382.00
2	BALANCE PLUMBING WORKS	13,82,053.33	18,96,212.45	32,78,266.00
3	BALANCE ELECTRICAL WORKS	1,62,976.00	4,23,590.00	5,86,566.00
	TOTAL	**99,54,807**	**45,25,406**	**14480214.00**

Project: BOQ for Restoration of damages in Global Gateway, Unitech Project at Gurugram

Abstract of Cost

Sl. No.	Description	Amount in Rs.	Remarks
1	Earth Work	1181533.00	
2	Cement Concrete Work	875025.00	
3	RCC Work	98701.00	
4	BRICK WORK	237386.00	
5	Cladding Work	20032.00	
6	Steel Work	749.00	
7	Flooring Work	874781.00	
8	Finishing Work	48610.00	
9	Dismantling & Demolishing Work	232889.00	
10	Road Work	4355498.00	
11	Rain Water Harvesting & Tubewells	484574.00	
		8409778.00	
12	Non-Schedule / Miscellaneous Work	2205604.00	
	TOTAL AMOUNT	**10615382.00**	

Project: BOQ for Restoration of damages in Global Gateway, Unitech Project at Gurugram						
Bill of Quantities						
Sl. No.	**DSR Item Ref.**	**Description**	**Unit**	**Qty**	**Rate**	**Amount**
1	**1**	**EARTH WORK**				
1.01	2.8	Earth work in excavation by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, including getting out the excavated soil and disposal of surplus excavated soil as directed by Engineer-in-charge, with all lead and lift.				
	2.8.1	All kinds of soil.	Cum	338.00	251.50	85007.00
1.02	2.25	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, for all lead and lift as directed by Engineer-in-charge	Cum	228.00	222.70	50776.00
1.03	2.25(a)	Supplying and filling of local earth (including royalty) by mechanical transport also including ramming and watering of the earth in layers not exceeding 20 cm in trenches, plinth, sides of foundation etc. complete.	cum	2481.00	323.20	801859.00
1.04	2.26	Extra for every additional lift of 1.5 m or part thereof in excavation / banking excavated or stacked materials.				
	2.26.1	All kinds of soil	Cum	101.40	91.60	9288.00
1.05	2.27	Supplying and filling in plinth with sand under floors, including watering, ramming, consolidating and dressing complete.	cum	90.50	1895.00	171498.00
1.06	1.1.18	Disposal of moorum/building rubbish/ malba/ similar unserviceable, dismantled or waste material by mechanical transport including loading, transporting, unloading to approved municipal dumping ground for lead upto 10 km for all lifts, complete as per directions of Engineer-in-charge.	cum	175.00	360.60	63105.00
		Total carried over to Summary				**1181533.00**
2	**4**	**CEMENT CONCRETE WORK**				
2.01	4.1	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:				
2.02	4.1.8	1:4:8 (1 Cement : 4 coarse sand (zone-III) derived from natural sources : 8 graded stone aggregate 40 mm nominal size derived from natural sources)	cum	126.00	5546.70	698884.00
	4.1.10	1:5:10 (1 cement : 5 coarse sand (zone-III): 10 graded stone aggregate 40 mm nominal size)	cum	27.00	5305.30	143243.00
2.03	4.3	Centering and shuttering including strutting, propping etc. and removal of form work for :				
2.04	4.3.1	Foundations, footings, bases for columns	sqm	121.85	270.00	32898.00
		Total carried over to Summary				**875025.00**
3	5	**RCC WORK**				
3.01	5.9	Centering and shuttering including strutting, propping etc. and removal of form for :				
	5.9.1	Foundations, footings, bases of columns, etc. for mass concrete	Sqm	5.00	270.00	1350.00
	5.9.2	Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	Sqm	3.00	587.10	1761.00
	5.9.3	Suspended floors, roofs, landings, balconies and access platform	Sqm	10.00	672.10	6721.00

	5.9.5	Lintels, beams, plinth beams, girders, bressumers and cantilevers	Sqm	17.00	533.40	9068.00
3.02	5.22	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete upto plinth level.				
	5.22.6	Thermo-Mechanically Treated bars of grade Fe-500D or more.	kg	480.00	78.60	37728.00
3.03	5.33	Providing and laying in position ready mixed or site batched design mix cement concrete for reinforced cement concrete work; using coarse aggregate and fine aggregate derived from natural sources, Portland Pozzolana / Ordinary Portland /Portland Slag cement, admixtures in recommended proportions as per IS: 9103 to accelerate / retard setting of concrete, to improve durability and workability without impairing strength; including pumping of concrete to site of laying, curing, carriage for all leads; but excluding the cost of centering, shuttering, finishing and reinforcement as per direction of the engineer-in-charge; for the following grades of concrete. Note: Extra cement up to 10% of the minimum specified cement content in design mix shall be payable separately. In case the cement content in design mix is more than 110% of the specified minimum cement content, the contractor shall have discretion to either re-design the mix or bear the cost of extra cement.				
	5.33.1	All works upto plinth level				
	5.33.1.1	Concrete of M25 grade with minimum cement content of 330 kg /cum	Cum	6.00	7012.10	42073.00
		Total carried over to Summary				**98701.00**
4	**6**	**Brick Work**				
4.1	6.1	Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in foundation and plinth in:				
	6.1.1	Cement mortar 1:4 (1 cement : 4 coarse sand)	Cum	36.00	6034.20	217231.00
4.2	6.2	Brick work with common burnt clay modular bricks of class designation 7.5 in foundation and plinth in:				
	6.2.1	Cement mortar 1:4 (1 cement : 4 coarse sand)	Cum	4.00	5038.80	20155.00
		Total carried over to Summary				**237386.00**
5	**8**	**CLADDING WORK**				
5.01	8.2	Providing and fixing 18 mm thick gang saw cut, mirror polished, premoulded and prepolished, machine cut for kitchen platforms, vanity counters, window sills, facias and similar locations of required size, approved shade, colour and texture laid over 20 mm thick base cement mortar 1:4 (1 cement : 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edges to give high gloss finish etc. completeat all levels.				
	8.2.3	Granite stone slab all colour and texture except black, Cherry/ Ruby red				
	8.2.3.1	Area of slab upto 0.50 sqm	sqm	2.00	3117.40	6235.00
5.02	8.6	Mirror polishing on marble work/Granite work/stone work where everrequired to give high gloss finish complete.	sqm	7.00	366.20	2563.00
5.03	8.7	Providing and fixing cramps of required size & shape in RCC/ CC / Brick masonry backing with cement mortar 1:2 (1 cement :2 coarse sand), including drilling necessary hole in stones and embedding the cramp in the hole (fastener to be paid separately).				
	8.7.2	Stainless steel cramps	kg	20.50	548.00	11234.00
		Total carried over to Summary				**20032.00**

6	**10**	**STEEL WORK**				
6.1	10.25	Steel work welded in built up sections/ framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.				
6.2	10.25.2	In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works	kg	6.00	124.80	749.00
		Total carried over to Summary				**749.00**
7	**11**	**FLOORING WORK**				
7.01	11.26	Kota stone slab flooring over 20 mm (average) thick base laid over and jointed with grey cement slurry mixed with pigment to match the shade of the slab, including rubbing and polishing complete with base of cement mortar 1 : 4 (1 cement : 4 coarse sand)				
	11.26.1	25 mm thick	sqm	156.00	1496.40	233438.00
7.02	11.27	Kota stone slabs 20 mm thick in risers of steps, skirting, dado and pillars laid on 12 mm (average) thick cement mortar 1:3 (1 cement: 3 coarse sand) and jointed with grey cement slurry mixed with pigment to match the shade of the slabs, including rubbing and polishing complete.	Sqm	16.00	1787.40	28598.00
7.03	11.56	Providing and laying Polished Granite stone flooring in required design and patterns, in linear as well as curvilinear portions of the building all complete as per the architectural drawings with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge				
7.04	11.56.2	Polished Granite stone slab of all colour and texture except Black, Cherry/Ruby Red	sqm	200.00	2348.00	469600.00
7.05	16.82	Taking out existing kerb stones of all types from footpath/ central verge, including removal of mortar etc., disposal of unserviceable material to the dumping ground, for which payment shall be made separately and stacking of serviceable material within 50 metre lead as per direction of Engineer-in-Charge.	Rmt	651.00	28.40	18488.00
7.06	16.85	Laying at or near ground level old kerb stones of all types in position to the required line, level and curvature, jointed with cement mortar 1:3 (1 cement : 3 coarse sand), including making joints with or without grooves (thickness of joints, except at sharp curve, shall not be more than 5 mm), including making drainage opening wherever required etc. complete as per direction of Engineer-in-charge. (Length of finished kerb edging shall be measured for payment). (Old kerb stones shall be supplied by the department free of cost)	Rmt	551.00	79.70	43915.00
7.07	16.69	Providing and laying at or near ground level factory made kerb stone of M-25 grade cement concrete in position to the required line, level and curvature, jointed with cement mortar 1:3 (1 cement: 3 coarse sand), including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5mm), including making drainage opening wherever required complete etc. as per direction of Engineer-in-charge (length of finished kerb edging shall be measured for payment). (Precast C.C. kerb stone shall be approved by Engineer-in-charge).	Cum	6.00	7552.40	45314.00

7.08	13.72	Washed stone grit plaster on exterior walls height upto 10 metre above ground level, in two layers, under layer 12 mm cement plaster 1:4 (1 cement : 4 coarse sand), furrowing the under layer with scratching tool, applying cement slurry on the under layer @ 2 Kg of cement per square metre, top layer 15 mm cement plaster 1:1/ 2:2 (1 cement: 1/2 coarse sand : 2 stone chipping 10 mm nominal size), in panels with groove all around as per approved pattern, including scrubbing and washing the top layer with brushes and water to expose the stone chippings ,complete as per specification and direction of Engineer-in-charge (payment for providing grooves shall be made separately).	Sqm.	41.00	864.10	35428.00
		Total carried over to Summary				**874781.00**
8	13	**FINISHING WORK**				
8.01	13.9	Cement plaster 1:3 (1 cement: 3 coarse sand) finished with a floating coat of neat cement.				
	13.9.1	12 mm cement plaster	Sqm	133.00	338.90	45074.00
8.02	13.50	Applying priming coat:				
	13.50.4	With ready mixed red oxide zinc chromate primer of approved brand and manufacture on steel work (second coat)	Sqm	25.00	26.10	653.00
8.03	13.61	Painting with synthetic enamel paint of approved brand and manufacture to give an even shade :				
	13.61.1	Two or more coats on new work	Sqm.	25.00	115.30	2883.00
		Total carried over to Summary				**48610.00**
9	15	**DISMANTLING AND DEMOLISHING WORK**				
9.01	15.2	Demolishing cement concrete manually/ by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in - charge.				
	15.2.2	Nominal concrete 1:4:8 or leaner mix (i/c equivalent design mix)	Cum	39.00	1086.90	42389.00
9.02	15.3	Demolishing R.C.C. work manually/ by mechanical means including stacking of steel bars and disposal of unserviceable material within 50 metres lead as per direction of Engineer - in-charge.	cum	26.00	2567.40	66752.00
9.03	15.7	Demolishing brick work manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-charge.				
	15.7.4	In Cement Mortar	cum	4.00	1489.20	5957.00
9.04	15.8	Removing mortar from bricks and cleaning bricks including stacking within a lead of 50 m (stacks of cleaned bricks shall be measured):				
	15.8.3	From brick work in cement mortar	1000 Nos	1.80	4842.00	8716.00
9.05	15.10	Dismantling dressed stone work ashlar face stone work, marble work or precast concrete work manually/ by mechanical means including stacking of serviceable and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-charge :				
	15.10.2	In Cement Mortar	sqm	52.00	2080.10	108165.00
9.06	15.19	Dismantling steel work manually/ by mechanical means in built up sections without dismembering and stacking within 50 metres lead as per direction of Engineer-in-charge.	kg	325.00	2.80	910.00
		Total carried over to Summary				**232889.00**
10	16	**ROAD WORK**				

10.01	16.1	Preparation and consolidation of sub grade with power road roller of 8 to 12 tonne capacity after excavating earth to an average of 22.5 cm depth, dressing to camber and consolidating with road roller including making good the undulations etc. and re-rolling the sub grade and disposal of surplus earthwith lead upto 50 metres.	sqm	2088.00	158.30	330530.00
	16.3	Supplying and stacking at site.				
	16.3.1	90 mm to 45 mm size stone aggregate	cum	314.00	1698.90	533455.00
	16.3.2	63 mm to 45 mm size stone aggregate	cum	209.00	1424.40	297700.00
10.02	16.4	Laying, spreading and compacting stone aggregate of specified sizes to WBM specifications in uniform thickness, hand picking, rolling with 3 wheeled road/vibratory roller 8-10 tonne capacity in stages toproper grade and camber, applying and brooming requisite type of screening / binding material to fill up interstices of coarse aggregate, watering and compacting to the required density .	cum	523.00	759.10	397009.00
10.03	16.68	Providing and laying 60mm thick faciory made cement concrete interlocking paver block of M -30 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50mm thick compacted bed of coarse sand, filling the joints with line sand etc. all complete as per the direction of Engineer-in-charge.	sqm	1538.40	833.80	1282718.00
10.04	16.83	Taking out existing CC interlocking paver blocks from footpath/ central verge, including removal of rubbish etc., disposal of unserviceable material to the dumping ground, for which payment shall be made separately and stacking of serviceable material within 50 metre lead as per direction of Engineer-in-Charge.	sqm	4013.00	95.30	382439.00
10.05	16.84	Laying old cement cocrete interlocking paver blocks of any design/ shape laid in required line, level, curvature, colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer in-charge. (Old CC paver blocks shall be supplied by the department free of cost).	sqm	3562.00	317.70	1131647.00
		Total carried over to Summary				**4355498.00**
11	**23**	**Rain Water Harvesting & Tubewells**				
11.01	23.5	Supplying, filling, spreading & leveling stone boulders of size range 5 cm to 20 cm, in recharge pit, in the required thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge.	cum	21.00	1141.90	23980.00
11.02	23.6	Supplying, filling, spreading & leveling gravels of size range 5 mm to 10 mm, in the recharge pit, over the existing layer of boulders, in required thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge.	cum	6.00	1147.70	6886.00
11.03	23.7	Supplying, filling, spreading & leveling coarse sand of size range 1.5 mm to 2 mm in recharge pit, in required thickness over gravel layer, for all leads & lifts, all complete as per direction of Engineer -incharge.	cum	6.00	1147.70	6886.00
11.04	23.1	Boring/drilling bore well of required dia for casing/ strainer pipe, by suitable method prescribed in IS: 2800 (part I), including collecting samples from different strata, preparing and submitting strata chart/ bore log, including hire & running charges of all equipments, tools, plants & machineries required for the job, all complete as per direction of Engineer-in-charge, upto 90 metre depth below ground level.				

	23.1.1	All types of soil				
	23.1.1.1	300mm dia	Metre	300.00	519.10	155730.00
11.05	23.4	Supplying, assembling, lowering and fixing in vertical position in bore well unplasticized PVC medium well screen (RMS) pipes with ribs, conforming to IS: 12818, including hire & labour charges, fittings & accessories etc. all complete, for all depths, as per direction of Engineer-in-charge.				
	23.4.3	200 mm nominal size dia	Metre	300.00	963.80	289140.00
11.06	23.8	Gravel packing in tubewell construction in accordance with IS: 4097, including providing gravel fine/ medium/ coarse, in required grading & sizes as per actual requirement, all complete as per direction of Engineer-in-charge.	cum	1.50	1297.00	1952.00
		Total carried over to Summary				**484574.00**
12	17	**NON-SCHEDULE /MISCELLANEOUS WORK**				
12.01	NSR	Providing and fixing of expansion joint system related with floor location as per drawings and direction of Engineer-In-Charge. The joints system will be of extruded aluminum base members, self aligning / self centering arrangement and support plates etc. as per ASTM B221-02. The system shall be such that it provides floor to floor /floor to wall expansion control system for various vertical localtion in load application areas that accommodates multi directional seismic movement without stress to it's components. System shall consist of metal profiles with a universal aluminum base member designed to accommodate various project conditions and finish floor treatments. The cover plate shall be designed of width and thickness required to satisfy projects movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self- centering arrangement that freely rotates / moves in all directions. The Self - centering arrangement shall exhibit circular sphere ends that lock and slide inside the corresponding aluminum extrusion cavity to allow freedom of movement and flexure in all directions including vertical displacement. Provision of Moisture Barrier Membrane in the Joint System to have watertight joint is mandatory requirement all as per the manufactures design and as approved by Engineer -in Charge. (Material shall confirm to ASTM 6063).				
	NSR	Floor Joint of 50 mm gap	metre	195.00	4005.20	781014.00
12.02	NSR	Providing and fixing of expansion joint system related with wall joint (internal/external) location as per drawings and direction of Engineer-In Charge. The joints shall be of extruded aluminum base members, self aligning / centering arrangement and support plates as per ASTM B221- 02. The material shall be such that it provides an Expansion Joints System suitable for vertical wall to wall/ wall to corner application, both new and existing construction in office Buildings & complexes with no slipping down tendency amongst the components of the Joint System. The Joint System shall utilize light weight aluminum profiles exhibiting minimal exposed aluminum surfaces mechanically snap locking the multicellular to facilitate movement. (Material shall confirm to ASTM 6063)				
	NSR	Wall Joint of 50 mm gap	metre	102.00	3763.50	383877.00

12.03	NSR	Providing and laying of 150 mm thick sub grade of compacted bed of 20 mm thick nominal size stone aggregate including spreading, well ramming, consolidating and finishing smooth etc. all complete as per direction of Engineer-in-charge.	Sqm.	90.50	400.70	36263.00
12.04	NSR	Laying of old HDPE Grass paver on 150 mm thick sub grade of compacted bed of 20 mm thick nominal size stone aggregate and base course and filling with 150 mm thick jamuna sand, including spreading, well ramming, consolidating and finishing smooth etc. all complete as per direction of Engineer-in-charge. (Note : Aggregate and sand shall be paid separately).	Sqm.	603.60	136.80	82572.00
12.05	NSR	Providing & laying of outdoor HDPE Grass Paver of 40mm thick on 150 mm thick sub grade of compacted bed of 20 mm thick nominal size stone aggregate and base course and filling with 150 mm thick jamuna sand, including spreading, well ramming, consolidating and finishing smooth etc. all complete as per direction of Engineer-in-charge.	Sqm	78.00	1112.70	86791.00
12.06	NSR	Providing, laying and fixing of precast suacer drain (solid & perforated) of size 600x300x70/100 mm (thickness 70mm at curve portion in centre & 100mm at both side) jointed with 1:3 cement mortar (1 cement : 3 coarse sand)over the base of 20mm thick cement mortar 1:4 (1 cement : 4 coarse sand) in slope, line & level as shown in drawing and manufactured by M 30 grade of concrete by vibro compaction process using joint less FRP moulds so as to achieve shuttering finish etc. all complete under instruction of engineer-in-charge.	metre	212.00	393.70	83464.00
12.07	NSR	Fixing of old Steel work welded in built up sections/ framed work, including grouting holdfast / desh fastner etc. all complete under instruction of engineer in - charge.	Kg	2000.00	11.10	22200.00
12.08	NSR	Granite work gang saw cut (polished and machine cut) of thickness 18 mm for wall lining (veneer work), backing filled with a grout of average 12 mm thick in cement mortar 1:3 (1 cement : 3 coarse sand), including pointing with jointed with white cement slurry @ 4.4 kg/sqm, including pointing with white cement slurry admixed with pigment to match the shade, including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge.)				
		Granite of any colour and shade	Sqm	11.00	4277.10	47048.00
12.09	NSR	Providing and laying shot blasted Granite stone flooring in required design and patterns, in linear as well as curvilinear portions of the building all complete as per the architectural drawings with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge				
		Shot blasted granite stone of any Colour and shade.	sqm	250.00	2729.50	682375.00
		Total carried over to Summary				**2205604.00**

SUMMARY OF COST FOR RESTORATION OF DAMAGES IN SEWER LINES/DRAINAGE AT GLOBAL GATEWAY GURUGRAM

S.No.	Description	AMOUNT AS PER DSR 2021 (EXCLUDING GST) (Rs.)	AMOUNT FOR NSR* ITEMS (Rs.)
1	WATER SUPPLY SYSTEM (INTERNAL & EXTERNAL)	664	80,681
2	SEWERAGE & DRAINAGE AROUND BUILDINGS	12,06,249	18,15,532
3	PERCOLATION / RECHARING PIT	1,75,140	-
	TOTAL (IN RS.)	**13,82,053**	**18,96,212**
	GRAND TOTAL (IN RS.)		

NSR* NON SCHEDULE RATE

ANNEXURE PART-A DSR ITEM TOTAL	**13,82,053**	
ANNEXURE PART-B NSR ITEM TOTAL		**18,96,212**
TOTAL PLUMBING WORKS		**32,78,266**

BILL OF QUANTITIES RESTORATION OF DAMAGES IN SEWER LINES/DRAINAGE FOR "GLOBAL GATEWAY" AT GURUGRAM							
SL. NO.	REF. NO. DSR 2021	DESCRIPTION	UNIT	QTY.	RATE (Rs.)	AMOUNT AS PER DSR	AMOUNT AS PER NSR*
1		**WATER SUPPLY SYSTEM (INTERNAL & EXTERNAL)**					
1.1	NSR*	Providing and Fixing **HDPE Pipes** (PE-100 grade) IS: 4984 of 10 Kg / cm2 including all fittings bends, junctions, tee, end cap etc. jointing as per manufacturer's instructions including trenching, refilling & testing of joints complete as per directions of the engineer-in-charge.**(For IRRIGATION SYSTEM)**					
	a)	25mm dia	Metre	10	460		4602
	b)	32mm dia	Metre	20	504		10083
	c)	40mm dia	Metre	20	548		10960
	d)	50mm dia	Metre	60	688		41298
1.2	NSR*	Providing and fixing **forged brass lever operated ball valve** of full flow with forged brass ball (Machined to mirror smooth finsh with hard chrome plated) and spindle with setting and gland of superior quality having minimum working pressure of 10 kg/cm^2 etc. complete in all respect.					
		40mm dia	Each	2	2455		4910
		50mm dia	Each	2	2748		5496
1.3	NSR*	Providing and fixing **C.I. butterfly valve**s , wafer end type class PN 1.0 as per I.S:13095 or BS:5155, including necessary nuts, bolts,gaskets, flanges etc., complete.					
		65mm nominal bore	Each	1	3332		3332
1.4	18.13	**Making connection of G.I. distribution branch with G.I. main** offollowing sizes by providing and fixing tee, including cutting and threading the pipe etc. complete :					
	18.13.1	25 to 40 mm nominal bore	Each	1	664	664	
		TOTAL"WATER SUPPLY SYSTEM (INTERNAL)"CARRIED TO SUMMARY				**664**	**80681**
2		**SEWERAGE & DRAINAGE AROUND BUILDINGS**					
2.1	2.10	Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth upto 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m :					
	2.10.1	In all kind of soils					
	2.10.1.2	Pipes, cables etc. exceeding 80 mm dia. But not exceeding 300 mm dia	Metre	190	366	69528	
	2.10.1.3	Pipes, cables etc. exceeding 300 mm dia but not exceeding 600 mm	Metre	200	571	114257	
2.2	19.6	Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete :					
	19.6.2	150 mm dia	Metre	80	432	34588	
	19.6.4	300 mm dia	Metre	110	791	87002	
	19.6.5	450mm dia	Metre	200	1299	259807	
2.2a	NSR*	Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete :					
		200 mm dia	Metre	210	598		125599
2.3	19.28	Constructing brick masonry **Road gully chamber 50x45x77.5 cm** with bricks in cement mortar 1:4 (1 cement : 4 coarse sand) with precast R.C.C. vertical grating complete as per standard design :					
	19.28.1	With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	Each	10	5487	54872	
2.4	19.7	Constructing brick masonry **manhole** in cement mortar 1:4 (1 cement : 4 coarse sand) with R.C.C. top slab with 1:1.5:3 mix (1 cement : 1.5 coarse sand (zone- III) : 3 graded stone aggregate 20 mm nominal Size),foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) finished with a floating coat of neat cement complete as per standard design :					
	19.7.1	**Inside size 90x80** cm and 45 cm deep including C.I. cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover and frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg) :					
	19.7.1.2	With Sewer bricks conforming to IS : 4885	Each	2	10142	20284	

2.5	19.8	**Extra for depth for manholes :**					
	19.8.1	Size 90x80 cm					
	19.8.1.2	With Sewer bricks conforming to IS : 4885	metre	1	6820	6820	
2.6	19.9	Constructing brick masonry **circular type manhole 0.91 m** internal dia at bottom and 0.56m dia at top in cement mortar 1:4 (1 cement : 4 coarse sand),inside cement plaster 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement, foundation concrete 1:3:6 mix (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size), and making necessary channel in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) finished with a floating coat of neat cement, all complete as per standard design :					
	19.9.1	0.91 m deep with S.F.R.C. cover and frame (heavy duty, HD-20 grade designation) 560 mm internal diameter conforming to I.S. 12592, total weight of cover and frame to be not less than 182kg., fixed in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) including centering, shuttering all complete. (Excavation, foot rests and 12mm thick cement plaster at the external surface shall be paid for separately) :					
	19.9.1.2	With Sewer bricks conforming to IS : 4885	Each	30	10230	306889	
2.7	19.10	**Extra depth for circular type manhole** 0.91m internal dia (at bottom) beyond 0.91 m to 1.67 m					
	19.10.2	With Sewer bricks conforming IS : 4885	metre	21	5869	123256	
2.8	19.11	Constructing brick masonry **circular manhole 1.22 m** internal diaat bottom and 0.56 m dia at top in cement mortar 1:4 (1 cement :4 coarse sand) inside cement plaster 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement foundation concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size) and making necessary channel in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) finished with a floating coat of neat cement, all complete as per standard design :					
	19.11.1	1.68 m deep with SFRC Cover and frame (heavy duty HD-20 grade designation) 560 mm internal diameter conforming to I.S. 12592, total weight of cover and frame to be not less than 182 kg. fixedin cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) including centering, shuttering all complete. (Excavation, foot rests and 12 mm thick cement plaster at the external surface shall be paid for separately) :					
	19.11.1.2	With Sewer bricks conforming IS : 4885	Each	5	19697	98483	
2.9	19.12	**Extra depth for circular type manhole** 1.22 m internal dia (at bottom)beyond 1.68 m to 2.29 m :					
	19.12.2	With Sewer bricks conforming IS : 4885	metre	4	7616	30464	
2.10	NSR*	Construction of brick masonry **Desilting chamber of size 200x100x60cm** (effective depth) before rainy well with 75 class designation bricks in cement mortar 1:4 (1 cement : 4 coarse sand) , foundation concrete 1:4:8 mix (1 cement : 4 coarse sand; 8 graded stone aggregate 40mm nominal size), inside and outside plastering 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand), finished with a floating coat of neat cement inside and rough plaster on outside, including fixing of grating , neatly finished complete in all respects including neccessary excavation, refilling and disposal of surplus earth, complete. (Shop drawing to be got approved).	Each	1	9504		9504
2.11	NSR*	**Making connection of Storm & Sewer line with GMDA line etc. all complete**	Job	1	1680429		1680429
		TOTAL"SEWERAGE & DRAINAGE AROUND BUILDINGS "CARRIED TO SUMMARY				**1206249**	**1815532**
3		**PERCOLATION / RECHARING PIT**					
3.1		Making wall for Earth Retain Supporting to boundry wall.(Below 3.5 to 4.50 m) and for Hrvesting pit					
	6.1.2	Providing and doing Brick work with common burnt clay selected F.P.S. (Non modular) bricks of class designation 7.5 in exposed brick work complete in cement mortar 1:6 (1 cement : 6 coarse sand)	Cum.	30	5838	175140	
		TOTAL"Percolation / Recharing Pit "CARRIED TO SUMMARY				**1,75,140**	**-**

SUMMARY OF COST FOR RESTORATION OF DAMAGES OF EXTERNAL ELECTRICAL WORKS GLOBAL GATEWAY GURUGRAM (HARYANA)

EXTERNAL				
S.NO.	**Description**	**Value Rs**	**AMOUNT As Per DSR (PART-A)**	**AMOUNT As Per NSR (PART-B)**
I	EXTERNAL LIGHTING	Rs	1,62,976	4,23,590
	TOTAL (Rs.)		**1,62,976**	**4,23,590**
	NSR* NON SCHEDULE RATE			
	ANNEXURE PART-A DSR ITEM TOTAL		**1,62,976**	
	ANNEXURE PART-B NSR ITEM TOTAL			**4,23,590**
TOTAL ELECTRICAL WORKS FOR UNIWORLD RESIDENCY CLUB				**5,86,566.00**

BILL OF QUANTITIES FOR RESTORATION OF DAMAGES OF EXTERNAL ELECTRICAL WORKS GLOBAL GATEWAY							
AT GURUGRAM (HARYANA)							
S.No.	**REF.NO. DSR 2018**	**Descripiton of Item**	**Qty.**	**Unit**	**Rate**	**AMOUNT As Per DSR (PART A)**	**AMOUNT As Per NSR (PART-B)**
SUB HEAD-I : EXTERNAL LIGHTING							
1		Supply of following sizes XLPE insulated (Heavy duty) Aluminium or Copper conductor armoured cables suitable for working voltage upto and including 1100 Volts complete as required and as per specifications.					
a)	NSR	4 x 6 sq,mm, Al conductor cable	100	RM	124.00		12400.00
b)	NSR	2 x 6 sq,mm, Al conductor cable	200	RM	93.00		18600.00
2		Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size direct in ground including excavation, sand cushioning, protective covering and refilling the trench etc as required.					
	7.1.1	Upto 35 sq. mm					
a)	I	4 x 6 sq,mm, Al conductor cable	100	RM	284.24	28424	
b)	II	2 x 6 sq,mm, Al conductor cable	200	RM	284.24	56848	
3		Laying of one number PVC insulated and PVC sheathed / XLPE power cable of 1.1 KV grade of following size in the existing RCC/ HUME/ METAL pipe as required.					
a)	7.5.1	4 x 6 sq,mm, Al conductor cable	100	RM	27.28	2728	
b)	7.5.1	2 x 6 sq,mm, Al conductor cable	100	RM	27.28	2728	
4		Supplying and making end termination with brass compression gland and aluminium lugs for following size of PVC insulated and PVC sheathed / XLPE aluminium conductor cable of 1.1 KV grade as required.					
a)	9.1.32	4 x 6 sq,mm, Al conductor cable	100	Nos.	192.72	19272	
b)	9.1.1	2 x 6 sq,mm, Al conductor cable	100	Nos.	174.24	17424	
5		Supply, laying and termination of the following sizes of 650/1100 volts grade PVC insulated **copper** conductor wires in existing conduits including end terminations with copper lugs.					
a)	1.17.12	3 x 2.5 sq.mm. Copper conductor ,PVC insulated PVC sheathed wires	100	RM	66	6600	
6	2842	Supplying and laying of 150 mm dia RCC hume pipes NP2 grade in road crossings and below paved areas laid and jointed complete with collars as required including excavation, road cutting and making good the damages etc including Cement concrete in foundations filling and mass concrete.1:4:8 (1cement 4 coarse sand and 8 grit 40 mm and below.(below Hume pipes)	50	RM	156.64	7832	
7		Supplying and laying of following size DWC HDPE pipe ISI marked along with all accessories like socket, bend, couplers etc. conforming to IS 14930, Part II complete with fitting and cutting, jointing etc. in the existing trench, complete as required.					
a)	14.15.3	120 mm dia (OD-120 mm & ID-103 mm nominal)	100	RM	211.2	21120	

8		**SINGLE ARM STREET LIGHTING 9 mtr. POLE**					
a)		Supply, Installation, wiring, connection, testing and commissioning of external boundary lighting system conforming to the technical specifications & drawings forming part of this document. The work for each light point comprises of: - of 9 meter long MS tubular pole. Weighing kgs (as per IS 2713-1980 of pole code 410 SP-7) + end bracket wt.5Kg. /mtr. + base plate 300 X 300 X 6mm plate Wt 7Kg. + Nipple Wt. 800gm. Fixture will come at top of the pole along with reducer.					
		Electrical Junction Box on surface/ recessed in foundation.					
		Digging for making foundation of the pole.					
		Erecting the pole by grouting in concrete foundation (The civil construction materials are the part of the supply against this assignment) made out of 1:3:6: mixture of cement concrete.					
		Weather proof junction box with 6A MCB and arrangement for terminating incoming and outgoing three phases cable					
		Mounting the street light fixture or approved equal on the pole top.					
		Connecting the fixture by using 3c* 2.5mm PVC flexible copper wires of colour green, red and black to the junction box.					
		Testing the connections and completing the installation.					
		Providing two numbers 38 mm GI Pipe for incoming and outgoing cables from cable laying depth to outside foundation.					
		Painting the pole with two coats of red oxide and two coats of aluminium paint.					
		The incoming cable work, out going cable work and the earthing of poles are covered under the cabling and earthing. **Make:-K Light ,KP-8109** or Equivalent .	5	Nos.	41950.00		209750
b)		Supply an outdoor street light fixture having 60W LED lamp in aluminium lamp chamber having an acrylic cover for satisfactory operation in the open complete in all respect. Havells or Equivalent .	5	Nos.	7803.00		39015
9		**POST TOP LIGHT :**					
a)		Supply Installation, wiring, connection, testing and commissioning of external post top lighting 4m Hight system conforming to the drawings forming part of this document.					
		Connecting the fixture by using 3Nos. 2.5mm PVC flexible copper wires of colour green, red and black to the junction box.					
		Testing the connections and completing the installation.					
		The incoming cable work, out going cable work and the earthing of poles are covered under the cabling and earthing.	5	Nos	19378.00		96890
b)		Supply an outdoor post top lantern/ gate having 25/30W LED lamp in aluminum lamp chamber having an acrylic cover for satisfactory operation in the open complete in all respect. Make:-**Havells CORALPT25WLED757PSYMTOPC** or Equivalent .	5	Nos	9387.00		46935
Total S.H.-I carried over to summary						**1,62,976.00**	**4,23,590.00**

MAKE LIST FOR RESTORATION OF DAMAGES FOR EXTERNAL SERVICES WORKS

AT

GLOBAL GATEWAY

M.G ROAD GURUGRAM

CLIENT

UNITECH LTD
8th & 13th Floor, Tower-B
Signature Tower, South City -1,
Gurugram

PMC

Rudrabhishek Enterprises ltd
A-6, Sector-58, Noida, U.P-201301

INDEX

UNITECH LIMITED				
Civil Works				
Sr. No.	**Material Name**	**Company Name**	**SPECIFICATIONS**	**Makes**
1	Cement		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 11.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0,22.0 from Pg. 625 to Pg. 1206.	
i		Ultra Tech		Ultra Tech
ii		Lafarge		Lafarge
iii		ACC		ACC
iv		Ambuja		Ambuja
v		Additional Brands for Chennai		COROMANDAL, CHETTINAD, VASAVDUTTA
vi		Additional Brands for Bengaluru		NUVOCO, CHETTINAD, DALMIA CEMNTS
vii		Additional Brands for Lucknow		PRISM, BIRLA PLUS
2	Reinforcement Steel {TMT Fe 500, Fe 550} and Structural Steel [Tubular sections, Hollow Steel sections & Rolled Steel sections]		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 11.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0,22.0 from Pg. 625 to Pg. 1206.	
i		TATA		JSW
ii		RINL		RINL
iii		JSW		JSW
iv		SAIL		SAIL
3	Synthetic Enamel Paint to M.S.grill		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 11.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0,22.0 from Pg. 625 to Pg. 1206.	
i		Asian		Asian
ii		Nerolac		Nerolac
iii		Berger		Berger
iv		Dulux		Dulux
4	Expansion Joint treatment		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 11.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0,22.0 from Pg. 625 to Pg. 1206.	
i		Chowgule Construction Chemicals Pvt. Ltd.		Chowgule Construction Chemicals Pvt. Ltd.
ii		Bizzar Expansion		Bizzar Expansion
iii		LBH Expansion Joints India Pvt Limited		LBH Expansion Joints India Pvt Limited
iv		NTE India Pvt. Ltd.		NTE India Pvt. Ltd.
v		SANFIELD (INDIA) LIMITED		SANFIELD (INDIA) LIMITED
vi		a) SNPG-600		a) SNPG-600
vii		b) SRFL -600		b) SRFL -600
viii		KANTAFLEX		KANTAFLEX

UNITECH LIMITED				
Civil Works				
Sr. No.	**Material Name**	**Company Name**	**SPECIFICATIONS**	**Makes**
5	Concrete Curing Compound		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 11.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0,22.0 from Pg. 625 to Pg. 1206.	
i		FOSROC		Fosroc
ii		SIKA		Sikka
iii		BASF		Basf
iv		Pidilite		Pidilite
v		CICO		CICO
6	CONCRETE ADMIXTURES		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 11.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0,22.0 from Pg. 625 to Pg. 1206.	
i		FOSROC		Fosroc
ii		SIKA		Sikka
iii		BASF		Basf
iv		Pidilite		Pidilite
7	CONSTRUCTION CHEMICALS(POLY SULPHIDE SEALENTS)		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 11.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0,22.0 from Pg. 625 to Pg. 1206.	
i		CHOWKSEY		CHOWKSEY
ii		CICO		CICO
iii		FOSROC		FOSROC
iv		PIDILITE		PIDILITE
v		STP		STP
8	PRE CAST CONCRETE (incl. DRAIN COVERS,KERB STONES etc..)		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 11.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0,22.0 from Pg. 625 to Pg. 1206.	
i		B.G. SHIRKE		B.G. SHIRKE
ii		SIPOREX		SIPOREX
iii		SUPREME CONCRETE		SUPREME CONCRETE
iv		KK MANHOLE AND GRATINGS CO.		KK MANHOLE AND GRATINGS CO.
9	GI RECESSED MANHOLE COVERS_INTERLOCK TYPE		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 11.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0,22.0 from Pg. 625 to Pg. 1206.	
i		ARC ENGG.		ARC ENGG.
ii		TASNEEM ENTERPRISES		TASNEEM ENTERPRISES
iii		SHOMYA FAB.		SHOMYA FAB.
iv		MNC DRAIN SOLUTION		MNC DRAIN SOLUTION
v		PROSPERITY EXIM		PROSPERITY EXIM

UNITECH LIMITED				
Civil Works				
Sr. No.	**Material Name**	**Company Name**	**SPECIFICATIONS**	**Makes**
10	CC PAVERS		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 11.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0,22.0 from Pg. 625 to Pg. 1206.	
i		NITCO		NITCO
ii		ULTRA		ULTRA
iii		UNISTONE		UNISTONE
iv		PAVIT		PAVIT
v		DURACRETE		DURACRETE
11	WELDING ELECTRODES		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 11.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0,22.0 from Pg. 625 to Pg. 1206.	
i		L&T		L&T
ii		MODI		MODI
iii		OERLIKON		OERLIKON
iv		ADVANI		ADVANI
v		ESAB		ESAB
vi		ADOR		ADOR
12	ANCHOR FASTNERS		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 11.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0,22.0 from Pg. 625 to Pg. 1206.	
	CHEMICAL FASTENERS			
i		FISCHER		FISCHER
ii		HILTI		HILTI
	MECHANICAL FASTENERS			
i		FISCHER		FISCHER
ii		HILTI		HILTI
13	ELECTRO FORGED GRATINGS		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 11.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0,22.0 from Pg. 625 to Pg. 1206.	
i		GREATWELD STEEL GRATINGS		GREATWELD STEEL GRATINGS
ii		KANADE ANAND UDYOG		KANADE ANAND UDYOG
iii		PINAX STEEL INDUSTRIES		PINAX STEEL INDUSTRIES
iv		CELLCOM GRATINGS		CELLCOM GRATINGS
v		OMKAR GRATINGS		OMKAR GRATINGS
vi		PREMIER GRATINGS, KOLKATA		

UNITECH LIMITED

Finishing Works

Sr. No.	Material Name	Company Name	SPECIFICATIONS	Makes
A	**CARPENTRY WORKS**			
C	**WALL FINISHES**			
D	**MISCELLANEOUS**			
1	SS CLAMPS		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016..(4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0 & 12.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0, 21.0, 22.0, 23.0 & 25.0 from Pg. 625 to Pg. 1274.	
i		DORMA		DORMA
ii		HILTI		HILTI
iii		FISCER		FISCER
2	SYNTHETIC ENAMEL AND PRIMER		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016..(4) CPWD Civil Specs.: Vol. 1: Sub Head No. 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0 & 12.0 from Pg. 1 to Pg. 624. (5) CPWD Civil Specs.: Vol. 2: Sub Head No. 13.0, 14.0, 15.0, 16.0, 20.0, 21.0, 22.0, 23.0 & 25.0 from Pg. 625 to Pg. 1274.	
i		ASIAN		ASIAN
ii		BERGER		BERGER
iii		DULUX		DULUX
iv		DUPONT		DUPONT
v		JOTUN		NEROLAC
		NEROLAC		SHALIMAR
		SHALIMAR		

UNITECH LIMITED				
External Development Works				
Sr. No.	**Material Name**	**Company Name**	**SPECIFICATIONS**	**Makes**
1	DRAIN CHANNEL		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016. (4) CPWD Specs Vol 1: 0.0 & 1.0 from Pg. 01 to 24. (5) CPWD Specs Vol 2, 17.0 from Pg. 877 - 940; 18.0 from Pg. 941 - 1008; 19.0 from Pg. 1009 -1074. .	
i		EVERLAST		EVERLAST
ii		THERMOSET		THERMOSET
iii		KK MANHOLE		KK MANHOLE
iv		LIDCO		LIDCO
v		GEBERIT		GEBERIT
2	KERB STONE		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016. (4) CPWD Specs Vol 1: 0.0 & 1.0 from Pg. 01 to 24. (5) CPWD Specs Vol 2, 16.0 from Pg.760 - 876.	
i	300mm x 250mm x 100mm	BASANT BEATONS		BASANT BEATONS
ii		NITCO		NITCO
iii		VYARA		VYARA
iv		KAJARIA CERAMICS		KAJARIA CERAMICS
3	PAVING BLOCKS		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016. (4) CPWD Spec 2019 Flg no 16.44 pg no 749.IS 822 & 16.1.18 pg no 766.	
i		BASANT BEATONS		BASANT BEATONS
ii		PAVIT		PAVIT
iii		NITCO		NITCO
iv		VYARA		VYARA
v		NIMCO Precast Pvt. Ltd.		NIMCO Precast Pvt. Ltd.
4	GRASS PAVERS		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016. (3) CPWD Horticulture Hand book Capter 3 Pg No 17, 18 & 19. (4) CPWD 2021 Vol 1 Pg no 243 (11.46).	
i		BASANT BEATONS		BASANT BEATONS
ii		NITCO		NITCO
iii		VYARA		VYARA
iv		NIMCO		NIMCO
v		Ultra		Ultra
vi		Unistone		Unistone
vii		Pavit		Pavit
viii		Duracrete		Duracrete
5	DRAIN COVER / CHAMBER COVER / MANHOLE COVER		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016. (4) CPWD Specs Vol 1: 0.0 & 1.0 from Pg. 01 to 24. (5) (4) CPWD Spec 2019 vol no 2 : 6.15 Pg no VII. & 14.41.3.1 pg no 711	
i		EVERLAST COMPOSITES LLP		EVERLAST COMPOSITES LLP
ii		PRINCE		PRINCE
iii		VYARA		VYARA
iv		RAWJI		RAWJI
v				
6	PRECAST CONCRETE COVER		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016. (3) CPWD Vol 1-7131 to 7137.	
i		**K.K.**		**K.K.**
ii		Daya Spun		Daya Spun
iii		Pragati		Pragati

UNITECH LIMITED				
External Development Works				
Sr. No.	**Material Name**	**Company Name**	**SPECIFICATIONS**	**Makes**
7	SYNTHETIC ENAMEL PAINT		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Ref no 16.8.1.1 Pg No 1132, 13.25 on pg 662..	
i		ICI DULUX		ICI DULUX
ii		ASIAN PAINTS		ASIAN PAINTS
iii		BERGER PAINTS		BERGER PAINTS
iv		NEROLAC		NEROLAC
8	WHITE CEMENT		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Ref no 13.13A Pg No 645,	
i		JK CEMENT		JK CEMENT
ii		BIRLA WHITE		BIRLA WHITE
iii		NIHON		NIHON
iv				
9	EXPANSION JOINT		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Ref no 14.50.1.5 Pg No 718.	
i		Chowgule Construction Chemicals Pvt. Ltd.		Chowgule Construction Chemicals Pvt. Ltd.
ii		Bizzar Expansion		Bizzar Expansion
iii		LBH Expansion Joints India Pvt Limited		LBH Expansion Joints India Pvt Limited
iv		NTE India Pvt. Ltd.		NTE India Pvt. Ltd.
v		SANFIELD (INDIA) LIMITED		SANFIELD (INDIA) LIMITED

UNITECH LIMITED

Electrical Works

Sr. No..	Material Name	Company Name	SPECIFICATIONS	Makes
1	MCB's - 10 KA.		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Electr. Specs.: Ch. 1 to Ch. 17 from Pg. 1 to Pg. 141. (5) CPWD Electr. Specs.: § 3.14, Pg. 31, § 3.20, Pg. 39 and Ch. 3.	
i		Legrand		Legrand
ii		Siemens		Siemens
iii		Wipro		Wipro
iv		L&T		L&T
v		ABB		ABB
vi		Polycab		Polycab
vii		Hager		Hager
viii		Schneider Electric		Schneider Electric
ix		Anchor		
x		Bentec		
xi		Indo-Asian		
xii		GE		
Indoor Electrical Wiring and Casing				
2	Wires: 1100V/660V Grade FRLS		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Electr. Specs.: Ch. 1 to Ch. 17 from Pg. 1 to Pg. 141. (5) CPWD Electr. Specs. : § 3.5, Pg. 27, 28; § 4.3.3, Pg. 46; Table X & Table XI on Pg. 82; Pg. 116, § F3.5.1., Pg. 126.	
i		Finolex		Finolex
ii		Polycab		Polycab
iii		Anchor		Anchor
iv		L&T		L&T
v		KEI		KEI
vi		HPL		HPL
vii		RR cable		RR cable
viii		Epsilon		
ix		Protoplast		
x		Centurian		
xi		Skytone		
xii		Lapp		
3	PVC Conduits & Accessories		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016..(4) CPWD HVAC Specs.: Ch. 18 from Pf. 168 to Pg. 174. (5) CPWD Specs for HVAC: :Ch. No. 1 to 18 from Pg. X to XIX. (6) CPWD Specs for HVAC: APENDICES as per Pg. XX.. (7) CPWD Electr. Sspecs.: Pg. 55, § 6.3.2 (8) CPWD HVAC Specs.: Ch. 13, § 13.5, Pg. 142. (9) CPWD Electr. SPecs.: Ch. 5 from Pg. 49 to Pg. 52. (10) CPWD Electr. Specs.: Table III on Pg. 53. (11) CPWD Electr. Specs.: Pg. 113.	
i		Precision		Precision
ii		Finolex		Finolex
iii		Polycab		Polycab
iv		Anchor		AKG
v		AKH		
vi		BEC		
vii		AKG		
viii		RMCON		
ix		NIC		
Outdoor Electrical Fittings				
4	LED Streetlight Fittings		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Electr. Specs.: Ch. 1 to Ch. 17 from Pg. 1 to Pg. 141. (5) CPWD Electr. Specs.: Ch. 2, Table 9 on Pg. 151.	
i		Wipro		Wipro

UNITECH LIMITED				
Electrical Works				
Sr. No..	**Material Name**	**Company Name**	**SPECIFICATIONS**	**Makes**
ii		Philips		Philips
iii		Havells		Havells
iv		C&S		Wipro
v		Polycab		Polycab
vi		Panasonic		Crompton
vii		HPL		BAJAJ ELECTRICALS
viii		Wipro		GE LIGHTING
ix		Crompton		
x		BAJAJ ELECTRICALS		
xi		GE LIGHTING		
5	LED Pathway Light		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Electr. Specs.: Ch. 1 to Ch. 17 from Pg. 1 to Pg. 141. (5) CPWD Electr. Specs.: Ch. 2, Table 9 on Pg. 151.	
i		Wipro		Wipro
ii		Philips		Philips
iii		Havells		Havells
iv		C&S		C&S
v		Polycab		Polycab
vi		Panasonic		Wipro
vii		HPL		Crompton
viii		Wipro		
ix		Crompton		
Outdoor Electrical Wires, Cables and Sockets				
6	XLPE Cables & Accessories		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Electr. Specs.: Ch. 1 to Ch. 17 from Pg. 1 to Pg. 141. (5) CPWD Substation Specs.: Section 5. (6) CPWD Electr. Specs.: Table 2, Pg. 143; Table 3, Pg. 144.	
i		Polycab		Polycab
ii		Havells		Havells
iii		Finolex		Finolex
iv		KEI		KEI

UNITECH LIMITED				
Electrical Works				
Sr. No..	**Material Name**	**Company Name**	**SPECIFICATIONS**	**Makes**
v		Anchor		Anchor
vi		RR cable		RR cable
vii		Protoplast		CABLE CORPORATION OF INDIA
viii		Centurion		RPG CABLES LTD
ix		CABLE CORPORATION OF INDIA		UNIVERSAL CABLES LTD
x		RPG CABLES LTD		GEMSCAB INDUSTRIES LTD
xi		UNIVERSAL CABLES LTD		RAVIN CABLES PVT LTD
xii		GEMSCAB INDUSTRIES LTD		BONTON CABLES
xiii		RAVIN CABLES PVT LTD		GLOSTER CABLES
xiv		BONTON CABLES		RALLISON ELECTRICALS PVT. LTD.
xv		GLOSTER CABLES		CCI
xvi		RALLISON ELECTRICALS PVT. LTD.		
xvii		CCI		
xviii		Skystone		
xix		NICCO		
xx		Torrent.		
External Electrical units				
7	Energy Meter		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Electr. Specs.: Ch. 1 to Ch. 17 from Pg. 1 to Pg. 141. (5) BIS 8645 (2020); BIS9847; BIS12346; BIS 17067. (6) CPWD Substation Specs.: Section 2.	
i		L&T		L&T
ii		HPL		HPL
iii		Bentec		Bentec
iv		Secure Meter		ABB
v		ABB		Schneider
vi		Schneider		
vii		Socomec		
viii		Neptune-Ducati		
ix		Conzerv		
8	BUSBAR		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Electr. Specs.: Ch. 1 to Ch. 17 from Pg. 1 to Pg. 141. (5) BIS 3842 (2016); BIS 8084 (2017); BIS 8623 (2018). (6) CPWD Substation Specs.: Section 3, Section 4, Section 6, Appendix III on Pg. 100; Pg. 112, Pg. 113. (7) CPWD Electr. Specs.: Ch. 7.	
i		L&T		L&T
ii		HPL		HPL
iii		Bentec		Legrand
iv		Legrand		ABB
v		ABB		Legrend
vi		C&S		

UNITECH LIMITED				
Electrical Works				
Sr. No..	**Material Name**	**Company Name**	**SPECIFICATIONS**	**Makes**
vii		ADLEC System		
viii		TRICOLITE		
ix		Jakson		
x		Advance Panel & Switchgear Pvt. Ltd. New Delhi		
xi		Legrend		
9	L.T. Feeder Pillar		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Electr. Specs.: Ch. 1 to Ch. 17 from Pg. 1 to Pg. 141.	
i		Siemens		Siemens
ii		L&T		L&T
iii		Indian Electrical		Indian Electrical
iv		ABB		Schneider
v		Schneider		Jakson
vi		ADLEC System		
vii		TRICOLITE		
viii		Jakson		
ix		Advance Panel & Switchgear Pvt. Ltd. New Delhi		
10	Metering Cubicle		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Electr. Specs.: Ch. 1 to Ch. 17 from Pg. 1 to Pg. 141.	
i		Siemens		Siemens
ii		L&T		L&T
iii		Indian Electrical		Indian Electrical
iv		ABB		ABB
v		Schneider		Schneider
vi		ADLEC System		Jakson
vii		TRICOLITE		
viii		Jakson		
ix		Advance Panel & Switchgear Pvt. Ltd. New Delhi		
11	LIGHTING POLES		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Electr. Specs.: Ch. 1 to Ch. 17 from Pg. 1 to Pg. 141.	
i		BAJAJ ELECTRICALS		BAJAJ ELECTRICALS
ii		BOMBAY TUBES AND POLES		BOMBAY TUBES AND POLES
iii		KESELEC		KESELEC
iv		PHILIPS		PHILIPS
v		Surya		Surya
vi		Wipro		Wipro
12	INDICATING LAMP		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Electr. Specs.: Ch. 1 to Ch. 17 from Pg. 1 to Pg. 141.	
i		L&T		L&T
ii		BCH		BCH
iii		SCHNEIDER		SCHNEIDER
iv		KAYCEE		ABB
v		ABB		SIEMENS
vi		SIEMENS		GE
vii		GE		

UNITECH LIMITED

Plumbing Works

Sr. No.	Material Name	Company Name	SPECIFICATIONS	Makes
1	HDPE Pipe & Fitting		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs. Vol 2: Ch. 17 from Pg. 877 to 940; Ch. 18 from Og. 941 to 1008; Ch. 19 from Pg. 1009 to 1074 and Ch. 23 from Pg. 1207 to 1240.	
i		Jain Irrigation		Jain Irrigation
ii		Supreme		Supreme
iii		Oriplast		Oriplast
iv		Duraline		PRINCE
v		EPC INDSUSTRIES		
vi		HASTI		
vii		PRINCE		
2	CPVC Pipes and Fittings		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs. Vol 2: Ch. 17 from Pg. 877 to 940; Ch. 18 from Og. 941 to 1008; Ch. 19 from Pg. 1009 to 1074 and Ch. 23 from Pg. 1207 to 1240.	
i		Astral		Astral
ii		Prince		Prince
iii		Supreme		Supreme
iv		Finolex		Finolex
v		Flowguard		Flowguard
vi		Jain		
vii		Ashirvad Pipes		
viii		AKG		
3	G.I. and M.S. Pipes		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs. Vol 2: Ch. 17 from Pg. 877 to 940; Ch. 18 from Og. 941 to 1008; Ch. 19 from Pg. 1009 to 1074 and Ch. 23 from Pg. 1207 to 1240.	
i		TATA		TATA
ii		JINDAL		JINDAL
iii		SURYA		SURYA
iv		ZENITH		ZENITH
v		SAIL		SAIL
vi		PRAKASH		
4	G.I. Fittings		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs. Vol 2: Ch. 17 from Pg. 877 to 940; Ch. 18 from Og. 941 to 1008; Ch. 19 from Pg. 1009 to 1074 and Ch. 23 from Pg. 1207 to 1240.	
i		Zoloto		Zoloto
ii		KS Brand		KS Brand
iii		R Brand		R Brand
iv		Kiriti		Kiriti
v		UNIK		UNIK
		VICTAULIC		
		DRP-M		
		NECO, ELECTROSTEEL, RIF		
5	RCC Pipes		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs. Vol 2: Ch. 17 from Pg. 877 to 940; Ch. 18 from Og. 941 to 1008; Ch. 19 from Pg. 1009 to 1074 and Ch. 23 from Pg. 1207 to 1240.	
i		Jain		Jain
ii		KK		KK
iii		Pranali		Indian Hume Pipe Co.
iv		Premiere Prestressed Products		Premiere Prestressed Products
v		Pragati		Indian Hume Pipe Co.
vi		Indian Hume Pipe Co.		
vii		OM SPUN		
viii		AKSHAY		
ix		NECO		
6	GM Gate. Globe, Check Valves		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs. Vol 2: Ch. 17 from Pg. 877 to 940; Ch. 18 from Og. 941 to 1008; Ch. 19 from Pg. 1009 to 1074 and Ch. 23 from Pg. 1207 to 1240.	
i		Zoloto		Zoloto
ii		Sant Brass Metal		Sant Brass Metal
iii		Leader		Leader
iv		Danfoss		Danfoss
7	CI Butterfly Valves		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs. Vol 2: Ch. 17 from Pg. 877 to 940; Ch. 18 from Og. 941 to 1008; Ch. 19 from Pg. 1009 to 1074 and Ch. 23 from Pg. 1207 to 1240.	
i		Zoloto		Zoloto

UNITECH LIMITED				
Plumbing Works				
Sr. No.	**Material Name**	**Company Name**	**SPECIFICATIONS**	**Makes**
ii		Danfoss		Danfoss
iii		Kirloskar Brothers		Kirloskar Brothers
iv		Leader		Leader
v		Advance		Advance
vi		Castle		
vii		DRP		
viii		Sant		
8	CI Sluice Valves		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs. Vol 2: Ch. 17 from Pg. 877 to 940; Ch. 18 from Og. 941 to 1008; Ch. 19 from Pg. 1009 to 1074 and Ch. 23 from Pg. 1207 to 1240.	
i		Kirloskar Brothers		Kirloskar Brothers
ii		Danfoss		Danfoss
iii		Intervalve		Intervalve
iv		IVC		IVC
v		Zoloto		Zoloto
vi		Advance		Advance
9	Gully Traps		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs. Vol 2: Ch. 17 from Pg. 877 to 940; Ch. 18 from Og. 941 to 1008; Ch. 19 from Pg. 1009 to 1074 and Ch. 23 from Pg. 1207 to 1240.	
i		Perfect		Perfect
ii		RK		RK
iii		Anand		Anand
10	Foot Rest		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs. Vol 2: Ch. 17 from Pg. 877 to 940; Ch. 18 from Og. 941 to 1008; Ch. 19 from Pg. 1009 to 1074 and Ch. 23 from Pg. 1207 to 1240.	
i		KGM		KGM
ii		Patel		Patel
iii		PRANALI INDUSTRIES		PRANALI INDUSTRIES
11	FRP Manhole Cover with Frame		(1) Project Specifications, Technical Specifications. (2) Relevant BIS Codes. (3) NBC 2016.. (4) CPWD Civil Specs. Vol 2: Ch. 17 from Pg. 877 to 940; Ch. 18 from Og. 941 to 1008; Ch. 19 from Pg. 1009 to 1074 and Ch. 23 from Pg. 1207 to 1240.	
i		Everlast		Everlast
ii		Thermodrain		Thermoset
iii		Supreme		Supreme
iv		Aquarian		