TENDER DOCUMENT

NEW MANGALORE PORT AUTHORITY

CIVIL ENGINEERING DEPARTMENT

NIT No. CIVIL/CE(C)/EE(C)/35/2023-24

E-Tender Event No.2023_NMPT_781941_1

Tender for

"CONSTRUCTION OF SECURITY WATCH TOWER NEAR NORTHERN BREAK WATER AT NMPA"

THROUGH E-TENDERING MODE

Tender Amount	**:**	**Rs.48,91,694/-**
E.M.D.	**:**	**Rs.1,15,500/-**
Tender Fee	**:**	**Rs.560/-(Including GST @ 12%)**

TENDER DOCUMENT

NEW MANGALORE PORT AUTHORITY

CIVIL ENGINEERING DEPARTMENT

Tender for

"CONSTRUCTION OF SECURITY WATCH TOWER NEAR NORTHERN BREAK WATER AT NMPA"

Volume - 1

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NEW MANGALORE PORT AUTHORITY

PANAMBUR, MANGALORE -575010

CIVIL ENGINEERING DEPARTMENT

NIT No: CIVIL/CE(C)/EE(C)/35/2023-24 Date: 45252

TENDER ID: 2023_NMPT_781941_1

i) NOTICE INVITING TENDER

(Through E-Procurement only)

E-Tenders are invited by New Mangalore Port Authority, Panambur, Mangalore-575010 through https://www.eprocure.gov.in/eprocure/app of CPP portal from the Contractor fulfilling the Minimum Eligibility Criteria stipulated in this notice in two cover bidding procedure for the work of "Construction of Security Watch Tower Near Northern Break Water at NMPA"

Minimum Eligibility Criteria:

a) The tenderers must have experience of having successfully completed *similar works during last 7 (seven) years ending last day of month previous to the one in which applications are invited shall be either of the following:-

At least Three similar completed works costing not less than the amount equal to Rs.19.60 lakhs each

or

At least Two similar completed works costing not less than the amount equal to Rs.24.5 lakhs each

or

At least One similar completed work costing not less than the amount equal to Rs.39.15 lakhs

Note1:*Similar work(s) means Construction of Residential or non-residential Building.

Note2: Documentary evidence for successful completion of the work shall be furnished along with work order and work completion certificate.

b) Average Financial turnover of the tenderer over the last three financial years 2020-21, 2021-22 and 2022-23 shall be at least Rs.14.70 lakhs.

c) The financial capacity of bidders would be evaluated considering the works in hand at NMPA. The port would award the work not exceeding the remaining financial capacity of the bidder. The financial capacity to be 3.33times of the average financial turnover of last three years of the bidder minus works in hand at NMPA. The bidder must fill the Annexure-6.

In case the average turnover is Rs.3.00 crores, the financial capacity of the contractor will considered as (3x3.333) Rs.10.00crores.

The turnover means sales/ contract receipts excluding taxes other income shall not be considered for calculation of turnover.

Pertinent information is given in the following table:

i)	Estimated Amount put to Tender	Rs.48,91,694/-
ii)	Earnest Money Deposit (EMD)	Rs.1,15,500/- (Rupees One Lakh Fifteen Thousand Five Hundred Only.) The EMD shall be in the form of Insurance Surety Bonds, Account Payee Demand draft, Fixed Deposit Receipt, Bankers Cheque or shall be paid by RTGS in favour of F.A. & C.A.O., NMPA. Scanned copy should be uploaded along with bid. The benefit of Exemption of EMD to all Micro and small enterprises (MSE) will allowed. Shall upload with their offer, the proof of their being MSE registered with district industries center (DIC) or Khadhi and village industries commission or Khadhi and Industries board (KVIV) or Coir board or National Small Industries Corporation (NSIC) or Directorate of handicrafts and handlooms or Udyam Registration Certificate or any other body specified by Ministry of MSME.
iii)	Cost of Tender (Tender fee)	Rs. 560/- (Rupees Five Hundred Sixty Only) Payment of Tender fee by NEFT in favour of F.A. & C.A.O., NMPA. Scanned copy should be uploaded along with bid. The benefit of Exemption of Tender fee to Micro and small enterprises (MSE) will allowed. Shall upload with their offer, the proof of their being MSE registered with district industries center (DIC) or Khadhi

		and village industries commission or Khadhi and Industries board (KVIV) or Coir board or National Small Industries Corporation (NSIC) or Directorate of handicrafts and handlooms or Udyam Registration Certificate or any other body specified by Ministry of MSME.
iv)	Document download start date and time	22-11-2023 at 15.00 HRS
v)	Seek clarification start date and time	NA
vi)	Seek clarification end date and time	NA
vii)	Bid submission start date and time	06-12-2023 at 10.00 HRS
vii)	Bid submission closing date and time	13-12-2023 at 15.00 HRS
ix)	Date & time of opening of Cover -I : Technical Part - II : Financial	 14-12-2023 at 15.30 HRS Shall be communicated separately.
x)	Completion period	9 (Nine) Months (including monsoon)
xi)	Validity of Tender	120 days from the date of closing of online submission of e-tender.

Tenderer shall have to pay the prescribed cost of tender i.e., Rs.560/-(Rupees Five Hundred Sixty Only) by NEFT in favour of F.A. & C.A.O., NMPA.

NMPA Bank Details.

1. Name of the Bank: State Bank of India, Panambur, Mangalore - 575 010.
2. Bank A/C No. 10205649448
3. IFSC Code: SBIN0002249
4. MICR Code: 575002011

Contact Nos. 0824-2887306 and 0824-2407149

Email id: yogindra.s@nmpt.gov.in /chiefengineer@nmpt.gov.in

Amendments / further information etc. pertaining to the tender, if any shall be uploaded only on websites https://www.eprocure.gov.in/eprocure/app of CPP portal, may have to be referred by the prospective Tenderer from time to time.

-sd-

Executive Engineer (Civil)

NEW MANGALORE PORTAUTHORITY

PANAMBUR, MANGALORE -575010

NIT No: CIVIL/CE(C)/EE(C)/35/2023-24

E-Tender event No. 2023_NMPT_781941_1

ii) INSTRUCTIONS TO TENDERERS

A. Instructions for E-Tendering

INSTRUCTION TO E-TENDERING

1. SPECIAL INSTRUCTIONS TO THE BIDDERS FOR THE E-SUBMISSION OF THE BIDS ONLINE THROUGH THIS E-PROCUREMENT PORTAL

This is an e-procurement event of NMPA. The e-procurement service provider is https://www.eprocure.gov.in/eprocure/app of CPP portal. You are requested to read the terms & conditions of this tender before submitting your online tender. Tenderers who do not comply with the conditions with documentary proof (wherever required) will not qualify in the Tender.

1. Bidder should do Online Enrolment in the Portal using the option Click Here to Enroll available in the Home Page. Then the Digital Signature enrollment has to be done with the e-token, after logging into the portal.
2. Bidder then logs into the portal giving user id / password chosen during enrollment.
3. The e-token that is registered should be used by the bidder and should not be misused by others.
4. DSC once mapped to an account cannot be remapped to any other account. It can only be inactivated.
5. The Bidders can update well in advance, the documents such as certificates, purchase order details etc., under My Documents option and these can be selected as per tender requirements and then attached along with bid documents during bid submission. This will ensure lesser upload of bid documents.
6. After downloading / getting the tender schedules, the Bidder should go through them carefully and then submit the documents as per the tender document; otherwise, the bid will be rejected.
7. The BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for that tender. Bidders are allowed to enter the Bidder Name and Values only.
8. If there are any clarifications, this may be obtained online through the e-Procurement Portal, or through the contact details given in the tender document. Bidder should take into account of the corrigendum published before submitting the

9. bids online on the portal or on www.newmangaloreport.gov.in Bidder, in advance, should prepare the bid documents to be submitted as indicated in the tender schedule and they should be in PDF formats.
10. Bidder should arrange for the EMD and tender fee as specified in the tender. The benefit of Exemption of EMD to all Micro and small enterprises (MSE) will allowed. Bidder Shall upload with their offer, the proof of their being MSE registered with district industries center (DIC) or Khadhi and village industries commission or Khadhi and Industries board (KVIV) or Coir board or National Small Industries Corporation (NSIC) or Directorate of handicrafts and handlooms or Udyam Registration Certificate or any other body specified by Ministry of MSME will be considered. The bidder should read the terms and conditions and accepts the same to proceed further to submit the bids.
11. The bidder has to submit the tender document(s) online well in advance before the prescribed time to avoid any delay or problem during the bid submission process.
12. There is no limit on the size of the file uploaded at the server end. However, the upload is decided on the Memory available at the Client System as well as the Network bandwidth available at the client side at that point of time. In order to reduce the file size, bidders are suggested to scan the documents in 75-100 DPI so that the clarity is maintained and the size of file gets reduced. This will help in quick uploading even at very low bandwidth speeds.
13. It is important to note that, the bidder has to click on the Freeze Bid Button, to ensure that, he/she completes the Bid Submission Process. Bids, which are not frozen, are considered as Incomplete/Invalid bids and are not considered for evaluation purposes.
14. The Tender Inviting Authority (TIA) will not be held responsible for any sort of delay or the difficulties faced during the submission of bids online by the bidders due to local issues.
15. The bidder may submit the bid documents online mode only, through this portal. Offline documents will not be handled through this system.
16. At the time of freezing the bid, the e-Procurement system will give a successful bid updating message after uploading all the bid documents submitted and then a bid summary will be shown with the bid no., date & time of submission of the bid with all other relevant details. The documents submitted by the bidders will be digitally signed using the e-token of the bidder and then submitted.
17. After the bid submission, the bid summary has to be printed and kept as an acknowledgement as a token of the submission of the bid. The bid

summary will act as a proof of bid submission for a tender floated and will also act as an entry point to participate in the bid opening event.

18. Successful bid submission from the system means, the bids as uploaded by the bidder is received and stored in the system. System does not certify for its correctness.
19. The bidder should see that the bid documents submitted should be free from virus and if the documents could not be opened, due to virus, during tender opening, the bid is liable to be rejected.
20. The time that is displayed from the server clock at the top of the tender Portal, will be valid for all actions of requesting bid submission, bid opening etc., in the e-Procurement portal. The Time followed in this portal is as per Indian Standard Time (IST) which is GMT+5:30. The bidders should adhere to this time during bid submission.
21. The bidders are requested to submit the bids through online e-Procurement system to the Tender Inviting Authority (TIA) well before the bid submission end date and time (as per Server System Clock).
22. Tender form Fee and EMD shall be submitted with the Part I- Technical BID. BID submitted without fees, as mentioned above will not be considered for evaluation and shall be rejected summarily the benefit of Exemption of EMD and tender fee to all Micro and small enterprises (MSE) registered with district industries center (DIC) or Khadhi and village industries commission or Khadhi and Industries board (KVIV) or Coir board or National Small Industries Corporation (NSIC) or Directorate of handicrafts and handlooms or any other body specified by Ministry of MSME, will be considered. The bidder shall upload with their offer, the proof of their being MSE.
23. The bidder / tenderer / contractor shall file the applicable returns with Tax departments in time and submit the same as documentary proof. The GST applicable shall be shown as a separate line items in the Tax invoices to avail in put credit to Port.

2. Cover – I Details (Technical)

The following documents shall be uploaded online only.

1. Scanned copy of NEFT Payment details for cost of tender / documentary evidence for exemption of tender fee.
2. Scanned copy of RTGS / NEFT Payment details for EMD / documentary evidence for exemption of EMD.
3. Scanned copy of documents as per Annexure 1 to 13 of section I(iii) of volume-I (Original power of attorney i.e. Annexure 2 to be submitted by post or by hand immediately after the closing date for submission of online e-tender). However, such Power of Attorney would not be required if the Application is signed by an authorized

partner or Director (on the Board of Directors) of the Applicant, in case the Applicant is a partnership firm or limited liability partnership Scanned copy of valid PAN card, ESI, PF and GST Registration certificate.

4. List of Ongoing works in hand at NMPA should be indicated in the prescribed form.
5. Scanned copy of Form of Tender as per Section VI(iii) of volume -III
6. Technical bid document – Cover I (Volume I to Volume III) along with amendments and clarifications.

3. Cover – II Detail (Finance)

PRICE BID (Bill of Quantities)

Price should be quoted in the BOQ template available in the portal. The BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for that tender. Bidders are allowed to enter the Bidder Name and Values only.

Any indication of 'Quoted price' in the online technical bid documents shall lead to rejection of the bid outright.

The price bid submitted through e-portal mode only will be taken up for the purpose for evaluation.

4. Opening of bids

A. Part I Techno-Commercial bid will be opened electronically on specified date and time as given in the NIT. Bidder(s) can witness electronic opening of bid.

B. Part II Price bid will be opened electronically of only those bidder(s) whose Part I Techno-Commercial Bid is found to be Techno-Commercially acceptable by NMPA. Such bidder(s) will be intimated, the date of opening of Part II Price bid, through valid email confirmed by them.

Note: The tenderers are advised to offer their best possible rates. There would generally be no negotiations hence most competitive prices may be quoted while submitting the price bid. However in case the lowest rate appears to be reasonable taking into account the prevailing market conditions, the work may be awarded to the lowest bidder and if the rate is still considered high, action as per prevailing instructions / guidelines shall be taken. All entries in the tender should be entered in online Technical & Commercial Formats without any ambiguity.

5. Evaluation process:

A proposal shall be considered responsive if –

a. It is received by the proposed Due Date and Time.
b. It is Digitally Signed.
c. It contains the information and documents as required in the Tender Document.

d. It contains information in formats specified in the Tender Document.
e. It mentions the validity period as set out in the document.
f. It provides the information in reasonable detail. The Port Authority reserves the right to determine whether the information has been provided in reasonable detail.
g. There are no significant inconsistencies between the proposal and the supporting documents.
h. The Technical qualification conforms to as specified in the qualification criteria.
i. A Tender that is substantially responsive is one that conforms to the preceding requirements without material deviation or reservation. A material deviation or reservation is one (1) which affects in any substantial way, the scope, quality, or performance of the Tenderer or (2) which limits in any substantial way, inconsistent with the Tender document, or (3) whose rectification would affect unfairly the competitive position of other Qualified Applicant presenting substantially responsive bids.
j. The Port Authority reserves the right to reject any tender which in its opinion is non-responsive and no request for alteration, modification, substitution or withdrawal shall be entertained by the Port Authority in respect of such Tenders.
k. The Port Authority would have the right to review the Technical Qualification and seek clarifications wherever necessary.
l. Since the tender involves selection based on pre-qualification criteria and technical specification, the Chief Engineer will examine and seek clarification if any and list out the firms, which are found technically suitable and Cover-II Price Bid of such tenderers only will be opened and EMD will be returned to the unsuccessful tenderers
m. The date and time will be intimated to tenderers whose offers are found suitable and Cover – II of such tenderers will be opened on the specified date and time
n. The cost of stamping Agreement must be borne by the successful Tenderer
o. The Fax/E-Mail offers will be treated as defective, invalid and rejected. Only detailed complete offers received through online prior to closing time and date of the tenders will be taken as valid.

B. Instructions to Tenderers (General)

1. Introduction:

This work essentially comprises of “Construction of Security Watch Tower Near Northern Break Water at NMPA”

2. Applicants:

Contractors who wish to bid for the tender for the contract work should apply for the tender document. The successful bidder will be expected to complete the works by

the intended completion date specified in the Contract document.

3. Invitation for Bids:

The online Invitation for Bids is open to all eligible bidders meeting the eligibility criteria. The bidders may submit bids for the works detailed in the NIT through e-tender mode only.

4. Purchase of Tender Documents:

Tender document can be downloaded from NMPA website www.newmangaloreport.gov.in,www.tender.gov.in&https://www.eprocure.gov.in/eprocure/app of CPP portal

5. One Bid per Bidder:

Each bidder shall submit only one bid for one package. Bidder who submits or participates in more than one Bid will cause all the proposals with the Bidder's participation to be disqualified.

6. Cost of Bidding:

The bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will in no case be responsible and liable for those costs.

7. Site visit:

The Bidder, at the Bidder's own responsibility and risk is encouraged to visit and examine the work site and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the site shall be at the Bidders' own expense.

8. Content of Bidding Documents:

Tender Document will consist of:

Volume I	Section I	Notice Inviting Tenders Instructions to Tenderers Annexure (1 to 13)
	Section II	Form of Agreement
	Section III	Conditions of Contract: Part A - E: General Conditions Conditions of Contract : Part F: Special Conditions Contract Data Form of Securities (A & B) Appendix – I and Appendix - II

Volume II	Section IV	Technical Specifications
	Section V	Drawings
Volume III	Section VI	Preamble Bill of Quantities For of tender
	Section VII	Schedules (A & B)

Any indication of "Quoted price" in the technical bid, shall lead to rejection of the bid outright. For evaluation purpose the uploaded offer documents will be treated as authentic and final. No hard copy shall be submitted, upload the entire document on the CPP portal only.

9. Clarification of the Bidding Documents:

The Tenderers are advised to examine the Tender Document carefully and if there be or appear to be any ambiguity or discrepancy in the documents, or any clarifications needed on the Tender Documents; these shall be referred to the Chief Engineer (Civil) in writing, so as to reach at least three days before start date of submission of bid. It is to be noted that queries asked after due date will not be answered. Employer's clarifications shall be furnished in the CPP e-portal or shall be issued a corrigendum in the web site after closing date of online pre-bid meeting without identifying the source.

A provision is made in the CPP e-portal for online pre-bid meeting during the date mentioned in the NIT. The bidders can ask queries if any during the period of pre-bid meeting through online. The queries of the bidders shall be answered online or a separate consolidated list of queries and clarifications shall be uploaded in web sites after closing date of online pre-bid meeting.

10. Amendment of Bidding Documents:

Any modification of the tender documents as a result of any ambiguity shall be shall be made exclusively through the issue of an Addendum. Any addendum thus issued shall be part of the tender documents and will be uploaded in CPP e-portal and Port website to all the bidders. Prospective

Bidders shall acknowledge receipt of each addendum to the Employer. Such addenda will be numbered and it shall be submitted by the Tenderers as part of Part I of their bid. The Addendum can also be downloaded from NMPA official website from 'Ongoing Project link'. The responsibility of downloading such addendum / amendment from NMPA website and CPP e-portal fully lies with the bidder.

11. Preparation of bids:

All documents relating to the bid shall be in the English language.

12. Minimum Eligibility Criteria:

a) The tenderers must have experience of having successfully completed *similar works during last 7 (seven) years ending last day of month previous to the one in which applications are invited shall be either of the following:-

At least Three similar completed works costing not less than the amount equal to Rs.19.60 lakhs each

or

At least Two similar completed works costing not less than the amount equal to Rs.24.50lakhs each

or

At least One similar completed works costing not less than the amount equal to Rs.39.15 lakhs

Note1:*Similar work(s) means Construction of Residential or non-residential Building.

Note2: Documentary evidence for successful completion of the work shall be furnished along with work order and work completion certificate

b) Average Financial turnover of the tenderer over the last three financial years 2020-21, 2021-22 and 2022-23 shall be at least Rs.14.70 lakhs.

The financial capacity of bidders would be evaluated considering the works in hand at NMPA. The port would award the work not exceeding the remaining financial capacity of the bidder. The financial capacity to be 3.33times of the average financial turnover of last three years of the bidder minus works in hand at NMPA. The bidder must fill the Annexure-6.

In case the average turnover is Rs.3.00crores, the financial capacity of the contractor will considered as (3x3.333) Rs.10.00crores.

The turnover means sales / contract receipts excluding taxes other income shall not be considered for calculation of turnover.

Copy of the work order, Client's satisfactory work completion Certificate, along with any other documentary proof certifying the year of completion, brief description of the project and project completion cost shall be submitted in support of the assignments performed and claimed by the tenderer to fulfill the eligibility criteria for qualification. Experience of the tenderer / contractor for completed works, executed in private organization shall be considered only if the Tax Deducted at Source Certificate with respect to referred work, issued by Competent Authority is enclosed by the tenderer along with the tender

A statement duly certified by the Chartered accountant showing the average annual

Financial Turnover over the last 3 financial years shall be submitted.

Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have:

i) made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or

ii) record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc.,

13. Bid Prices:

The contract shall be for the whole works as described in based on the priced Bill of Quantities submitted through CPP e-portal by the Bidder .The Bidder shall fill in the percentage of Excess or Less in the Bill of Quantities through CPP e-portal. Items for which no rate or price is entered will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities.

14. Currencies of Bid and Payment:

The Unit rates and the prices shall be quoted by the bidder entirely in Indian Rupees

15. Bid Validity:

Bids shall remain valid for a period not less than one hundred twenty days (120 days) after the last date for online bid submission. A bid valid for a shorter period shall be rejected by the Employer as non-responsive.

In exceptional circumstances, prior to expiry of the original bid validity period, the Employer may request that the bidders may extend the period of validity for a specified additional period. The request and the bidders' responses shall be made in writing or by cable. A bidder agreeing to the request will not be permitted to modify his bid and also shall submit an extension for EMD, if it is in the form of Bank Guarantee

16. Bid Security / EMD:

i. The EMD shall be in the form of Insurance Surety Bonds, Account Payee Demand draft, Fixed Deposit Receipt, Bankers Cheque or shall be paid by RTGS/NEFT in favour of Financial Adviser & Chief Accounts Officer, New Mangalore Port Authority, Mangalore

   1. Name of the Bank: State Bank of India, Panambur, Mangalore - 10.
   2. Bank A/C No. 10205649448
   3. IFSC Code: SBIN0002249
   4. MICR Code: 575002011

ii. The Techno Commercial Bid shall be accompanied by the RTGS/NEFT deposit details towards Earnest Money Deposit of Rs.115500/- (Rupees One Lakh Fifteen Thousand

Five Hundred Only) as stipulated in the tender. The tender without EMD shall be treated invalid. The benefit of Exemption of EMD and tender fee to all Micro and small enterprises (MSE) registered with district industries center (DIC) or Khadhi and village industries commission or Khadhi and Industries board (KVIV) or Coir board or National Small Industries Corporation (NSIC) or Directorate of handicrafts and handlooms or any other body specified by Ministry of MSME, will be considered. The bidder shall upload with their offer, the proof of their being MSE.

iii. In the event of Bidder withdrawing his Bid before the expiry of tender validity period of 120 days from the last date for online bid submission, the tender shall be cancelled and EMD shall be forfeited.

iv. The Earnest Money Deposit of unsuccessful bidder shall be returned without interest as early as possible by RTGS/NEFT on conclusion of contract. The Earnest Money Deposit of the successful bidder shall be refunded (without interest) after he has signed the agreement and furnished required performance security.

v. The Bid Security of a successful bidder will be forfeited in the following cases:

a) If the bidder withdraws his Tender during the period of bid validity.

b) In case of a successful tenderer fails

i) to commence the work, apart forfeiture of other claims

ii) within the specified time limit to sign the Agreement or furnish the required Performance Security. In the event of forfeiting the EMD / SD / LD and while imposing penalty GST as applicable will be collected.

17. No Alternative Proposals by Bidders:

Bidders shall submit offers that comply with the requirements of the bidding documents, including the basic technical design as indicated in the drawing and specifications. Alternatives will not be considered.

18. Format and Signing of Bid:

The Bid shall be in online mode. The Bid shall contain no alterations or additions, except those comply with instructions issued by the Employer

19. Bid Submission:

Tender document including quoted bid price have to be submitted online only through CPP Portal before deadline for online submission of bid.

For evaluation purpose the uploaded offer documents will be treated as authentic and final.

The Tender shall be submitted in Two Bids.

I. Technical Bid: Shall contain the following.

i) Techno Commercial Bid: Shall contain all the documents. Techno Commercial Bid should not contain Price Bid. “Disclosure/indication of

Price in the Techno Commercial Bid shall render the tender disqualified and rejected.

ii) The details of payment of EARNEST MONEY DEPOSIT for Rs.115500/- (Rupees One Lakh Fifteen Thousand Five Hundred Only) by RTGS/NEFT to NMPA Bank Account, failing which the Techno commercial Bid shall not be considered).

iii) Transaction details of payment towards the COST OF TENDER Fee: Rs. 560/-(Rupees Five Hundred And Sixty Only) (To be paid by RTGS/NEFT to NMPA Bank Account).

iv) List of Ongoing works in hand at NMPA should be indicated in the prescribed form.

II. FINANCIAL BID: shall contain only the Price. The Bidder shall fill in the percentage of Excess or Less in the Bill of Quantities

III. LAST DATE FOR SUBMISSION OF ONLINE TENDER: is as per the date mentioned in the NIT

NMPA may at its sole discretion reserves the right to extend the date for receipt of Bid. Bid after the aforesaid time and date or the extended time and date, if any, shall not be accepted by the portal.

The following details pertaining to Techno Commercial Bid shall be uploaded online.

a) Letter of Submission- Covering letter (vide Annexure – 1)

b) Power of Attorney in favour of signatory/s to the Tender,.(vide Annexure -2) (Original power of attorney ie. Annexure 2 to be submitted by post or by hand so as to reach the Executive Engineer (Civil) immediately after the closing date for submission of online e-tender).

c) Organization Details (vide Annexure-3)

d) Details of “Minimum eligibility criteria” as per Clause 12 of instruction to Tenderers and certificates (Client Certificates / work completion certificates or any other documentary evidences with respect to the eligibility work) (vide Annexure-4) of condition of contract. The following specific instruction may be noted ;

   i) Bidders are expected to provide information in respect of Eligible Assignments in this Section. The assignments cited must comply with the criteria specified in Clause No. 12 (a) for “Minimum eligibility”.

   ii) A separate sheet should be filled for each of the eligible assignments.

   iii) the details are to be supplemented by documentary proof from the respective client for having carried out such assignment duly certified by client’s completion certificates and work orders etc.

e) A statement duly certified by Chartered Accountant showing Average Financial turnover of the tenderer over the last three financial years (vide

Annexure-5) with balance sheet.

f) List of Ongoing works in hand at NMPA should be indicated in the prescribed form (Annexure 6).

g) A list of Plant and equipment proposed to be engaged for work. (vide Annexure-7) The equipment indicated in the Annexure -7 will form part of contract agreement and as such the bidders are requested to indicate the availability of the equipment at site at what stage of the construction period the equipment would made available.

h) A declaration to the effect that (vide Annexure -8):-

   a. All details regarding construction plant and machinery, temporary work and personnel for site organization considered necessary and sufficient for the work have been furnished in the Annexure to Conditions of Contract in Volume I and that such plant, temporary works and personnel for site organization will be available at appropriate time of relevant works for which the equipment have been proposed at site till the completion of the respective work.

   b. No conditions are incorporated in the financial bid. In case any conditions are specified in the financial bid, the tender will be rejected summarily without making any further reference to the bidder.

   c. We have not made any payment or illegal gratification to any persons/ authority connected with the bid process so as to influence the bid process and have not committed any offence under PC Act in connection with the bid.

   d. We disclose with that we have made / not made payments or propose to be made to any intermediaries (agents) etc in connection with the bid.

i) NEFT Payment details towards cost of tender.

j) RTGS/NEFT Payment details towards EMD / documentary evidence of exemption of EMD.

k) The tenderer shall attach Scanned copy of Pre-contract, Integrity Pact agreement executed as per Appendix II. The Original copy to be submitted by post or by hand so as to reach the Executive Engineer (Civil) immediately after closing date for submission of online tender.

l) Tenderer should submit copy of Permanent Account Number. (PAN), ESI, PF and GST Registration (GSTIN) Number along with certificates issued by the authority as applicable

20. Deadline for Submission of the Bids:

i. The completed bid shall be submitted in the electronic form by the date and time mentioned in NIT only through CPP e-portal.

ii. The Employer may extend the deadline for submission of bids by issuing an amendment in accordance with Clause 10, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will thereafter be subject to the deadline as extended.

iii. Price should be quoted in CPP e-portal. Any indication of 'Quoted price' in the online technical bid documents shall lead to rejection of the bid outright. For evaluation purpose the uploaded offer documents will be treated as authentic and final. No hard copy shall be submitted for reference purpose. The bid submitted through e-tendering mode only will be taken up for the purpose for evaluation.

iv. The uploaded Port Tender Document will be treated as authentic tender and if any discrepancy is noticed at any stage between the Port's tender document and the one submitted/uploaded by the tenderer, the conditions mentioned in the Port's uploaded document shall prevail. Besides, the tenderer shall be liable for legal action for the lapses.

21. Late Bids:

The time that is displayed from the server clock at the top of the CPP e-portal, will be valid for all actions of requesting bid submission, bid opening etc., The bidders should adhere to this time during bid submission.

22. Modification and Withdrawal of Bids:

i. Bidders may modify the offers by deleting their already freezed bids in online only through CPP e-portal (after submission of bid) and resubmit/upload the revised offer before the deadline prescribed in Clause 20.

ii. No bid shall be withdrawn and resubmitted through CPP e-portal by the bidder after the deadline for submission of bids.

iii. Withdrawal of a Bid between the deadline for submission of bids and the expiration of the original period of bid validity specified in Clause 15 may result in the forfeiture of the Bid Security or the bidder shall be disqualified from bidding for any contract with New Mangalore Port Authority for a period of 2 (two) years in pursuant to Clause 16.

iv. Bidders may only modify the prices and other required details of their Bids by Resubmitting Bid only in accordance with this clause through CPP e-portal.

23. Bid Opening - Technical Bid:

a. On the due date and time as specified in Clause 20, the Employer will first open Techno Commercial bids of all bids received online in presence of the Bidders or their representatives who choose to attend. In the event of specified date for bid

opening is declared as holiday by the Employer, the bid will be opened at the appointed time and location on the next working day.

b. In the first instance the Techno Commercial Bid containing the RTGS/NEFT payment details of EMD & Cost of tender document will be verified. If EMD and Tender Fee is in line with the Tender Condition there after the Techno Commercial Bid will be considered for evaluation.

c. If all Bidders have submitted unconditional Bids together with requisite Bid security, then all Bidders will be so informed then and there. If any Bid contains any deviation from the Bids documents and / or if the same does not contains Bid security in the manner prescribed in the Bid documents, then that Bid will be rejected and the Bidder informed accordingly.

24. Bid Opening – Financial Bid:

The date and time of opening of price bid (cover-II) shall be intimated to the qualified bidders based on the evaluation of the technical bid. The price bid (cover-II) of such eligible bidders shall be opened on the specified date and time.

If bidder withdraws his tender after opening of price bid the bidder will be disqualified for participating in NMPA tender for a period of two years.

25. Clarification of Bids:

To assist in the examination and comparison of Bids, the Employer may, at his discretion, ask any Bidder for clarification of his Bid, including breakdown of unit rates. The request for clarification and the response shall be in writing, but no change in the price or substance of the Bid shall be sought, offered, or permitted.

No Bidder shall contact the Employer on any matter relating to his bid from the time of the bid opening to the time the contract is awarded. If the Bidder wishes to bring additional information to the notice of the Employer, he should do so in writing.

Any effort by the Bidder to influence the Employer's bid evaluation, bid comparison or contract award decisions, may result in the rejection of his bid.

Employer reserves the right to reject any Bid, if the Bidder does not provide the clarification sought for by the Employer, within the time specified by the Employer, for proper evaluation of the Bid.

26. Examination of Bids and Determination of Responsiveness:

Prior to detailed evaluation of Bids, NMPA will determine whether each Bid

a) meets the eligibility criteria as defined in Clause 12.

b) has been properly signed by an authorised signatory (accredited representative) holding Power of Attorney in his favour. The Power of Attorney shall interalia include a provision to bind the Bidder to settlement of disputes clause;

c) is accompanied by the requisite Bid security and;

d) is responsive to the requirements of the Bidding documents.

A responsive Bid is one which conforms to all the terms, conditions and specification of the Bidding documents, without material deviation or reservation. A material deviation or reservation is one

a) which affects in any substantial way the scope, quality or performance of the Works;

b) which limits in any substantial way, the Employer's rights or the Bidder's obligations under the Contract; or

c) whose rectification would affect unfairly the competitive position of other Bidders presenting responsive Bids.

The tenderer shall submit a certificate in the tender schedule in the Technical Bid that he has not incorporated any conditions in the Financial Bid and in case any conditions are specified in the financial bid his tender will be rejected without making any further reference to him.

If a Bid is not substantially responsive, it shall be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

27. Correction of Errors: (Not Applicable)

28. Evaluation and Comparison of Bids:

The Employer will evaluate and compare only the Bids determined to be responsive in accordance with Clause 26. In evaluating the Bids, the Employer will determine for each Bid the evaluated Bid Price by adjusting the Bid Price as follows:

a) making appropriate adjustments to reflect discounts or other price modifications offered in accordance with Clause 22.

29. Alteration of tender documents:

No alteration shall be made in any of the tender documents or in the Bill of Quantities and the tender shall comply strictly with the terms and conditions of the tender document. The Employer may however ask any tenderer for clarifications of his tender if required. Nevertheless, no tenderer will be permitted to alter his tender price after opening of the tender.

30. Alternative conditions and Proposal:

The Tenderer shall note that alternative or qualifying tender conditions, or alternative design proposal for whole or part of the work will not be acceptable. Tenders containing any qualifying conditions or even Bidder's clarifications in any form will be treated as non-responsive and will run the risk of rejection. Part II: Price Bid of such Bidder's will not be opened.

31. Award of Contract:

The Employer will award the Contract to the bidder whose bid has been determined to be responsive to the bidding documents and who has offered the lowest evaluated bid price, provided that such bidder has been determined to be

a) Eligible in accordance with the provisions of Clause 12, and

b) Qualified in accordance with the provisions of Clause 12.

32. Notification of Award:

i) The Bidder whose Bid has been accepted will be notified about the award by the Employer prior to expiration of the Bid validity period by, fax or e-mail and confirmed by registered letter. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") will state the sum that the Employer will pay the Contractor in consideration of the execution, completion and maintenance of the works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price").

ii) The notification of award will constitute the formation of the Contract subject only to the furnishing of a performance security in accordance with the provisions of Clause 34.

iii) The Agreement will also incorporate all correspondence exchanged between the employer and the successful bidder. Within 21 days of receipt of Letter of Acceptance, the successful bidder shall furnish the performance security and sign the Agreement with the Employer. The contractor shall make 12 copies of the Agreement and submit to the employer within 7 days following the date of signing of Agreement.

33. Release of Bid Security / EMD:

The Earnest Money Deposit of unsuccessful bidder, shall be returned without interest by RTGS/NEFT on conclusion of Contract. The Earnest Money Deposit of the successful bidder if deposited in cash, shall be refunded (without interest) after he has signed the agreement and furnished required performance security.

34. Performance Security:

i) Within 21 days of receipt of the Letter of Acceptance, the successful Bidder shall deliver to the Employer a Performance Security in the form in the form of Insurance Surety Bonds, Account Payee Demand draft, Fixed Deposit Receipt from a commercial bank, remittance by RTGS for an amount equivalent to 5% of the Contract price including GST, as applicable rounded off to the nearest 1000.

ii) If the performance security is provided by the successful Bidder in the form of a Bank Guarantee, it shall be issued by a Nationalized /Scheduled Indian bank having its branch at Mangalore acceptable by NMPA. The BG shall be issued in

favor of New Mangalore Port Authority in the Format enclosed in Volume I as Annexure-A.

35. Fraud and Corrupt Practices:

The bidder and their respective officers, employees, agents and advisers shall observe the highest standard of ethics during the Selection Process. Notwithstanding anything to the contrary contained in this document, the Port shall reject the tender without being liable in any manner whatsoever to the bidder, if it determines that the bidder has, directly or indirectly or through an agent, engaged in corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice (collectively the "Prohibited Practices") in the Selection Process. In such an event, the Port shall, without prejudice to its any other rights or remedies, forfeit and appropriate the Bid Security or Performance Security, as the case may be, as mutually agreed genuine pre-estimated compensation and damages payable to the Port for, inter alia, time, cost and effort of the Authority, in regard to the Tender, including consideration and evaluation of such Bidder's Proposal. Such Bidder shall not be eligible to participate in any tender or RFP issued by the Authority during a period of 2 (two) years from the date such Bidder is found by the Authority to have directly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice, as the case may be.

For the purposes of this Clause, the following terms shall have the meaning hereinafter respectively assigned to them:

(a) "corrupt practice" means

i) the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the action of any person connected with the Selection Process (for avoidance of doubt, offering of employment to or employing or engaging in any manner whatsoever, directly or indirectly, any official of the Authority who is or has been associated in any manner, directly or indirectly with the Selection Process or the LOA or has dealt with matters concerning the Agreement or arising there from, before or after the execution thereof, at any time prior to the expiry of one year from the date such official resigns or retires from or otherwise ceases to be in the service of the Authority, shall be deemed to constitute influencing the actions of a person connected with the Selection Process; or

ii) engaging in any manner whatsoever, whether during the Selection Process or after the issue of the LOA or after the execution of the Agreement, as the case may be, any person in respect of any matter relating to the Project or the LOA or the Agreement, who at any time has been or is a legal, financial or technical consultant/ adviser of

the Authority in relation to any matter concerning the Project;

(b) “fraudulent practice” means a misrepresentation or omission of facts or disclosure of incomplete facts, in order to influence the Selection Process;

(c) “coercive practice” means impairing or harming or threatening to impair or harm, directly or indirectly, any persons or property to influence any person’s participation or action in the Selection Process;

(d) “undesirable practice” means

i) establishing contact with any person connected with or employed or engaged by the Authority with the objective of canvassing, lobbying or in any manner influencing or attempting to influence the Selection Process; or

ii) having a Conflict of Interest; and

(e) “Restrictive practice” means forming a cartel or arriving at any understanding or arrangement among Applicants with the objective of restricting or manipulating a full and fair competition in the Selection Process.

36. Rejection of Tender:

Any Tender not conforming to the foregoing instructions will not be considered. The Employer does not bind himself to accept the lowest or any tender and has the right to reject any tender without assigning any reason thereof. No representation whatsoever will be entertained on this account.

37. Additional Information:

The "Instructions to Tenderers" shall not form part of the Contract. They are intended only to aid the Tenderers in the preparation of their tender.

38. Compliance of Local Content as per Make in India Policy:

Bidder shall comply with DPIIT Order No. P-45021/2/2017-PP(B-II) dtd. 16-09-2020 in respect of Local Content and furnish an undertaking in the prescribed format as per Annexure 13, to that effect, failing which, the bid may be liable for cancellation.

Annexure – 1

LETTER OF SUBMISSION - COVERING LETTER

(ON THE LETTER HEAD OF THE BIDDER)

Date:

To,

The Executive Engineer (Civil),
New Mangalore Port Authority,

Administration Building,
Panambur, Mangalore – 575 010

Sir,

Sub: The work of "Construction of Security Watch Tower Near Northern Break Water at NMPA"

Being duly authorized to represent and act on behalf of ..... (Hereinafter referred to as "the Bidder") and having reviewed and fully understood all of the requirements of the bid document and information provided, the undersigned hereby apply for the project referred above.

We are submitting our Bid enclosing the following, with the details as per the requirements of the Bid Document, for your evaluation.

i. Tender Document along with Addendum No ----,
ii. Power of Attorney - (Annexure - 2)
iii. Organization Details - (Annexure - 3)
iv. Details to fulfill the "Minimum Eligibility Criteria" and certificates –(Annexure 4)
v. Average Financial turnover over the last three financial year - (Annexure 5)
vi. list of ongoing works In hand at NMPA-(Annexure-6)
vii. List of plant and equipment – (Annexure - 7)
viii. Declaration – (Annexure – 8)
ix. EMD Paid by RTGS/NEFT vide UTR No.....dtd. ..... of (name and address of the branch).
x. Banker's Details – Annexure 10 & 11
xi. Tender fee paid by NEFT vide vide UTR No.....dtd. ..... of (name and address of the branch).
xii. Copy of valid PAN Card ESI, PF and GST Registration certificate.

Signature
(Authorised Signatory)

Annexure – 2

ON STAMP PAPER of Rs 100/-

"CONSTRUCTION OF SECURITY WATCH TOWER NEAR NORTHERN BREAK WATER AT NMPA"

FORMAT OF POWER OF ATTORNEY (in original)

In favour of signatory/s to the Tender, duly authenticated by Notary Public.

POWER OF ATTORNEY IN FAVOUR OF ---------- (Name, Designation, Company name)

TO ALL TO WHOM THESE PRESENTS shall come, I, (Name & address of the authorized person to sub-delegate/delegate powers, delegated on him by the Board of Directors) do hereby sub-delegate/delegate, in terms of the powers delegated to me by the Board of Directors, ---------- (name of the Co.) to Shri ---------- (name, designation & address of the Attorney) the following:

NOW KNOW YE AND THOSE PRESENTS that I, (Name & address of the authorized person to sub-delegate/delegate powers, delegated on him by the Board of Directors), do hereby authorize and empower Shri ---------- (name, designation & address of the Attorney) to do severally amongst others, for the purpose of carrying on our business, the following:

a) To represent lawfully the (name of the Co.) for obtaining bid/tender documents, prepare, sign, execute and submit tenders for execution of (Name of work)or any other works incidental to such construction works.
b) To discuss the technical and financial matters, negotiate and accept prices and take decisions regarding terms and conditions and sign agreements and contracts and also to bind the (name of the Co.) to the arbitration clause included in the contract.
c) For all or any of the purposes here of to sign and deliver or otherwise execute such deed or deeds, transfer or transfers, endorsement or endorsements and to perform such other acts, matters, things as the Attorney shall consider requisite or advisable as full and effectively as the Company could do, if present and acting there.

I, (Name & address of the authorized person to sub-delegate/delegate powers, delegated on him by the Board of Directors) in terms of the powers delegated to me by the Board of Directors of (name of the Co.), do hereby agree that all acts, deeds and

things done by the said Attorney by virtue of this power of attorney, shall be construed as acts, deeds and things done by the Company.

I, (Name & address of the authorized person to sub-delegate/delegate powers, delegated on him by the Board of Directors), further undertake to ratify and confirm whatever our said attorney shall do or cause to be done for the Company, the said Company, in the premises, by virtue of the powers hereby given.

WHEREAS, this sub-delegation is signed and delivered to Shri ---------- (name & designation of the Attorney), on this _____ day of _____, 20___ (Two thousand _____).

WHEREAS, even though this sub-delegation is signed on this _____ day of _____ 20_____ (Two thousand _____), will have effect from the date he signs and receives this delegation.

IN WITNESS WHEREOF, I, (Name & address of the authorized person to sub-delegate/delegate powers, delegated on him by the Board of Directors) has, this _____ day of _____ 20_____ (Two thousand _____) set my hands and subscribed my signature unto this instrument.

SIGNED AND DELIVERED ON
_____ BY

(Name of authorized person to delegate powers)

WITNESS:

SIGNED AND RECEIVED ON
_____ BY
(Name & designation of Attorney)

Annexure – 3

"CONSTRUCTION OF SECURITY WATCH TOWER NEAR NORTHERN BREAK WATER AT NMPA"

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ORGANIZATION DETAILS

CONTACT No.:

NAME OF APPLICANT:

1. Name of the Owner:
2. Address:
   Telephone No. :
   Fax No.
3. Description of Applicant
   (for e.g. General, Civil Engineering etc.,)
4. Registration and Classification of Contractors:
5. Name and address of bankers:
6. Number of years of experience as a general contractor:-
   In own Country:
   Internationally:
7. Number of years of experience as a sub-contractor:
   Name and Address of partners or associated companies to be involved in the project and whether Parent/Subsidiary/other:
8. Name and address of any associates knowledgeable in the procedures of customs, immigration and local experience in various aspect of the project etc.
9. Name and address of the companies / Sub-contractors who will be involved in the execution of works, namely:

Signature

(Authorised Signatory)

Annexure – 4

NEW MANGALORE PORT AUTHORITY

"CONSTRUCTION OF SECURITY WATCH TOWER NEAR NORTHERN BREAK WATER AT NMPA"

Tenderer shall furnish Details of "eligibility works experience" as per Clause 12(a) of Minimum Eligible Criteria (MEC) of Instruction to Tenderer and certificates in the following format (Client Certificates/work completion certificates or any other documentary evidences with respect to the eligibility work)

ELIGIBLE ASSIGNMENT DETAILS FOR MEC

Assignment Number:

Description	Bidder to fill up the details here
Name and Address of the Client	
Title of the Eligible Assignment	
Date of completion of the Eligible Assignment	
Project Cost	
Reference No of the enclosed work order	
Reference No of the enclosed Client work Completion Certificate	
Reference No of any other documentary evidence; if enclosed.	
Name, telephone no, telefax no and email address of the client's representative	
Description and Scope of Work	

Signature
(Authorised Signatory)

Certificate from the Statutory Auditor

This is to certify that the information contained in Column 4 above is correct as per the accounts of the Applicant and/ or the clients.

(Signature, name and designation of the authorised signatory)

Date: Name and seal of the audit firm:

In case the Applicant does not have a statutory auditor, it shall provide the certificate from its chartered accountant that ordinarily audits the annual accounts of the Applicant.

Instructions:

i. Bidders are expected to provide information in respect of Eligible Assignments in this Section. The assignments cited must comply with the criteria specified Clause No. 12.0(a) Minimum eligibility of the "Instructions to Tenderers".
ii. A separate sheet should be filled for each of the eligible assignments.
iii. The details are to be supplemented by documentary proof (Work order and work completion certificate) from the respective client for having carried out such assignment duly certified by clients.

Annexure – 5

NEW MANGALORE PORT AUTHORITY

"CONSTRUCTION OF SECURITY WATCH TOWER NEAR NORTHERN BREAK WATER AT NMPA"

FINANCIAL CAPABLITY

(A) Net worth & Average Annual Turnover of the Bidder

Net Worth	Turnover			
Year 1	Year 1	Year 2	Year 3	Average

Instructions:

Net Worth = (Subscribed and Paid-up Equity + Reserves) - (Revaluation reserves + Miscellaneous expenditure not written off + depreciation not provided for). Year 1 will be the Financial Year 2020-21. Year 2 shall be the year immediately preceding Year 1 and Year 3 shall be the year immediately preceding Year 2. The Bidder shall provide audited Annual Reports as required under this Bid Document.

Net worth & Annual turnover of the bidder shall be submitted duly verified by Charted Accountant or Competent Authority.

(B) (Here specify proposed sources of credit line to meet the Cash flow demand for the work)

Source of Credit line	Amount

There should be a letter from the Bank mentioning that line of credit offered is specifically for this work / contract.

NOTE: If the Tenderer intends to meet the "Cash Flow Demand" for the project through their internal resources without availing the loan of credit, a specific mention to be made to this effect and proof for such resources shall be enclosed.

Certified by C.A Signature

(Authorised Signatory)

Annexure – 6

NEW MANGALORE PORT AUTHORITY

"CONSTRUCTION OF SECURITY WATCH TOWER NEAR NORTHERN BREAK WATER AT NMPA"

LIST OF ONGOING WORKS IN HAND AT NMPA

The Tenderer shall furnish in the format given below details of works being carried out by him at the time of bidding in NMPA.

Sl. No.	Name of work	Work order No. and Date	Value Of Work Order In Rs.	Average annual financial turnover as per MEC for the work

Contractor

Annexure – 6A (Not applicable)

NEW MANGALORE PORT AUTHORITY

"CONSTRUCTION OF SECURITY WATCH TOWER NEAR NORTHERN BREAK WATER AT NMPA"

DETAILS OF PROPOSED APPROACH & METHODOLOGY

Bidder shall furnish a detailed method statement (Technical Note) for carrying out of the works, along with a construction programme showing sequence of operation and the time frame for various segments of temporary and permanent works.

Signature
(Authorised Signatory)

Annexure – 7

NEW MANGALORE PORT AUTHORITY

"CONSTRUCTION OF SECURITY WATCH TOWER NEAR NORTHERN BREAK WATER AT NMPA"

PLANT AND EQUIPMENT PROPOSED FOR THE WORK

Please indicate the main plant and equipment considered to be necessary for undertaking the work and whether this plant is ready in ownership or will be purchased or hired.

Description of equipment	Requirement no. / capacity	Owned / leased / to be procured	Nos / capacity	Age / condition	Remarks (from whom to be purchased)	At what stage of contract period the equipment will be available

Note: The equipment indicated in the above statement will form part of contract agreement and as such the bidders are requested to indicate the availability of the equipment at site and at what stage of the construction period in a separate column.

Signature
(Authorised Signatory)

Annexure – 8

NEW MANGALORE PORT AUTHORITY

"CONSTRUCTION OF SECURITY WATCH TOWER NEAR NORTHERN BREAK WATER AT NMPA"

DECLARATION

We M/s. (Name & address of the bidder) hereby declare that:-

i. I have read the tender document Vol. I (Section I to III) Vol. II (Section IV and V) and Vol. III (Section V and VII) and agreed to the terms and conditions mentioned therein.

ii. All details regarding construction plant, temporary work and personnel for site organization considered necessary and sufficient for the work have been furnished in the Annexures to Conditions of Contract in Volume I and that such plant, temporary works and personnel for site organization will be available at the site till the completion of the respective work.

iii. No conditions are incorporated in the financial bid. In case any conditions are specified in the financial bid, the tender will be rejected summarily without making any further reference to the bidder.

iv. We have not made any payment or illegal gratification to any persons/ authority connected with the bid process so as to influence the bid process and have not committed any offence under PC Act in connection with the bid.

v. We shall undertake that, the Employer i.e. NMPA is indemnified against all damages or compensation payable at Law in respect of or in consequence of any accident or injury to any workman or other person in the employment of the Contractor or Sub-Contractor against all claims, demands, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto and the Employer shall be at liberty to deduct or adjust from the Contactor's bills an amount that Employer may be called upon to pay towards claims, demands, proceedings, costs, charges and expenses Whatsoever in respect of or in relation to any accident or injury referred to above without any reference to the Contractor. The contractor shall execute indemnity bond in the prescribed format as per **Annexure - 12**

vi. We shall comply with all the Central State and Municipal Laws and Rules and we shall

be solely responsible for complying with the provisions of the Contract Labour (Regulations & Abolition) Act, 1970 & the contract labour (Regulation &Abolition) Karnataka Rules 1974 and rules there under and the enactments that may be applicable including ESI Act, the payment of wages act, Provident Fund Act, the Minimum Wages Act, the Factory's Act. The Workmen Compensation Act or any other applicable legislation and the Municipal by-laws or other statutory Rules and Regulations whatsoever in force if these are applicable. Any obligations finding or otherwise missed under any statutory enactments, rules & regulations there under shall be the responsibility of the Contractor and the NMPA will take no responsibility for the same. The Contractor should take Workmen's Compensation Policy for his Workers, who are not covered under ESI and submit the same to the EIC immediately after commencement of the work

vii. We undertake that, we are liable to pay all Statutory Compensation to the Labourers/persons engaged by him for the satisfactory execution of the works. lf any claim is made against New Mangalore Port Authority on this work, the Port Authority shall have the right to deduct the same from the bill amount payable to the contractor after verification of the validity and if admissible as per rules

viii. *We disclose with that we have made / not made payments or propose to be made to any intermediaries (agents) etc. in connection with the bid.

* Note: Delete whichever is not applicable.

Signature
(Authorised Signatory)

Annexure-9

BID SECURITY (BANK GUARANTEE)(NA)

WHEREAS, _____ [Name of Bidder] (hereinafter called “the Bidder”) has submitted his bid dated_____ [date] for the Construction of Security Watch Tower Near Northern Break Water at NMPA(hereinafter called “the Bid”).

KNOW ALL PEOPLE by these presents that We _____ [name of bank] of _____ (name of country) having our registered office at _____ (hereinafter called “the Bank”) are bound unto _____ [name of Employer] (hereinafter called “the Employer”) in the sum of _____ 1 for which payment well and truly to be made to the said Employer the Bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this _____ day of _____ 20 ___

THE CONDITIONS of these obligations are:

(1) If after Bid opening the Bidder withdraws his Bid during the period of bid validity specified in the Form of Bid;

or

(2) If the Bidder having been notified of the acceptance of his Bid by the Employer during the period of bid validity:

(a) fails or refuses to execute the Form of Agreement in accordance with the Instructions to Bidders, if required; or

(b) fails or refuses to furnish the Performance Security, in accordance with the Instructions to Bidders, or

(c) does not accept the correction of the Bid Price pursuant to Clause 27;

We undertake to pay to the Employer up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Employer will note that the amount claimed by him is due to him owing to the occurrence of one or any of the three conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date _____ 2 days after the deadline for submission of Bids as such deadline is stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

Notwithstanding anything mentioned above,

Our liability against this guarantee is restricted to Rs ..... (Rupees

…… only) and unless a claim in writing is lodged with us within 3 months of the date of expiry or the extended date of expiry of this guarantee all our liabilities under this guarantee shall stand discharges.

IN WITNESS WHEREOF this guarantee has been duly executed on this …… day of …… 20 ……

DATE_____ SIGNATURE OF THE BANK_____

WITNESS_____SEAL_____

_____

_____

[Signature, name and address]

_____ _____ _____ _____ _____

The Bidder should insert the amount of the guarantee in words and figures denominated in Indian Rupees. This figure should be the same as shown in Clause 16 of the Instructions to Bidders.

30 days after the end of the validity period of the Bid. Date should be inserted by the Employer before the Bidding documents are issued.

Annexure-10

DETAILS OF THE PARTY OPTING FOR REFUND OF EMD THROUGH E-PAYMENT SYSTEM FROM NEW MANGALORE PORT AUTHORITY

Name of the Party :

Bank A/c No :

Account type : (Savings / Current / Overdraft)

Bank Name :

Branch :

IFSC Code Number : (11 digit code)

Centre (Location) :

FAX No. :

E-Mail ID : (For forwarding information of remittance)

Mobile No :

Signature of the Party

Annexure-11

FORMAT FOR FURNISHING BANK INFORMATION FOR e-PAYMENT

1	Name and full address of the beneficiary	
2	Credit Account No. (Should be full 14 digit)	
3	Account Type (SB or CA or OD)	
4	Name of the Bank	
5	Branch (Full address with telephone No.)	
6	IFSC Code Number (11 digit)	
7	MICR code (Should be 9 digit)	
8	Telephone/Mobile/Fax No. of the beneficiary	Telephone: Mobile : Fax :
9	Photostat copy of a Cheque	

Signature of the party with seal

Verified the details furnished by the party and it is ascertained that the information furnished are in full shape as required. Xerox copy of a Cheque is also enclosed.

Signature of the HOD/HOO with seal

Annexure 12

INDEMNITY BOND

(To be furnished in Stamp paper not less than Rs.100 e-Stamp paper)

This deed of indemnity is executed by ..... herein after referred to as 'Indemnifier' which expression shall unless repugnant to the context or meaning thereof, include its successors, Administrator, representatives and assignees in favour of New Mangalore Port Authority, Panambur, Mangalore 575010, herein after referred to as 'Indemnified' which expression shall unless repugnant to the context or meaning thereof include its representatives and assignees witnesses as to.

Whereas the indemnified herein as awarded to the indemnifier herein a Tender/Contract or for supply of / Construction of ..... on terms and conditions set out interalia in the work order No..... valued at Rs.....

AND Whereas, the clauses No..... of the above mentioned work order provides for indemnifying the indemnified by the indemnifier for any accident, damage or compensation payable to any workmen or other person in the employment of the contractor or any sub-contractor during the period of tender/contract.

AND Whereas, the Indemnifier hereby irrevocably agrees to indemnify the indemnified against all damages or compensation payable at law in respect of or in consequence of any accident or injury to any workmen or other person in the employment of the contractor or sub-contractor against all claims, demands, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto and the indemnified shall be at liberty to deduct or adjust from the bills payable to the indemnifier by the indemnified for an amount that the indemnified may be called upon to pay towards claims, demands, proceedings, costs, charges and expenses whatsoever in respect of or in relation to any accident or injury referred to above without any reference to the indemnifier.

The Indemnifier shall comply with all the Central State and Municipal Laws and Rules and shall be solely responsible for complying with the provisions of the Contract Labour (Regulations & Abolition) Act, 1970 & the contract labour (Regulation & Abolition) Karnataka Rules 1974 and rules there under and the enactments that may be applicable including ESI Act, the payment of wages act, Provident Fund Act, the Minimum Wages Act, the Factory's Act, the Workmen Compensation Act or any other applicable legislation and the Municipal by-laws or other statutory Rules and Regulations whatsoever in force if these are applicable. Any obligations finding or otherwise missed under any statutory enactments rules & regulations there under

shall be the responsibility of the Indemnifier and the Indemnified will have no responsibility for the same. The Indemnifier shall obtain Workmen's Compensation Policy for his workers, who are not covered under ESI and submit the same to the ESIC immediately after commencement of the work.

The Indemnifier is liable to pay all Statutory Compensation to the Labourers / persons engaged by him for the satisfactory execution of the works. If any claim is made against Indemnified arising out of this work, the Port shall have the right to deduct the same from the bill amount payable to the Indemnifier after verification of the validity and if admissible as per rules.

The Indemnifier shall ensure the use of PPE such as helmets, safety shoes, nose masks, hand gloves, safety harness or any other equipment as required depending on nature of work by his staff at site.

In addition to complying of the above, the Indemnifier hereby undertakes to indemnify the indemnified against any unforeseen incidents / accidents, which may lead to fatality including death, permanent/ partial disablement, injury, financial loss, legal issues or any other etc., of the labourers / workmen's/ staffs of the contractor / sub-contractor for which the indemnified and its officers / representation are in no way responsible.

For……
INDEMINIFIER
(Signature with Name and Designation)
Company Seal

Station:
Date:
Witness:
1……
Signature with Name, Designation & Address
2……
Signature with Name, Designation & Address

Annexure-13

Format for Self Certification under Preference to “MAKE IN INDIA” Policy
(Refer Clause No. 38 of ITT)

CERTIFICATE

In line with Government Public Procurement Order No. P-45021/2/2017-PP(B-II) dtd:16-09-2020, as amended from time to time and as applicable on the date of submission of tender, we hereby certify that we M/s_____ (name of the Bidder) are local supplier meeting the requirement of minimum Local content (50%) as defined in above orders for the material against Tender NIT No_____ for the work of _____

_____

_____

Details of location at which local value addition will be made is as follows:

---------- ----------

We also understand, false declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rule for which for which a bidder or its successors can be debarred for up two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law. Seal and Signature of Authorized Signatory

Signature of the Bidder

Date :

Place :

SECTION - II

iii) FORM OF AGREEMENT

THIS AGREEMENT made the _____ day of _____ 20___ BETWEEN New Mangalore Port Authority (hereinafter called "the Employer") of the one part and _____ _____ _____ _____ _____

(hereinafter called "the Contractor") of the other part WHEREAS the Employer is desirous that certain works should be executed by the Contractor, Viz---------- and has accepted a Tender by the Contractor for the execution and Completion of such works and the remedying of any defects therein at a contract price of Rs .....

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the General Conditions hereinafter referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.-
   a) The Letter of Acceptance;
   b) The Said Tender (Technical Bid);
   c) The Conditions of Contract (Parts I and II)
   d) The Specifications;
   e) The Drawings;
   f) The Bill of Quantities and
   g) The Addenda
   h) Letters exchanged between the Employer and the Tenderer up to the issue of Letter of Acceptance as separately listed and annexed here to.

3. In consideration of the payments to be made by the Employer to the contractor as hereinafter mentioned the Contractor hereby covenants with the Employer to execute and complete the works and remedy any defects therein in conformity in all respect with the provisions of the Contract.

4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the works and the remedying of defects therein the Contract Price or and such other sum as may become payable under the Provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed the day and year first above written in accordance with their respective laws.

This document contains ..... pages in all. This agreement is assigned No. CEA ..... /20XX-XX.

The Common Seal of

_____

_____

was hereunto affixed in the presence of :

SECTION - III

iv) CONDITIONS OF CONTRACT

A. General

1. Definitions

Terms which are defined in the Contract Data are not also defined in the Conditions of Contract but keep their defined meanings. Capital initials are used to identify defined terms.

Bill of Quantities means the priced and completed Bill of Quantities forming part of the Bid.

Compensation Events are those defined in Clause 44.

The Completion Date is the date of completion of the Works as certified by the Engineer or his nominee in accordance with Sub Clause 54

The Contract is the contract between the Employer and the Contractor to execute, complete and maintain the Works. It consists of the documents listed in Clause 2.3 below.

The Contract Data defines the documents and other information which comprise the Contract.

The Contractor is a person or corporate body whose Bid to carry out the Works has been accepted by the Employer.

The Contractor's Bid is the completed Bidding documents submitted by the Contractor to the Employer.

The Contract Price is the price stated in the letter of acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

Days are calendar days, months are calendar months.

A Defect is any part of the Works not completed in accordance with the Contract.

The Defects Liability Period is the period named in the Contract Data and calculated from the Completion Date.

The Employer is the party who will employ the Contractor to carry out the Works.

Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

The Initial Contract Price is the Contract Price listed in the Employer's Letter of

Acceptance.

The Intended Completion Date is the date on which it is intended that the Contractor shall complete the works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Engineer or his nominee by issuing an extension of time.

Materials are all supplies, including consumables, used by the contractor for incorporation in the Works.

The Engineer or his nominee is the person named in the Contract Data (or any other competent person appointed and notified to the contractor to act in replacement of the Engineer or his nominee) who is responsible for supervising the Contractor, administering the Contract, certifying payments due to the Contractor, issuing and valuing Variations to the Contract, awarding extensions of time and valuing the Compensation Events.

Plant is any integral part of the Works which is to have mechanical, electrical, electronic or chemical or biological function.

The Site is the area defined as such in the Contract Data.

Site Investigation Reports are those which are included in the Bidding documents and are factual interpretative reports about the surface and sub-surface conditions at the site.

Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Engineer or his nominee.

The Start Date is given in the Contract Data. It is the date when the Contractor shall commence execution of the works. It does not necessarily coincide with any of the Site Possession Date.

A Subcontractor is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract which includes work on the Site.

Temporary Works are works designed, constructed, installed and removed by the Contractor which are needed for construction or installation of the Works.

A Variation is an instruction given by the Engineer or his nominee which varies the Works.

The Works are what the Contract requires the Contractor to construct, install and turn over to the Employer as defined in the Contract Data.

The Trained Work Person are those employed / proposed to be employed by the Contractor at the Project Site, who have participated and are in possession of a valid Competency Certificate through a programme run under the auspices of a University, State Technical Board, Ministry of Government of India.

2. Interpretation

2.1 In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Engineer or his nominee will provide instructions clarifying queries about the Conditions of Contract.

2.2 If sectional completion is specified in the Contract Data, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion date for the whole of the Works).

2.3 The documents forming the Contract shall be interpreted in the following order of priority:

(1) Agreement
(2) Letter of Acceptance and notice to proceed with works
(3) Contractor's Bid
(4) Contract Data
(5) Conditions of Contract including Special Conditions of Contract
(6) Specifications
(7) Drawings
(8) Bill of quantities and
(9) Any other documents listed in the Contract Data as forming part of the Contract.

3. Language and Law

3.1 The language of the Contract and the law governing the Contract are stated in the Contract Data.

4. Engineer or his nominee's Decisions

4.1 Except where otherwise specifically stated, the Engineer or his nominee will decide contractual matters between the Employer and the Contractor in the role representing the Employer.

5. Delegation

5.1 The Engineer or his nominee may delegate any of the duties and responsibilities to other people after notifying the Contractor and may cancel any delegation after notifying the Contractor.

6. Communications

Communications between parties which are referred to in the conditions are effective only when in writing. A notice shall be effective only when it is delivered (in terms of

Indian Contract Act 1872).

7. Contract Agreement

A suitable form is annexed as "FORM OF AGREEMENT" to the Contract Document. Upon signing the Contract Agreement, the Contractor shall make 12 copies of Contract Documents in hardbound cover which shall cover documents used in Contract/Agreement and provide the same to the Employer at no extra cost.

Data made available by the Employer in accordance with provisions of the Condition of Contract shall be deemed to include data listed elsewhere in the Contract and open for inspection at the office of the Deputy Chief Engineer (Civil) of the New Mangalore Port Authority (by prior appointment with the Engineer). Within 21 days of receipt of Letter of Acceptance, the successful bidder shall furnish the performance security and sign the Agreement with the Employer. However No work shall be commenced before signing of contract Agreement.

8. Subcontracting

8.1 The Contractor may subcontract with the approval of the Engineer or his nominee but may not assign the Contract without the approval of the Employer in writing. Subcontracting does not alter the Contractor's obligations.

Other Contractors

8.2 The Contractor shall co-operate and share the site with other contractors, public authorities, utilities, and the Employer between the dates given in the Schedule of other contractors. The Contractor shall as referred to in the Contract Data, also provide facilities and services for them as described in the Schedule. The employer may modify the schedule of other contractors and shall notify the contractor of any such modification.

9. Personnel

9.1 The Contractor shall employ the key personnel named in the Schedule of Key Personnel as referred to in the Contract Data to carry out the functions stated in the Schedule or other personnel approved by the Engineer or his nominee. The Engineer or his nominee will approve any proposed replacement of key personnel only if their qualifications, abilities, and relevant experience are substantially equal to or better than those of the personnel listed in the schedule.

9.2 If the Engineer or his nominee asks the contractor to remove a person who is a member of the contractor's staff of his work force stating the reasons, the contractor shall ensure that the person leaves the site within seven days and has no further connections with the work in the contract.

10. Employer's and Contractor's Risks

10.1 The Employer carries the risks which this Contract states are Employer's risks and the contractor carries the risks which this Contract states are contractor's risks.

11. Employer's Risks

11.1 The Employers risks are

(a) In so far as they directly affect the execution of the Works in the country where the Permanent Works are to be executed:

i) war and hostilities (whether war be declared or not), invasion, act of foreign enemies;

ii) rebellion, revolution, insurrection, or military or usurped power, or civil war;

iii) ionizing radiations, or contamination by radioactivity from any nuclear fuel, or from any nuclear waste, from the combustion of nuclear fuel, radioactive toxic explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof;

iv) pressure waves caused by aircraft or other aerial devices travelling at sonic or Supersonic speeds; and

v) riot, commotion or disorder, unless solely restricted to the employees of the Contractor or of his Subcontractors and arising from the conduct of the Works;

vi) Unforeseen Rains (Rains if any; during the period other than the Monsoon period as stated in the Tender), floods, tornadoes, earthquakes and landslides.

(b) loss or damage due to the use or occupation by the Employer of any Section or part of the Permanent Works, except as may be provided for in the Contract;

(c) loss or damage to the extent that it is due to the design of the Works, other than any part of the design provided by the Contractor or for which the Contractor is responsible; and

(d) any operation of the forces of nature (in so far as it occurs on the Site) which an experienced contractor:

i) could not have reasonably foreseen, or

ii) could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures:

iii) prevent loss or damage to physical property from occurring by taking appropriate measures, or

iv) insure against.

12. Contractor's Risks

12.1 All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks are the responsibility of the Contractor.

13. Insurance

13.1The Contractor shall provide in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the Contract Data for the following events which are due to the Contractors risks.

a) loss of or damage to the Works, Plant and Materials
b) loss of or damage to Equipment;
c) loss of or damage of property (except the Works, Plant, Materials and Equipment) in connection with the Contract; and
d) personal injury or death.

13.2 Policies and certificates for insurance shall be delivered by the contractor to the Engineer or his nominee for the Engineer or his nominee's approval before the start date. All such insurances shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.

13.3 If the contractor does not provide any of the policies and certificates required, the Employer may affect the insurance which the contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the contractor or, if no payment is due, the payment of the premiums shall be a debt due.

13.4 Alterations to the terms of insurance shall not be made without the approval of the Engineer or his nominee.

13.5 Both parties shall comply with all conditions of the insurance policies.

14. Site Investigation Reports

The Contractor, in preparing the Bid, shall rely on the Site Investigation Report referred to in the Contract Data, supplemented by any information available to the Bidder.

15. Queries about the Contract Data

The Engineer or his nominee will clarify queries on the Contract Data.

16. Contractor to Construct the Works

The Contractor shall construct and install the works in accordance with the

Specification and Drawings.

17. The Works to Be Completed by the Intended Completion Date

The Contractor may commence execution of the works on the Start Date and shall carry out the works in accordance with the program submitted by the contractor as updated with the approval of the Engineer or his nominee, and complete them by the Intended Completion Date.

18. Approval by the Engineer or his nominee

18.1 The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Engineer or his nominee, who is to approve them if they comply with the specifications and Drawings.

18.2 The Contractor shall be responsible for design of Temporary Works.

18.3 The Engineer or his nominee's Approval shall not alter the contractor's Responsibility for design of the Temporary Works.

18.4 All Drawings prepared by the contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Engineer or his nominee before their use.

19. Safety

The contractor shall be responsible for the safety of all activities on the Site.

20. Discoveries

Anything of historical or other interest or of significant value unexpectedly discovered on the Site is the property of the Employer. The Contractor is to notify the Engineer or his nominee of such discoveries and carry out the Engineer or his nominee's instructions for dealing with them.

21. Possession of the Site

The Employer shall give possession of all parts of the Site to the Contractor, free from encumbrances. If possession of a part is not given by the start date stated in the Contract Data the Employer is deemed to have delayed the start of the relevant activities and this will be a Compensation Event.

22. Access to the Site

The Contractor shall allow the Engineer or his nominee and any person authorized by the Engineer or his nominee access to the Site to any place where work in connection with the Contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured, fabricated and/or assembled for the works.

23. Instructions

The Contractor shall carry out all instructions of the Engineer or his nominee

which comply with the applicable laws where the Site is located.

24. Disputes

If the Contractor believes that a decision taken by the Engineer or his nominee was either outside the authority given to the Engineer or his nominee by the Contract or that the decision was wrongly taken, the decision shall be referred to the Dispute Review Board (DRB) within 28 days of the notification of the Engineer or his nominee's decision.

25. Settlement of Disputes

25.1 If a dispute of any kind whatsoever arises between the Employer and the Contractor in connection with, or arising out of the Contract or the execution of the Works, whether during the execution of the Works or after their completion and whether before or after repudiation or after termination of the Contract, including any disagreement by either party with any action, inaction, opinion, instruction, determination, certificate or valuation of the Engineer or his nominee, the matter in dispute shall, in the first place be referred to the Disputes Review Board [DRB] established pursuant to Appendix 1 hereto. (Not applicable to this contract) Unless the Contract has already been repudiated or terminated or frustrated the Contractor shall in every case, continue to proceed with the Works with all due diligence and the Contractor and the Employer shall give effect forthwith to every decision of the Engineer or his nominee unless and until the same shall be revised, as hereinafter provided, in a Dispute Review Board Recommendation / Arbitral Award.

25.2. Arbitration

Any dispute in respect of in respect of contracts where party is dissatisfied by the Dispute Review Board's (DRB) decision shall be decided by arbitration as set forth below:

i) A dispute with contractor shall be finally settled by arbitration in accordance with the Indian Arbitration and Conciliation Act, 1996, or any statutory amendment thereof. The arbitral tribunal shall consist of 3 arbitrators, one each to be appointed by the Employer and the contractor, and the third to be appointed by the mutual consent of both the arbitrators, failing which by making a reference to CIDC-SIAC Arbitration Center from their panel.

ii) Neither party shall be limited in the proceedings before such arbitrators to the evidence or arguments already put before the Engineer or his nominee or

the Board, as the case may be, for the purpose of obtaining said recommendations/decision. No such recommendations/decision shall disqualify the Engineer or his nominee or any of the members of the Board, as the case may be, from being called as a witness and giving evidence before the arbitrators or any matter whatsoever relevant to the dispute.

iii) The reference to arbitration shall proceed notwithstanding that the works shall not then be or be alleged to be complete, provided always that the obligations of the Employer, the Engineer or his nominee and the Contractor shall not be altered by reason of the arbitration being conducted during the progress of the works. Neither party shall be entitled to suspend the works to which the dispute relates, and payment to the Contractor shall be continued to be made as provided by the contract.

iv) If one of the parties fails to appoint its arbitrators in pursuance of sub-clause [i], within 14 days after receipt of the notice of the appointment of its arbitrator by the other party, then President/Chairman of the nominated Institution shall appoint arbitrator within 14 days of the receipt of the request by the nominated institution. A certified copy of the President's/ Chairman's order, making such an appointment shall be furnished to both the parties.

v) Arbitration proceedings shall be held at Mangalore, and the language of the arbitration proceedings and that of all documents and communications between the parties shall be 'English

vi) The Arbitration shall be conducted by the experts from the panel of CIDCSIAC Arbitration Center.

vii) The decision of the majority of arbitrators shall be final and binding upon both parties. The expenses of the arbitrators as determined by the arbitrators shall be shared equally by the Employer and the Contractor. However, the expenses incurred by each party in connection with the preparation, presentation, etc. of its case prior to, during and after the arbitration proceedings shall be borne by each party itself.

viii) All arbitration awards shall be in writing and shall state the reasons for the award.

ix) Performance under the contract shall continue during the arbitration proceedings and payments due to the contractor by the Employer shall not be withheld, unless they are subject matter of the arbitration proceedings.

26. Replacement of conciliator (deleted)

B. TIME CONTROL

27. Program

27.1 Within the time stated in the Contract Data the Contractor shall submit to the Engineer or his nominee for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the works along with monthly cash flow forecast.

27.2 An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work including any changes to the sequence of the activities.

27.3 The Contractor shall submit to the Engineer on the first day of each week or such longer period as the Engineer may from time to time direct, a progress report in an approved form showing up-to-date total progress, progress achieved against planned progress, during the previous week and progress forecast for the following week for all important items in each section or portion of the Works, in relation with the approved Program.

27.4 The Contractor shall submit to the Engineer or his nominee, for approval an updated Program at intervals no longer than the period stated in the Contract Data. If the Contractor does not submit an updated Program within this period, the Engineer or his nominee may withhold the amount stated in the Contract Data from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted.

28. Revised Program

The Engineer or his nominee's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Engineer or his nominee again at any time. A revised Program is to show the effect of Variations and Compensation Events.

29. Extension of the Intended Completion Date

29.1 The Engineer or his nominee shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work and which would cause the Contractor to incur additional cost.

29.2 The Engineer or his nominee shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Engineer or his nominee for a decision upon the effect of a Compensation

Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

30. Delays Ordered by the Engineer or his nominee

The Engineer or his nominee may instruct the Contractor to delay the start or progress of any activity within the Works.

31. Management Meetings

31.1 Either the Engineer or his nominee or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.

31.2 The Engineer or his nominee shall record the business of management meetings and is to provide copies of his record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken is to be decided by the Engineer or his nominee either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.

32. Early Warning

32.1 The Contractor is to warn the Engineer or his nominee at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price or delay the execution of works. The Engineer or his nominee may require the Contractor to provide an estimate of the expected effect of the event or circumstance on the Contract Price and Completion Date. The estimate is to be provided by the Contractor as soon as reasonably possible.

32.2 The Contractor shall cooperate with the Engineer or his nominee in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Engineer or his nominee.

C. QUALITY CONTROL

33. Identify Defects

The Engineer or his nominee shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Engineer or his nominee may instruct the Contractor to search for a Defect and to uncover and test any work that the Engineer or his nominee considers may have a Defect.

34. Tests

If the Engineer or his nominee instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does the Contractor shall pay for the test and any samples. If there is no Defect the test shall be a Compensation Event.

35. Defect Liability

35.1 The Engineer or his nominee shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and is defined in the Contract Data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

35.2 Every time notice of a Defect is given, the Contractor shall correct the notified defect within the length of time specified by the Engineer or his nominee's notice. To the intent that the works shall, at or as soon as practicable after the expiration of the Defects Liability Period, be delivered to the Employer in the condition required by the Contract, fair wear and tear excepted, to the satisfaction of the Engineer, the Contractor shall :

(a) Complete the work, if any, outstanding on the date stated in the Taking-Over Certificate within the date to be intimated by the engineer and

(b) execute all such work of amendment, reconstruction, and remedying defects, shrinkages or other faults as the Engineer may, during the Defects Liability Period or within 14 days after its expiration, as a result of an inspection made by or on behalf of the Engineer prior to its expiration, instruct the Contractor to execute.

35.3 Cost of Remedying Defects

All work referred to in Sub-Clause 35.2 shall be executed by the contractor at his own cost if the necessity thereof is, in the opinion of the Engineer, due to:

a) The use of materials, Plant or workmanship not in accordance with the Contract, or

b) Where the Contractor is responsible for the design of part of the Permanent Works, any fault in such design, or the neglect or failure on the part of the Contractor to

comply with any obligation, expressed or implied, on the Contractor's part under the Contract.

35.4 Defects Liability Certificate

The Contract shall not be considered as completed until a Defects Liability Certificate shall have been signed by the Engineer and delivered to the Employer, with a copy to the Contractor, stating the date on which the Contractor shall have completed his obligations to execute and complete the Works and remedy any defects therein to the Engineer's satisfaction. The Defects Liability Certificate shall be given by the Engineer within 28 days after the expiration of the Defects Liability Period, or, if different defects liability periods shall become applicable to different Sections or parts of the Permanent Works, the expiration of the latest such period, or as soon thereafter as any works instructed, pursuant to Clauses 35, have been completed to the satisfaction of the Engineer.

35.5 Unfulfilled Obligations

Notwithstanding the issue of the Defects Liability Certificate the Contractor and the Employer shall remain liable for the fulfillment of any obligation incurred under the provisions of the Contract prior to the issue of the Defects Liability Certificate which remains unperformed at the time such Defects Liability Certificate is issued and, for the purposes of determining the nature and extent of any such obligation, the Contract shall be deemed to remain in force between the parties to the Contract.

36. Uncorrected Defects.

If the Contractor has not corrected a Defect within the time specified in the Engineer or his nominee's notice the Engineer or his nominee will assess the cost of having the Defect corrected, and the Contractor will pay this amount.

D. COST CONTROL

37. Bill of Quantities

37.1 The Bill of Quantities shall contain items for the construction, supply, installation, testing and commissioning work to be done by the Contractor.

37.2 The Bill of Quantities is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the Bill of Quantities for each item.

38. Changes in the Quantities

38.1 If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than +25 % provided the change exceeds +10% of initial Contract Price, the Engineer or his nominee shall adjust the rate(s), to allow for the change.

38.2 The Engineer or his nominee shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15 percent except with the Prior approval of the Employer.

38.3 If requested by the Engineer or his nominee where the quoted rate(s) of any item(s) is abnormally high, the Contractor shall provide the Engineer or his nominee with a detailed cost breakdown of such rate in the Bill of Quantities.

39. Variations

39.1 The Engineer shall make any variation of the form, quality or quantity of the Works or any part thereof that may, in his opinion, be necessary and for that purpose, or if for any other reason it shall, in his opinion, be appropriate, he shall have the authority to instruct the Contractor to do and the Contractor shall do any of the following:

a) increase or decrease the quantity of any work included in the Contract,
b) omit any such work,
c) change the character or quality or kind of any such work,
d) change the levels, lines, position and dimension of any part of the Works,
e) execute additional work of any kind necessary for the completion of the Works,
f) change any specified sequence or timing of construction of any part of the Works.

No such variation shall in any way vitiate or invalidate the Contract, by the effect, if any, of all such variations shall be valued in accordance with Clause 40. Provided that where the issue of an instruction to vary the works is necessitated by some default of or breach of contract by the contractor or for which he is responsible, any additional cost attributable to such default shall be borne by the contractor. All Variations shall be included in updated Programs produced by the contractor.

39.2 Instructions for Variations

The Contractor shall not make any such variation without an instruction of the Engineer. Provided that no instruction shall be required for increase or decrease in the quantity of any work where such increase or decrease is not the result of an instruction given under this clause, but is the result of the quantities exceeding or being less than those stated in the Bill of Quantities.

40. Payments for Variations

40.1 Variation permitted shall not exceed +25% in quantity of each individual item, and +10% of the total contract price. Within 14 days of the date of instruction for executing varied work, extra work or substitution, and before the commencement of such work, notice shall be given either (a) by the contractor to the Employer of his intention to claim extra payment or a varied rate or price, or (b) by the Employer to the contractor of his intention to vary rate or price.

40.2 For items not existing in the Bill of Quantities or substitution to items in the Bill of Quantities, rate payable should be determined by methods given below and in the order given below:

i) Rates and prices in Contract, if applicable plus escalation as per contract.

ii) Rates and prices in the Schedule of Rates applicable to the Contract plus ruling percentage.

iii) Market rates of materials and labor, hire charges of plant and machinery used, plus 10% for overheads and profits of contractor.

40.3 For items in the Bill of Quantities but where quantities have increased beyond the variation limits, the rate payable for quantity in excess of the quantity in the Bill of Quantity plus the permissible variation should be:

i) Rates and prices in contract, if reasonable plus escalation, failing which (ii) and (iii) below will apply

ii) Rates and prices in the schedule of Rates applicable to the contract plus ruling percentage.

iii) Market rates of material and labor, hire charges of plant and machinery used plus 10% for overheads and profits of contractor.

40.4 If there is delay in the Employer and the Contractor coming to an agreement on the rate of an extra item, rates as proposed by the Employer shall be payable provisionally till such time as the rates are finally determined or till date mutually agreed.

40.5 If the Engineer or his nominee decides that the urgency of varying the

work prevent a quotation being given and considers not delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

41. Cash flow forecasts

41.1 When the Program is updated, the contractor is to provide the Engineer or his nominee with an updated cash flow forecast.

42. Payment Certificates

42.1 The Contractor shall submit to the Engineer or his nominee monthly statements of the estimated value of the work completed less the cumulative amount certified previously.

42.2 The Engineer or his nominee shall check the Contractors' monthly statement within 14 days and certify the amount to be paid to the Contractor after taking into account any credit or debit for the month in question in respect of materials for the works in the relevant amounts and under conditions set forth in sub-clause 51.6 of the Contract Data (Secured Advance).

42.3 The value of work executed shall be determined by the Engineer or his nominee.

42.4 The value of work executed shall comprise the value of the quantities of the items in the Bill of quantities completed.

42.5 The value of work executed shall include the valuation of variations and Compensation Events.

42.6 The Engineer or his nominee may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

43. Payments

43.1 The bills for other Construction/Renovation/Miscellaneous works which are not paid on monthly basis the Contractor has to submit the bill within 7 days of joint measurement taken along with the concerned Engineer. The Engineer has to ensure that joint measurement to be completed within 7 days of completing of part work / running work. The concerned Engineer i/c shall check and make entries into bill/M.B within 10 days of submission of the interim bill and submit to Executive Engineer/ Superintending Engineer (Civil). The Executive Engineer/ Superintending Engineer (Civil) shall check the bills and after certification of the quantities as per manual shall forward to the Finance Department within 3 working days. The Contractor and Assistant Engineer both jointly complete the measurements, if Contractor due to any reason does not attend/avoid joint survey/measurements the Executive Engineer shall give notice to the contractor to be present at the site for joint measurement within 7 days notice. If the contractor fails to attend the joint measurement second notice shall be issued to the contractor to attend the joint measurement within 3 days failure to attend the site for joint measurement the Assistant Engineer and AEE or EE would record the reason and complete the measurements in a transparent manner departmentally and submit the bill.

Bills / Tax invoice shall be prepared and submitted by the Contractor. Joint measurements shall be taken continuously and need not be connected with billing stage. System of 4 copies of measurements, one each for Contractor, Employer and Engineer or his nominee, and signed by both Contractor and Employer shall be followed.

43.2 Interim of bill amount will be paid within 14 days of submission of the bill.

43.3 Contractor shall submit final Bill within 60 days from the date of completion of work and the same will be paid by the Port within 30 days from the date of submission

43.4 The payment will be made to the contractor after deducting any dues payable to the Port statutory authorities etc

43.5 If an amount certified is increased in a later certificate as a result of an award by the DRB or an Arbitrator, the Contractor shall be paid interest upon the delayed payment as set out in this clause. Interest shall be calculated from the date upon which the increased amount would have been certified in the absence of dispute.

43.6 Items of the Works for which no rate or price has been entered in will not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

44. Compensation Events

44.1 The following mutually agreed Compensation Events unless they are caused by the Contractor would be applicable:

(a) The Employer does not give access to a part of the Site by the Site Possession Date stated in the Contract Data.

(b) The Employer modifies the schedule of other contractors in a way which affects the work of the contractor under the contract.

(c) The Engineer or his nominee orders a delay or does not issue drawings, specifications or instructions required for execution of works on time.

(d) The Engineer or his nominee instructs the Contractor to uncover or to carry out additional tests upon work which is then found to have no Defects.

(e) The Engineer or his nominee unreasonably does not approve for a subcontract to be let.

(f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of Letter of Acceptance from the information issued to Bidders (including the Site Investigation Reports), from information available publicly and form a visual inspection of the site.

(g) The Engineer or his nominee gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.

(h) Other contractors, public authorities, utilities or the Employer does not work within the dates and other constraints stated in the Contract that cause delay or extra cost to the Contractor.

(i) The effect on the Contractor of any of the Employer's Risks.

(j) Other Compensation Events listed in the Contract Data or mentioned in the contract.

Whenever any compensation event occurs, the contractor will notify the employer, within 14 days and provide a forecast cost of the compensation event.

44.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date shall be extended. The Engineer or his nominee shall decide whether and by how much he Contract Price shall be increased and whether and by how much the Intended

Completion Date shall be extended.

44.3 As soon as information demonstrating the effect of each Compensation Event upon the Contractor's forecast has been provided by the Contractor, it is to be assessed by the Engineer or his nominee and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable the Engineer or his nominee shall adjust the Contract Price based on Engineer or his nominee's own forecast. The Engineer or his nominee will assume that the Contractor will react competently and promptly to the event.

45. Tax

45.1 The rates quoted by the Contractor to be inclusive of taxes if any excluding GST that the Contractor will have to pay for the performance of this Contract. The Employer will perform such duties in regard to the deduction of such taxes at sources as per applicable law. Any new Taxes, levies, duties imposed after signing the Contract shall be reimbursed by the employer on production of documentary evidence. The GST shall be quoted separately in tax invoice. The contractor shall file the applicable returns with tax department in time and submit the same as documentary evidence.

46. Currencies

46.1 All payments shall be made in Indian Rupees unless specifically mentioned.

47. Price Adjustment. (Not Applicable)

48. Retention

48.1 The Employer shall retain from each payment due to the Contractor the proportion stated in the Contract Data until Completion of the whole of the Works.

48.2 Retention Money shall be deducted at the rate of 10% of the toatal tax invoice, from first Running Bill onwards subject to a max of 5% plus of the contract price including GST. Retention money shall be refunded after completion of defect liability period along with performance security.

49. Liquidated Damages

49A In case of delay in completion of the contract, liquidated damages (L.D) may be levied at the rate of half per cent (½%) of the contract price per week of delay, or part thereof subject to a maximum of 10 per cent of the contract price.

49A(i)The Employer, if satisfied, that the works can be completed by the contractor within a reasonable time after the specified time for completion, may allow further extension of time at its discretion with or without the levy of L.D. In

the event of extension granted being with L.D, the Employer will be entitled without prejudice to any other right or remedy available in that behalf, to recover from the contractor as agreed damages equivalent to half per cent (½%) of the contract value of the works including GST for each week or part of the week subject to the ceiling defined in sub-Clause 49 A.

In the event of forfeiting the LD / EMD / SD performance guarantee and while imposing penalty GST at applicable rate is applicable.

49A(ii) The Employer, if not satisfied that the works can be completed by the contractor, and in the event of failure on the part of the contractor to complete work within further extension of time allowed as aforesaid, shall be entitled, without prejudice to any other right, or remedy available in that behalf, to rescind the contract.

49A(iii)The Employer, if not satisfied with the progress of the contract and in the event of failure of the contractor to recoup the delays in the mutually agreed time frame, shall be entitled to terminate the contract.

49A(iv) In the event of such termination of the contract as described in clauses 49A(ii) or 49A(iii) or both the Employer shall be entitled to recover L.D. up to ten per cent (10%) of the contract value and forfeit the security deposit made by the contractor besides getting the work completed by other means at the risk and cost of the contractor.

49A(v) In case Part / portions of the work can be commissioned and the Port operates the portion for commercial purposes, the rate of LD will be restricted to the uncompleted value of work, the maximum LD being on the entire contract value.

50. Nominated Subcontractors

All specialists, merchants, tradesmen and others executing any work or supplying any good, materials, Plant or services for which provisional Sums are included in the Contract, who may have been or be nominated or selected or approved by the Employer or the Engineer, and all persons to whom by virtue of the provisions of the Contract, the Contractor is required to subcontract shall, in the execution of such work or the supply of such goods, materials, Plant or services, be deemed to be subcontractors to the Contractor and are referred to in this Contract as “Nominated Subcontractors”.

51. Advance payment (Not Applicable)

The Employer shall make the following advance payments:

51.1 Mobilization Advance shall be paid up to 10% of Contract price, payable in two equal installments. The first installment shall be paid after mobilization has started and next installment shall be paid after satisfactory utilization of earlier advance.

51.2 Construction / installation equipment Advance shall be paid up to 5% of Contract price, limited to 90% of assessed cost of machinery.

51.3 Mobilization Advance and Construction Equipment Advance shall be paid at SBI PLR + 2% p.a. (as on date of payment) interest rate at the discretion of the employer and against Bank Guarantee for Mobilization Advance and against hypothecation of Construction Equipment to the Employer.

51.4 Equipment advance will be paid in two or more installments. First installment shall be paid after Construction Equipment has arrived at the site and next installment shall be paid after satisfactory utilization of earlier advance (s).

51.5 Recovery of Mobilization and Construction Equipment advance will start when 15% of the work is executed and recovery of total advance should be completed by the time 80% of the original Contract work is executed.

51.6 Secured Advance: The Engineer or his nominee shall make advance payment in respect of materials and plant brought to site but not yet incorporated and installed in the Works in accordance with conditions stipulated in the Contract Data.

75% of cost of materials and plant brought to site for incorporation into the works only shall be paid as Secured Advance. Materials which are of perishable nature should be adequately insured.

52. Securities

52.1 Security deposit shall consist of two parts

a) Performance security to be submitted at award of the work

b) Retention Money to be recovered from Running Bills.

52.2 The Security deposit at 10% of the contract amount including GST, of which 5% of contract price should be submitted as Performance Security within 21 days of receipt of letter of acceptance and balance 5% recovered as retention money from running bills. Recovery of 5% of retention money shall commence from the first RA bill onwards @ 10% for each bill. Retention money shall be refunded after completion of defect liability period. The performance Bank Guarantee will be released after completion of defect liability period.

53. Removal of Craft or Plant Which Has Sunk (NA)

The Contractor shall forthwith and with dispatch at his own cost raise and remove any craft or plant (floating or otherwise) belonging to him or to any sub-contractor employed by him (including also any plant which is held by the Contractor or any sub-contractor under agreement for hire or hire-purchase) which may be sunk in the course of the construction completion or maintenance of the Works or otherwise deal with the same as the Engineer may direct or until the same shall be raised and removed, the contractor shall set al such buoys and display at night such lights and do all such things for the safety of navigation as may be required by the Engineer or by Employer. In the event of the Contractor not carrying out his obligation imposed upon him by this clause the Employer may provide buoy and light such sunken craft or plant and raise and remove the same (without prejudice to the right of the Employer to hold the Contractor liable under General Conditions) and the Contractor shall refund to the Employer all costs incurred in connection therewith.

Contractor's Temporary Moorings

Should the Contractor need, in connection with implementing the Works, to provide temporary moorings for his craft he may be allowed to do so in location and manner approved by the Engineer subject to all necessary permissions being first obtained by the Contractor from the authorities concerned. The Contractor shall not lay his temporary moorings such as to interfere with the port traffic and such moorings shall be removed if and when required by the Employer.

54. Cost of Repairs

54.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction period shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

E. FINISHING THE CONTRACT

55. Completion

After completion of the work, the contractor will serve a written notice to the Engineer or his nominee/Employer to this effect. The Engineer or his nominee/Employer upon receipt of this notice shall conduct a complete joint survey of the work within 7 days and prepare a defects list jointly. The defects pointed out by the Engineer or his nominee/Employer would be rectified by the contractor within 14 days and thereafter acceptance report be signed jointly by

the contractor and the Employer. This joint acceptance report shall be treated as 'Completion Certificate'.

Substantial Completion of Parts

If any part of the Permanent Works has been substantially completed and satisfactorily passed any Tests on Completion prescribed by the Contract, the Engineer may issue a Taking-Over Certificate in respect of that part of the Permanent works before completion of the whole of the Works and, upon the issue of such Certificate, the Contractor shall be deemed to have undertaken to complete with due expedition any outstanding work in that part of the Permanent Works during the Defects Liability Period.

Surfaces Requiring Reinstatement

Provided that a Taking-Over Certificate given in respect of any Section or part of the Permanent Works before completion of the whole of the Works shall not be deemed to certify completion of any ground or surfaces requiring reinstatement, unless such Taking-Over Certificate shall expressly so state.

56. Taking Over

The Employer shall take over the Site and the Works within seven days of the Engineer or his nominee issuing a certificate of Completion.

Taking-Over Certificate

When the whole of the Works have been substantially completed and have satisfactorily passed any Tests on Completion prescribed by the Contract, the Contractor may give a notice to that effect to the Engineer, with a copy to the Employer, accompanied by a written undertaking to finish with due expedition any outstanding work during the Defects Liability Period. Such notice and undertaking shall be deemed to be a request by the Contractor for the Engineer to issue a Taking- over Certificate in respect of the Works. The Engineer shall, within 21 days of the date of delivery of such notice, either issue to the Contractor, with a copy to the Employer, a Taking- Over Certificate, stating the date on which, in his opinion, the Works were substantially completed in accordance with the Contract, or give instruction in writing to the Contractor specifying all the work which in the Engineer's opinion, is required to be done by the Contractor before the issue of such Certificate. The Engineer shall also notify the Contractor of any defects in the Works affecting substantial completion that may appear after such instructions and before completion of the Works specified therein. The Contractor shall be entitled to receive such Taking-Over Certificate within 21 days of completion, to the satisfaction of the

Engineer, of the Works so specified and remedying any defects so notified.

Taking Over of Sections or Parts

Similarly, in accordance with the procedure set out in above Clause, the Contractor may request and the Engineer shall issue a Taking-Over Certificate in respect of:

any Section in respect of which a separate Time for Completion is provided in the appendix to Tender, or

any substantial part of the Permanent Works which has been both completed to the satisfaction of the Engineer and, otherwise than as provided for in the Contract, occupied or used by the Employer, or

Any part of the Permanent Works which the Employer has elected to occupy or use prior to completion (where such prior occupation or use is not provided for in the Contract or has not been agreed by the Contractor as a temporary measure).

57. Final Account

The Contractor shall supply to the Engineer or his nominee a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Engineer or his nominee shall issue a Defects Liability Certificate and certify any final payment that is due to the Contractor within 60 days of receiving the Contractor's account if it is correct and complete. If it is not, the Engineer or his nominee shall issue within 15 days a schedule that states the scope of the corrections or additions that are necessary for the correction and certify payment of 50% of the undisputed amount to the contractor. If the Final Account is still unsatisfactory after it has been resubmitted the Engineer or his nominee shall decide on the amount payable to the Contractor and issue a payment certificate, within 60 days of receiving the Contractor's revised account.

58. Submission of 'As built Drawings' (NA)

"As built" Drawings are required to be submitted by the Contractor and shall be supplied by them by the dates stated in the Contract Data. If the Contractor does not supply the Drawings and/or manuals by the dates stated in the Contract Data, or they do not receive the Engineer or his nominee's approval, the Engineer or his nominee shall withhold the amount stated in the Contract Data from payments due to the Contractor.

59. Termination

59.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

59.2 Fundamental breaches of Contract include, but shall not be limited to the following:

(a) The Delay in signing of contract agreement beyond prescribed time limit.

(b) The Contractor stops work for 28 days when no stoppage of work is shown on the current Program and the stoppage has not been authorised by the Engineer or his nominee.

(c) the Engineer or his nominee instructs the Contractor to delay the progress of the Works and the instruction is not withdrawn within 28 days.

(d) the Employer or the Contractor becomes bankrupt or goes into liquidation other than for a reconstruction restructure or amalgamation.

(e) a payment certified by the Engineer or his nominee is not paid by the Employer to the Contractor within 50 days of the date of the Engineer or his Nominee's certificate:

(f) The Engineer or his nominee gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Engineer or his nominee.

(g) The Contractor does not maintain a security which is required.

(h) the Contractor has delayed the completion of works by the number days for Which the maximum amount of liquidated damages can be paid as defined in The Contract data and

(i) if the Contractor, in the judgment of the Employer has engaged in corrupt or Fraudulent practices in competing for or in the executing the Contract.

For the purpose of this paragraph: "corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution. "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Employer, and includes collusive practice. Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition."

59.3 When either party to the Contract gives notice of a breach of contract to the Engineer or his nominee for a cause other than those listed under Sub Clause

59.2 above, the Engineer or his nominee shall decide whether the breach is fundamental or not.

59.4 Notwithstanding the above, the Employer may terminate the Contract for convenience subject to payment of compensation to the contractor including loss of profit on uncompleted works. Loss of profit shall be calculated on the same basis as adopted for calculation of extra/additional items.

59.5 If the Contract is terminated the Contractor shall stop work immediately, make the Site safe and secure and leave the Site as soon as reasonably possible.

60. Payment upon Termination

60.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Engineer or his nominee shall issue a certificate for the value of the work done less advance payments received up to the date of the issue of the certificate, less other recoveries due in terms of the contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the work not completed as indicated in the Contract Data. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer.

60.2 If the Contract is terminated at the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Engineer or his nominee shall issue a certificate for the value of the work done, the reasonable cost of removal of Equipment repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works and loss of profit on uncompleted works less advance payments received up to the date of the certificate, less other recoveries due in terms of the contract and less taxes due to be deducted at source as per applicable law.

61. Property

All materials on the Site, Plant, Equipment, Temporary Works and Works for which payment has been made to the contractor by the Employer, are deemed to be the property of the Employer, if the Contract is terminated because of a Contractor's default.

62. Release from Performance

If the Contract is frustrated by the outbreak of war or by other event entirely outside the control of either the Employer or the Contractor, the Engineer or his nominee shall certify that the Contract has been frustrated. The Contractor

shall leave the Site and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which commitment was made.

F. SPECIAL CONDITIONS OF CONTRACT

The conditions of contract shall be the general conditions of contract in Section-III (v) as modified or added by the following condition of special conditions as provided in Section – III(vi) herein, which shall be read and construed with the general condition in Section – 3 A to E as if they were incorporated therein. In so far as any of the condition of the special conditions may conflict or be in consisting with any of general conditions of in Section -3F- Special condition of the contract shall prevail.

63. Labour

The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport.

The Contractor shall, if required by the Engineer or his nominee, deliver to the Engineer or his nominee a return in detail, in such form and at such intervals as the Engineer or his nominee may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such other information as the Engineer or his nominee may require.

64. Compliance with labour regulations

During continuance of the contract, the Contractor and his sub contractors shall abide at all times by all existing labour enactment and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour law (including rules) regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or Central Government or the local authority. Salient features of some of the major labour laws that are applicable to construction industry are given below. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Employer is caused to pay or reimburse such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/bye laws/Acts/Rules/regulations including

amendments, if any, on the part of the Contractor the Engineer or his nominee/Employer shall have the right to deduct any money due to the Contractor including his amount of performance security. The Employer / Engineer or his nominee shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.

The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

65. Safety, Security and Protection of the Environment.

Subject and without prejudice to any other provision of the Contract, the Contractor shall take all reasonable precautions:

(a) In connection with underground water resources (including percolating water) to prevent

(b) Any interference with the supply to or abstraction from such sources
Pollution of the water so as to affect adversely the quality thereof.

(c) All works shall be carried out without unreasonable noise and disturbance. The Contractor shall indemnify the Employer from and against any liability for damages on account of noise or other disturbance created while or in carrying out the work and from and against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in regard or in relation to such liability.

(d) The Contractor at his own cost shall make such provisions for lighting of Works, Temporary Works, Materials and Plant and shall provide all such marks and lights as may be required by the Employer or the Engineer or any other authority having jurisdiction over the Site together with all labour stores and services required for their efficient working and use at any time, day or night.

(e) The Contractor shall also provide at his own cost every description of watching and maintenance required in connection with the foregoing, and all other services for protecting and securing all places dangerous whether to Contractor's workmen or to other persons until the Works are handed over to the Employer, or till such time when the Engineer decides that such services are no longer required.

All lights provided by the Contractor shall be placed or screened such as not to interfere with any navigation lights or with any traffic or signal lights of any local or other authority.

66. Insurance of Works and Contractor’s Equipment

The Insurance shall be issued by Nationalized Insurance Company from its Mangalore Branch which has been determined by the Contractor to be

acceptable to the Employer.

The contractor shall at his own costs and expenses obtain and shall cause any subcontractor to obtain such insurance as may be necessary to cover the liability of the contractor or as the case may be of such subcontractor in respect of personal injuries and death arising out of or in the course of or caused during the execution of the works for a minimum amount of Rs. 25 lakhs and shall produce or cause any such subcontractor to produce for inspection the relevant policy or policies together with receipt for the premium paid under such policy/policies as and when required by the Employer.

i. The Employer (NMPA) shall not be liable for any accident, damage or compensation payable to any workman or other person in the employment of the Contractor or any Subcontractor.

ii. Employer Liability Insurance: The Contractor shall indemnify and keep indemnified the Employer i.e. NMPA against all damages or compensation payable at Law in respect of or in consequence of any accident or injury to any workman or other person in the employment of the Contractor or Sub-Contractor against all claims, demands, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto and the Employer shall be at liberty to deduct or adjust from the Contactor's bills an amount that Employer may be called upon to pay towards claims, demands, proceedings, costs, charges and expenses Whatsoever in respect of or in relation to any accident or injury referred to above without any reference to the Contractor.

iii. The Contractor shall comply with all the Central State and Municipal Laws and Rules and shall be solely responsible for complying with the provisions of the Contract Labour (Regulations & Abolition) Act, 1970 & the contract labour (Regulation & Abolition) Karnataka Rules 1974 and rules there under and the enactments that may be applicable including ESI Act, the payment of wages act, Provident Fund Act, the Minimum Wages Act, the Factory's Act. The Workmen Compensation Act or any other applicable legislation and the Municipal by-laws or other statutory Rules and Regulations whatsoever in force if these are applicable. Any obligations finding or otherwise missed under any statutory enactments, rules & regulations there under shall be the responsibility of the Contractor and the NMPA will take no responsibility for the same. The Contractor should take Workmen's Compensation Policy for his Workers, who are not covered under ESI and submit the same to the EIC immediately after commencement of the work.

iv. The Contractor is liable to pay all Statutory Compensation to the Labourers/persons engaged by him for the satisfactory execution of the works. If any claim is made against

New Mangalore Port Authority on this work, the Port Authority shall have the right to deduct the same from the bill amount payable to the contractor after verification of the validity and if admissible as per rules.

v. PERSONAL PROTECTIVE EQUIPMENTS The Contractor shall ensure the use of PPE such as helmets, safety shoes, nose masks, hand gloves, Safety Harness or any other equipment as required depending on nature of work by his staff at site.

67. War Risks Insurance

If the Contractor receives instructions from the Employer to insure against war risks, such insurance if normally available shall be effected, at the cost of the Employer, with the Insurance Company acceptable to the Employer and shall be in the joint names of the Employer and the Contractor.

68. Royalty

Except where otherwise stated, the contractor shall pay to the authority all tonnage and other royalties, rent and other payments or compensation if any, for getting stone, sand, gravel, clay or other materials by him and his subordinates and his subcontractors and required for the works, at the rates and such conditions as notified by the State Government. The applicable rates for royalty is enclosed as Schedule-A in Volume –III. The contractor should submit the Mineral Dispatch Permit (MDP) in original for the quantity executed by the contractor for the requisite quantity of material incorporated in works for which MDP is issued by the authorized supplier. If contractor fails to submit the MDP in original the amount equal to 5 times the royalty charges shall be deducted from the contractor's bills as per prevailing orders issued by the Authority.

69. Transport of Contractor's Equipment or Temporary Works

If it is found necessary for the Contractor to move one or more loads of heavy constructional plant or equipment materials or pre-constructed units or parts of units of work over roads, highways or bridges on which such oversized and over weight items are not normally allowed to be moved, the Contractor shall obtain prior permission from the concerned authorities. Payments for complying with the requirements, if any, for protection of or strengthening of the roads, highways or bridges shall be deemed to be included in his contract price.

70. Transport of Materials or Plant

The contractor shall save harmless and indemnify the Employer in respect of all claims, proceedings, damages, costs, charges and expenses whatsoever

arising out of or in relation to any claim made by the concerned authorities in respect of damage or injury to roads, highways or bridges. In case of failure of the Contractor to settle such claims and in case the Employer is held responsible for payment to the authorities, then the Employer shall settle the claim and the Employer's expenses in this regard, as certified by the Engineer, may be deducted by the Employer from any money due or to become due to the Contractor and the Engineer shall notify the Contractor accordingly with a copy to the Employer.

71. Labor Laws & Regulations

The Contractor shall at all times during the continuance of the Contract comply fully with all existing Acts, regulations and bye-laws including all statutory amendments and re-enactment of State or Central Govt. and other local authorities and any other enactments and act that may be passed in future either by the State or the Central Govt. or local authority, including Indian Workmen's Compensation Act, Contract Labour (Regulation And Abolition) Act 1970 and Equal Remuneration Act 1976, Employees' State Insurance Act, 1948, Factories Act, Minimum Wages Act, Provident Fund Regulations. Employees' Provident Fund Act and schemes made under the same Act, Health and Sanitary Arrangements for Workmen, Insurance and other benefits and shall keep the Employer indemnified in case any action is commenced for contravention by the Contractor. If the Employer is caused to pay or reimburse any amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated here-forth on the part of the Contractor, the Engineer shall have the right to recover from the Contractor any sum required estimated to be required for making good the loss or damage suffered by the Employer. The Tenderers must have valid ESI and PF registration and shall maintain the records prescribed under ESI Regulations and PF Act & make the contribution towards ESI and PF in respect of persons employed by the Contractor. The contractor shall make available such records for inspection by ESI and PF authorities during inspection and furnish the copies of such records to the employer regularly. The EPF and ESI contribution on the part of the employer in respect of this contract shall be paid by the contractor. These contributions on the part of Employer paid by the contractor shall be reimbursed by the Engineer –in –charge to the contractor on actual basis. The minimum wages applicable for Mangalore City is enclosed as Schedule – B in Volume – III.

71.1. Accident Prevention / Safety Officer

The Contractor shall have on his staff on site an officer dealing with all matters regarding safety and protection against, accidents of all staff and labour. This officer shall be qualified for this work and shall have the authority to issue instructions and shall take protective measures to prevent accidents.

71.2 Disorderly Conduct

The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his staff and labour and for the preservation of peace and protection of Persons and property in the neighborhood of the Works from the same.

71.3 Health and Safety

Due precautions shall be taken by the Contractor, and at his own cost, to ensure the safety of his staff and labour and, in collaboration with and to the requirements of the local health authorities, to ensure that medical staff, first aid equipment and stores, sick bay and suitable ambulance services are available at the camps, housing and on the site at all times throughout the period of the Contract and that suitable arrangements are made for the prevention of epidemics and for all necessary welfare and hygiene requirements.

71.4 Supply of Water

The Contractor shall, so far as is reasonably practicable, having regard to local conditions provide on the Site, to the satisfaction of the Engineer's Representative, an adequate supply of drinking and other water for the use of the Contractor's staff and work people.

71.5 Alcoholic Liquor or Drugs

The Contractor shall not, otherwise than in accordance with the Statues, Ordinances and Government Regulations or Orders for the time being in force, import, sell, give, barter or otherwise dispose of any alcoholic liquor, or drugs or permit or suffer any such importation, sale, and gift, barter disposal by his sub-contractions agents or employees.

71.6 Arms and Ammunition

The Contractor shall not give, barter or otherwise dispose of to any persons or person, any arms or ammunition of any kind or permit or suffer the same as aforesaid.

71.7 Festivals and Religious Customs

The Contractor shall in all dealings with labour in his employment have due

regard to all recognized festivals, days of rest and religious or other customs.

71.8 Epidemics

In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as may be made by the Govt., or the local medical or sanitary authorities for the purpose of dealing with and overcoming the same.

71.9 Employment of Person in the Service of Others

The Contractor shall not recruit or attempt to recruit his staff and labour from amongst persons in the service of the Employer or other agencies engaged for any works of the Employer.

71.10 Housing for Labour

Save in so far as the Contract otherwise provides, the Contractor shall provide and maintain such accommodation and amenities as he may consider necessary for all his staff and labour employed for the purposes of or in connection with the Contract, including all fencing water supply (both for drinking and other purposes), electricity supply, sanitation, cook houses fire prevention and fire-fighting equipment, **crèche for children** of his staff and labour employed for the purposes, furniture, other requirements in connection with such accommodation or amenities. On completion of the Contract, unless otherwise agreed with the Employer, the temporary camps/housing provided by the Contractor shall be removed and the site reinstated to its original condition, all to the approval of the Engineer. The land for construction of labour camps shall be allotted outside the security area to the extent available and such area allotted for labour camps will be charged a ground rent at TAMP approved rates. The ground rent is liable for change as per the prevailing TAMP rates from time to time during the currency of the contract.

71.11 Fair Wages, Records, Inspection

The Contractor shall pay the labourers engaged by him on the work not less than a fair wage which expression shall mean whether for time or piecework the respective rates of wages as fixed by the Public Works Department as fair wages for Dakshina Kannada District payable to the different categories of labourers of those notified under the Minimum Wages Act.

The Contractor shall maintain records of Wages and other remuneration paid to his employee in such form as may be convenient and to the

requirements of the Employer/Engineer and the Labour Enforcement Officer (Central), Ministry of Labour, Govt. of India, or such other authorized person appointed by the Central Govt. The Contractor shall allow inspection of the aforesaid Wage Records and Wage Slips to the Engineer and to any of his workers or to his agent at a convenient time and place after due notice is received, or to any other person authorized by him on his behalf.

71.12 Reporting of Accidents

The Contractor shall report to the Engineer details of any accident as soon as possible after its occurrence. In the case of any fatality or serious accident, the Contractor shall, in addition, notify the local police authorities immediately by the available means.

71.13 Observance by Sub-Contractors

The Contractor shall be responsible for observance by his sub-contractors of the foregoing provisions.

71.14 Port Entry Permission

The Contractor shall submit prior application for Port entry passes to the concerned Port authority for his Materials, labors and the staffs engaged in the works. The Contractor has to get the vehicle and labor RIFD based passes for the entry inside the wharf area based on prevailing rates.

71.15 Site - Protected Area

The Site of Work is a protected area. Entry to the Port premises is regulated by entry passes. These passes will be issued by the Central Industrial Security Force or any other authority authorized by the Employer. The Contractor should furnish a list of person for whom the passes are to be issued to the Engineer and arrange to obtain the passes from the appropriate authority, based on the recommendation of the Engineer and abide by the Rules of the New Mangalore Port Authority with regard to entry etc. For the entry of trucks and other vehicles also, the Contractor should obtain necessary permits. The Contractor shall retain the original passes obtained by them in respect of their labour and staffs engaged in the Works and produce the same to the Engineer as and when called for. It should not be either destroyed or allowed to be taken by the labour/staff after its use.

72. Life Saving Appliances and First Aid

The Contractor shall provide and maintain upon the Works sufficient proper and efficient life saving appliances and first aid equipment to the approval of the Engineer. The appliances and equipment shall be available for use at all times.

73. Diving Operations(NA)

a) Any diving work shall be carried out in accordance with the Diving Operations Regulations of the Government of India.

b) Before any diving work is undertaken the Contractor shall supply the Engineer or his representative with two copies of the Code of signals to be employed and is to have a copy of such Code Prominently displayed on the craft or structure from which the operations take place

74. Bribes

If the Contractor, or any of his Subcontractors, agents or servants gives or offers to give to any person any bribe, gift, gratuity or commission as an inducement or reward for doing or forbearing to do any action in relation to the Contract or any other contract with the Employer, or for showing or forbearing to show favour or disfavor to any person in relation to the Contract or to any other contract with the Employer, then the Employer may enter upon the Site and the works and terminate the employment of the Contractor and the provisions of Clause 63 hereof shall apply as if such entry and termination had been made pursuant to that Clause.

The bidders shall give an undertaking that they have not made any payment or illegal gratification to any person/authority connected with the bid process so as to influence the bid process and have not committed any offence under the PC Act in connection with the bid.

75. Details to be Confidential

The Contractor shall treat the details of the contract as private and confidential, save insofar as may be necessary for the purposes thereof, and shall not publish or disclose the same or any particulars thereof in any trade or technical paper of elsewhere without the previous consent in writing of the employer. If any dispute arises as to the necessity of any publication or disclosure for the purpose of the Contract the same shall be referred to the decision of the Employer whose award shall be final.

76. Contractor's Temporary works, office, etc.

76.1 The Contractor shall submit to the Engineer for his approval not less

than 15 days before commencement of erection of any part of Temporary Works, drawings and detailed proposals for the method of construction of Temporary works such as office, store, false work and temporary platforms etc. which he intends to construct for the execution of the contract and no such work shall be constructed before obtaining the written approval of Chief Engineer. These temporary works, office, store etc. shall be erected at or near the work area subject to approval of the Employer and the land space for the same will be allotted free of ground rent to the extent available. The Contractor shall obtain permission for any Temporary Works and would ensure that during execution of works the statutory requirements of the concerned authorities such as New Mangalore Port Authority, Police, Customs, etc. would be complied with.

76.2 Submission of Reports, Returns, etc.

All reports, statements, returns, drawings, diagrams etc. which the Contractor is required to submit to the Engineer during the progress of the Works, shall be furnished in triplicate without any additional cost.

77. Water Supply

Water to the extent available will be supplied to the Contractor at a fixed point on the main water supply line within the Port area. The plumbing connection and extension of necessary supply pipeline to the working area shall be arranged by the Contractor at his own cost. The Contractor shall also provide a water meter at his cost for metering the quantity of water used. Charges for the consumption of the water will be paid by the Contractor to the Employer at notify rate as applicable time to time during the currency of the Contract. For non-supply of water at any stage port will not be responsible and the Contractor shall not have any claim whatever for loss or damage.

78. Power Supply

The Electricity connection for lighting, welding and other mechanical works to the extent available will be made available by the Employer within the Port area. Drawing of power lines etc. from the available point of supply of power to the actual work site either by overhead lines or underground cables shall be arranged by the contractor at his cost. The temporary lines and connections by the Contractor shall be approved by the Engineer's representative before availing power. The Contractor shall provide Trivector Meter to read consumption in units, power demand and power factor.

The Contractor shall indicate his requirement of power to the Engineer within 15 days from the date of the letter of acceptance of the tender. If the power requirement is more than 50 KW, the Contractor has to avail the power supply at 11 KV and install his own transformer of suitable capacity and work carried out as per IE Rules & Regulations as approved by the CEA. The Contractor shall pay to the Employer, the power charges as per the prevailing Tariff schedule of MESCOM in force during the work of the Contractor. At present, it is Rs.7.46 per unit consumed and demand charges @ Rs. 190.00 per KVA or part thereof per month on connected load, security deposit Rs. 4,604.00 per KVA along with departmental charges @ 23.75% of the bill amount. The Contractor shall also pay the connection and disconnection charges as applicable.

The Contractor shall ensure that the power factor of the system does not fall below 0.90 at any time and shall provide at his cost required capacity capacitors bank to maintain the Power Factor of all power loads. If the capacity of the capacitor found less than stipulated as per regulation during inspection, surcharge at Rs. 0.03 per unit will be levied. The contractor shall pay refundable Security Deposit of Rs. 4,604/- per KVA of the sanctioned load, before availing the power supply in the form of a Demand Draft drawn in favour of FA&CAO, NMPA from any Scheduled Bank.

The Contractor shall submit a complete drawing of the power points, wiring, diagram indicating all electrical loads, earthing etc. in complete shape along with the completion report. The Trivector Meter provided is calibrated either by M/s. MESCOM or NITK, Surathkal, and such a Certificate to be produced. For non-supply of power at any stage port will not be responsible and the Contractor shall not have any claim whatever for loss or damage.

79. Taxes and Duties

79.1 The Contractor shall pay Tax if any and other levies as applicable from time to time. GST at applicable rate shall be shown separate line items in the Tax invoice.

79.2 Sales / Turnover Tax on Works Contract (Deleted)

79.3 Income Tax

The Contractor and his staff shall be responsible for payment of all personal income taxes to the concerned authorities as per the law in force from time to time. Deduction of Income Tax shall be made by the Employer from each certificate of payment to the contractor at the rate of 2% plus surcharge or such

other rates as may be specified by the Central Government from time to time, on the gross amount of the Contractor's bill for payment.

79.4 Goods and Service tax

The contractor shall not include GST component in rate. The GST shall be paid to the contractor separately as applicable. The contractor shall submit running account bills indicating GST separately as applicable. The Contractor shall be responsible for the payment of GST applicable, to the GST authority. The contractor shall file the applicable returns with tax department in time and submit the same as documentary evidence.

The invoice with respect to supplies should contain following information:-

- Name of the Customer : New Mangalore Port Authority
- GSTIN of the Customer : 29AAALN0057A2ZG
- All other information as specified in GST act and GST tax invoice rules such as SAC code, Supplier address, Supplier GSTIN, IRN number QR code etc.

Noncompliance of the above result in rejection of invoice.

The Invoice should be uploaded to GST website on monthly basis with in the due date as specified by GST act. Input tax credit lost by Port due to any error, omission or non filing of return will be recovered from any amount due to the supplier Any input tax credit lost by the Port due to due to any error, omission or non filing of return will be recovered from the bills and other monies available with the Port

80. Price Adjustment (not applicable to this contract)

81. Noise and Disturbance

All works shall be carried out without unreasonable noise and disturbance. The Contractor shall indemnify the Employer from and against any liability for damages on account of noise or other disturbance created while or in carrying out the work and from and against all claims demands proceedings damages costs charges and expenses whatsoever in regard or in relation to such liability.

82. Safety Code

Necessary Indian Safety regulations for the safety purpose shall be adhered to by the contractor and he will be held responsible for any violations of the same. The set of such conditions (regulation) is available with NMPA and the contractor is required to go through it before tendering.

Besides the above, the Contractor shall also scrupulously adhere to and observe the following safety codes:

The Contractor has to provide sufficient barricades to site of work so that traffic plying nearby should not damage the recently concreted work. In case of any damage on

account of above, the entire responsibility will remain with contractor and nothing extra will be paid on this account.

Suitable and strong scaffolds should be provided for the workmen for all work that cannot be safely done from ground. No portable single ladder shall be over 8 meters in length. Hoisting machines and tackles used in the works including their attachments, and supports shall be in perfect condition as per stipulations of the relevant Rules. The ropes used for hoisting or lowering materials or as means or suspension shall be of durable quality and adequate strength and free from defects.

The excavated material shall no be placed within 1.5 meters of the edge of the trench or half of the depth of the trench, whichever is more. All trenches and excavation shall be provided with necessary fencing to lighting. Every opening in the floor of a building or in a working platform shall be provided with suitable fence to prevent the fall of persons or materials. No floor, roof or other parts of the structure shall be so overloaded with debris or materials as to render it unsafe.

Workers employed on mixing and handling materials such cement, cement mortar, concrete, lime mortar and asphalt shall be provided with protective footwear and rubber hand gloves and thin cloth for covering face and head.

Those engaged in welding work shall be provided with welder protective eye shield and glove.

All safety rules shall be strictly followed while working on live electrical systems or installations as stipulated in the relevant Rules.

83. Port Authority Rules

The Contractor shall observe the Conservancy Rules relating to the harbour and shall always take such necessary additional steps to keep the harbour waters free of noxious or unhygienic matters coming from his works as are required by the Employer. Under no circumstances shall inflammable materials be allowed to spill into the harbour waters.

The Contractor shall always observe and comply with the working rules and regulations of the Port Authority in force or as issued from time to time.

84. Execution of work

The contractor shall be required to execute the work in such a way so as not to cause any damage, hindrance or interference with port activities going on in the area or nearby. He should not also deposit the materials at such places which may cause inconvenience to the public and the work going on in the nearby area The Contractor shall have to make good all damages done by him to the structures nearby while executing the work and no extra payment shall

be made to him on that account.

All the materials required to be used in the work shall have to be got approved from the Engineer-in-Charge before stacking at the site of work.

Barricading, including proper lighting arrangement in the night at the required places shall have to be provided by the contractor at his own cost, including necessary arrangements for proper movement of traffic by carefully maintained approaches and road diversions with suitable sign boards for indications of road signs etc. as directed by the Engineer-in-Charge.

85. Customs Duty

Being Port Development Project, Customs Duty shall be applicable as per project import chapter 9801.00 read with Notification 17-2001, serial No. 38 (vi) and Notification 42-96 amended by 21-2000 of customs tariff, Government of India.

Customs Duty leviable shall be paid directly by the Contractor to the Customs Authorities, Government of India. The Employer shall reimburse this amount upon submission of documentary evidence in original for the proof of payment of such Customs Duty. The reimbursement of such amount towards Customs Duty shall be limited to the Ceiling amount quoted by the Contractor in the Bill of Quantities as above. If the Contractor incurs Customs Duty Levy less than the said Ceiling Amount, the reimbursement by the Employer shall be limited to the documented cost of Customs Duty levies actually paid to the Customs Authorities, Government of India. If the Actual Customs Duty levies paid by the Contractor exceeds the said Ceiling Amount, then the reimbursement by the Employer shall be limited to the Ceiling Amount. The reimbursement of the Customs Duty will be limited only to the Imported Materials listed in “Preamble and Bill of Quantities”, BOQ No.__. During the execution of the Works, if it necessitates for expeditious completion of the Works, Contractor may resort to import of any of the materials not listed aforesaid, with the approval of the Employer. However, the aggregate amount of Customs Duty to be reimbursed shall not exceed the lump sum amount offered in the Priced Bill of Quantities.

It shall be the responsibility of the Contractor to provide the requisite particulars and documents to the customs and other Government authorities and get the Imported Materials cleared and transported in time. The Contractor shall be fully responsible for port and Customs clearance including stevedoring, handling, unloading, loading, storage, inland transportation, if any of materials, equipments and plant to storage godowns, yards, sites etc. The contractor shall be fully responsible for any delays,

penalties charges and losses if any in this regard.

The Employer shall upon request from the Contractor along with necessary details, provide recommendatory letter(s) for Imported Materials at concession rate or Customs Duty as applicable. However, the responsibility for obtaining such concession rate of customs duty shall be that of the Contractor.

It shall be the responsibility of the Contractor to check the latest position on Customs duty levies applicable and the Employer does not accept any liability on the account. For bill of Lading, the "Consignee" for permanent materials to be incorporated into the Works will be the New Mangalore Port Authority. The Contractor will be "Notify Party". Notwithstanding the above, obtaining "Essentiality Certificate" (if any), payment of deposit (if any) towards Customs Duty, etc. shall be the responsibility of the Contractor.

The Contractor shall give an undertaking follows:

a) Being the ultimate Employer of the materials to be imported and incorporated into the works covered under the Tender _____ _____ _____ we request New Mangalore Port Authority to be consignee in the matter of permanent materials to be imported by us at our cost (covering payments of materials by letter of credit) including freight, insurances, taxes and any other charges whatsoever payable in connection with the import and its incorporation into the work.

b) We hereby confirm, in the event of New Mangalore Port Authority becoming consignee, it will not absolve us from any of the obligations, and will not alter the payment terms under the Contract No. SCB II/ 2009 dated …….. between …….. (*the Contractor*) and New Mangalore Port Authority.

c) New Mangalore Port Authority becoming a consignee is a matter of convenience and we undertake to abide by all the obligations, responsibilities etc. as if we are our self a consignee.

d) In respect of nay consequences arising out of New Mangalore Port Authority becoming the consignee we hereby unequivocally and irrevocably agree to indemnify New Mangalore Port Authority for such consequences.

e) We also undertake and confirm to obtained all permits and licenses etc. at our own cost. New Mangalore Port Authority's responsibilities in this regard will be the same as under the said contract and limited to issuing required recommendatory letters for obtaining such permits and licenses.

f) *This undertaking does not in anyway vitiate our contractual liabilities and* obligations cast upon us by Contract No. / 20XX dated …….. between ……..(*the Contractor*) and New Mangalore Port Authority.

86. Drawings & Designs

(a) General details of the works are shown on the drawings accompanying this tender document. The Engineer will supply to the Contractor from time to time during the progress of the works such further working drawings as will be necessary in his opinion for the proper and adequate execution and maintenance of the Works in accordance with the Engineer's designs and/or any modification thereof as decided by the Engineer and the Contractor shall carry out the work in accordance with the said working drawings. Two sets of such working drawings will be issued. If the Contractor requires more sets he will have to make his own arrangement at his cost. Residual Design, Detailing & Engineering: - The Engineer to the project has done the detailed design and engineering for the subject tender. During execution of the work the residual design, detailing and engineering, if needed, is to be carried out by the contractor at no extra cost to the Employer. For equipment/ Installations detailed drawings need to be produced by the contractor at no extra cost to the Employer. The contractor shall also get approved such design, detailing & engineering from the Engineer.

(b) In the event of the Contractor proposing any alteration/modification to the Engineer's design, detail, method of construction, he shall at his own expenses prepare and submit for approval of the Engineer copies in duplicate (in the first instance) of detailed working drawings which may be required for such alteration/modification and at the same time call the attention of the Engineer to any alternative detail or modification of the contract drawings which the Contractor may wish to make at least 30 days prior to the commencement of the work or part of the work to which such drawings relate. The contractor shall at the same time, if so required by the Engineer, furnish calculation sheets in duplicate relating to the strength and anticipated deflections in respect of such altered/modified works. The Engineer will, after any such alteration which he may approve, record on the copies as amended his approval and will return one copy of the drawings and calculation sheets to the contractor, who shall carryout the work in accordance therewith. The contractor shall forward to the Engineer three additional copies of the working drawings and calculation sheets as approved in additions to these working drawings and calculation sheets as approved. In addition to these working drawings are also to be submitted (the same procedure as in the ease of the contractor) in respect of any work proposed to be executed by sub-contractors. The approval of the Engineer of all

or any of the calculation sheets, drawings shall not relieve the contractor of responsibility in connection with the execution of the altered/modified or subcontractor's work.

(c) Submission of 'As built Drawings'

"As built" Drawings are required to be submitted by the Contractor and shall be supplied by them by the dates stated in the Contract Data. If the Contractor does not supply the Drawings and/or manuals by the dates stated in the Contract Data, or they do not receive the Engineer or his nominee's approval, the Engineer or his nominee shall withhold the amount stated in the Contract Data from payments due to the Contractor.

87. Monsoon Period

Monsoon period will be reckoned from 1st June to 30th September.

88. Progress Report

The following reports shall be submitted for review; as an input to the Management meeting to be held as per Clause No 31 of Conditions of Contract.

88.1 Daily reports

The contractor shall submit daily report indicating daily activities, weather condition, actual manpower, equipment and the prominent materials available and arriving to site. The contractor shall submit the daily report format to the Department for prior approval.

88.2 Monthly Reports

Monthly progress reports shall be prepared by the Contractor and submitted to the Engineer in triplicate. The first report shall cover the period up to the end of the first calendar month following the Commencement Date. Reports shall be submitted monthly thereafter, each within 7days after the last day of the period to which it relates. Reporting shall continue until the Contractor has completed all work, which is known to be outstanding at the completion date, stated in the Taking-Over Certificate for the Works.

Each report shall include:

a) Charts and detailed descriptions of progress, including each stage of design (if any), Contractor's Documents, procurement, manufacture, delivery to Site, construction, erection and testing; and including these stages for work by each Sub-Contractor,
b) Photographs in hardcopy & digital copy and videography in two sets showing the various stages of progress on the Site monthly;
c) For the supply of manufactured items, the name of the manufacturer, manufacture

location, percentage progress, and the actual or expected dates of:

i) Commencement of manufacture,

ii) Contractor's/Engineer's inspections,

iii) Tests,

iv) Shipment and arrival at the Site;

d) Copies of quality assurance documents, test results and certificates of Materials;

e) Safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations; and

f) Comparisons of actual and planned progress, with details of any events or circumstances which may jeopardize the completion In accordance with the Contract, and the measures being (or to be) adopted to overcome delays.

89. Stated Documents

To treat that the work has been completed and issue a final payment certificate, the following documents will be deemed to form the completion documents:

i) The Technical documents according to which the work was carried out.

ii) The set of construction drawings showing therein the modifications and corrections made during the course of execution signed by the Engineer.

iii) Certificates of final levels and dimensions as set out for various works.

iv) Certificates of tests performed for various works.

v) "As Built" Drawings.

90. Submission of statutory documents

The successful bidder, with in 7days from the date of work order, shall submit self-attested copy of statutory documents such PAN card, GST registration certificate, ESI registration certificate, EPF registration certificate, Labour Identification Number (LIN) and any other documents required for successful completion of work.

G. SALIENT FEATURES OF SOME MAJOR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN CONSTRUCTION WORK

(a) Workmen Compensation Act 1923:- The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

b) Payment of Gratuity Act 1972: Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years service or more on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

(c) Employees P.F and Miscellaneous Provision Act 1952: The Act Provides for monthly contributions by the employer and workers @ 13.00% and12% respectively. The benefits payable under the Act are:

(i) Pension to family pension on retirement or death, as the case may be.

(ii) Deposit linked insurance on the death in harness of the worker.

(iii) Payment of P.F accumulation on retirement/death etc.

d) Maternity Benefit Act 1951:-The Act provides for leave and some other benefits to workmen/ employees in case of confinement or miscarriage etc.

e) Contract Labour (Regulation & Abolition) Act 1970:-The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by Law. The Principal Employer is required to- take Certificate of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ 20 or more contract labor.

f) Minimum Wages Act 1948: The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment Construction of Buildings, Roads, Runways are scheduled employment.

(g) Payment of Wages Act 1936:-It lays down as to by what date the wages are to be paid when it will be paid and what deductions can be made from the wages of the workers.

(h) Equal Remuneration Act 1979:-The Act provides for payment of equal wages for work of equal nature to Male and Female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.

i) Payment of Bonus Act 1965: The Act is applicable to all establishments employing 20 or more employees. The Act provides for payments of annual bonus subject to a minimum of 8.33% of wages and maximum of 20% of wages to employees drawing

Rs.3,500/- per month or less. The bonus to be paid to employees getting Rs.2,500/- per month or above up to Rs.3,500/- per month shall be worked out by taking wages as Rs.2,500/- per month only. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act.

j) Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979: The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home upon the establishment and back,

k) The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996:-All the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified by the Government. The Employer of the establishment is required to provide safety measures at the Building or Construction work and other welfare measures, such as Canteens, First-Aid facilities. Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

v) CONTRACT DATA

Items marked “N/A” do not apply in this Contract.

Sl. No.	Description	Reference Cl. No.
1	The following documents are also part of the Contract	
	The Schedule of other contractors	(8)
	The Schedule of Key personnel	(9)
2	The above insertions should correspond to the information provided in the Invitation of Bids.	
3	The Employer is	(1)
	New Mangalore Port Authority, Panambur, Mangalore – 575010	
	Name of Authorized Representative:	
	Name : Chairman, New Mangalore Port Authority, Panambur, Mangalore – 575010	
4	The Engineer is	
	Name : Chief Engineer (C), New Mangalore Port Authority, Panambur, Mangalore- 575010	
	Name of Nominee is	
	Name : Superintending Engineer (SE(C-II)) Civil Engineering Department, NMPA, Panambur, Mangalore- 575010	
5	The name and identification number of the Contract is	
	Name of Contract:- “Construction of Security Watch Tower Near Northern Break Water at NMPA”	(1)

<table>
<tr><td>Sl. No.</td><td>Description</td><td>Reference Cl. No.</td></tr>
<tr><td></td><td>Tender no: CIVIL/CE(C)/EE(C)/35/2023-24</td><td></td></tr>
<tr><td>6</td><td>The works consist of “Construction of Security Watch Tower Near Northern Break Water at NMPA”.</td><td>(1)</td></tr>
<tr><td>7</td><td>Schedule date of commencement 7 days from the date of Issue of Letter of Acceptance.

However No work shall be commenced before signing of contract Agreement.</td><td>Conditions of contract A-General 1.Definitions

59.2(a)</td></tr>
<tr><td>8</td><td>The Contract price is the price stated in the letter of acceptance. However payment will be made as per actual work done accordance with the contract provisions.</td><td>1.Definitions</td></tr>
<tr><td>9</td><td>The Intended completion Date for the whole of the Work is 9 (Nine) Months (including monsoon) with the following milestones:</td><td>(17,27)</td></tr>
<tr><td>10</td><td>Milestone dates:
<table><tr><td>Physical works to be completed</td><td>Period from the date of commencement of work</td></tr><tr><td colspan="2">Milestones dates shall be provided to the Contractor by the Executive Engineer executing the work for completion of the work as per the scheduled date.</td></tr></table></td><td>(27)</td></tr>
<tr><td>11</td><td>The following shall form part of the Contract Document:
(1) Form of Agreement
(2) Letter of Acceptance
(3) Contractor’s Bid
(4) Contract Data
(5) Conditions of Contract including Special Conditions of Contract
(6) Specifications
(7) Drawings
(8) Bill of quantities and
(9) Any other documents listed in the Contract Data as forming part of the Contract.</td><td>(2.3)</td></tr>
</table>

Sl. No.	Description	Reference Cl. No.
	(10) Correspondence exchanged after the opening of the Bid and before the issue of Letter of Acceptance by which the Condition of Contract are amended, varied or modified in any way by mutual consent (to be enumerated).	
12	The Contractor shall submit a Program for the Works within 14 days of delivery of the letter of Acceptance.	(27)
13	The site possession date The site will be handed over immediately after issue of Letter of acceptance and the site is free from encumbrances.	(21)
14	The site is defined in drawing No. 19/64-LP	
15	The Defects Liability Period is 1 (One) year	(35) 13
16	The minimum insurance cover for physical property, injury and death is Rs.5,00,000/- (Rupees five Lakhs) per occurrence with the number of occurrences limited to four. After each occurrence, contractor will pay additional premium necessary to make insurance valid for four occurrences always.	
17	The following events shall also be Compensation Events: The Employer terminates the contract for his convenience.	(44)
18	The period between Programme updates shall be 30 days.	(27)
19	The amount to be withheld for late submission of an updated Programme shall be Rs. 25,000/-.	(27)
20	The Penalty for the delay in submission of the Performance guarantee shall be at the rate of 0.25% of the amount of performance guarantee for each week or part of the week for the number of weeks delayed beyond the stipulated date of submission.	(52.2) 34.1
21	The language of the Contract documents is English.	(3)
22	The law, which applies to the Contract, is the law of Union of India.	(3)
23	The currency of the Contract is Indian Rupees.	(46)
24	Fees and types of reimbursable expenses to be paid to the Dispute Review Board (Deleted)	(25)

Sl. No.	Description	Reference Cl. No.
	As per actuals and equally shared by both the parties. (NA)	
25	The Dispute Review Board shall be constituted after signing of the agreement on mutually agreed terms. (Appendix 1). (Deleted) (NA)	(25)
26	Price Adjustment (deleted)	(47) (80)
27	The proportion of payments retained (retention money) shall be 10% of total tax invoice value from each bill subject to a maximum of 5% of the contract price including GST as applicable.	(48)
28	The maximum amount of liquidated damages for the whole of the works is 10 % of the contract price plus taxes and duties. The half per cent (½%) per week L.D is applicable for delay period of $\frac{1}{3}$of contract period and thereafter 10% L.D is applicable.	[49]
29	Clause No. 49A (v) deleted.	
30	Advance payment is not applicable to this contract	[51]
31	Repayment of secured advance: deleted	(51.6)
32	The Securities shall be for the following minimum amounts equivalent as a percentage of the Contract Price.	(52)
33	Performance Security in the form of Bank guarantee for 5% of the contract price including GST.	(52.2)
34	The standard form of Performance Security acceptable to the Employer shall be an unconditional Bank Guarantee of the type as presented in Section III (iv) of the Bidding Documents.	Annexure-A
35	The Contractor has to submit the final claim for reimbursement of ESI and EPF contribution on the part of the employer in respect of this contract within 60 days from the date of completion of work.	(71)

vi) FORM OF SECURITIES

Acceptable forms of securities are annexed. Bidders should not complete the Performance Security form at this time. Only the successful Bidder will be required to provide Performance and Advance Payment Securities in accordance with one of the forms, or in a similar form acceptable to the Employer.

Annexure A: Performance Bank Guarantee

Annexure B: Bank Guarantee for Advance Payment

ANNEXURE - A

PERFORMANCE BANK GUARANTEE

To: _____ [name of Employer]
_____ [address of Employer]
WHEREAS_____ [name and address of Contractor] (hereinafter called "the Contractor") has undertaken, in pursuance of Contract _____ No._____ dated_____ to execute _____ _____ [name of Contract and brief description of Works] (hereinafter called "the Contract").

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of _____ [amount of guarantee]1 _____ [In words], such sum being payable in the types and proportions of currencies in which the Contract Price is payable, and we undertake to pay you, upon your first written demand, and without cavil or argument, any sum or sums within the limits of _____ [amount of guarantee]1 as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until 28 days from the date of expiry of the Defects Liability Period.

Notwithstanding anything mentioned above,

Our liability against this guarantee is restricted to Rs..... (Rupees ..... only) and unless a claim in writing is lodged with us within 3

months of the date of expiry or the extended date of expiry of this guarantee all our liabilities under this guarantee shall stand discharges.

IN WITNESS WHEREOF this guarantee has been duly executed on this ..... day of .....

Signature and seal of the guarantor _____

Name of Bank _____

Address_____Date_____

_____

1An amount shall be inserted by the Guarantor, representing the percentage of the Contract Price specified in the Contract and denominated in Indian Rupees.

Annexure B (NA)

BANK GUARANTEE FOR ADVANCE PAYMENT (NOT APPLICABLE)

To: _____ [name of Employer]

_____ [address of Employer]

_____ [name of Contract]

Gentlemen:

In accordance with the provisions of the Conditions of Contract, Sub-clause 51.1 ("Advance Payment") of the above mentioned Contract, _____[name and address of Contractor] (hereinafter called "the Contractor") shall deposit with_____[name of Employer] a bank guarantee to guarantee his proper and faithful performance under the said Clause of the Contract in an amount of

1

_____[amount of guarantee] _____[in words].

We, the_____ [bank or financial institution], as instructed by the Contractor, agree unconditionally and irrevocably to guarantee as primary obligator and not as Surety merely, the payment to_____[name of Employer] on his first demand without whatsoever right of objection on our part and without his first claim to the Contractor, in the amount not exceeding _____[amount of guarantee]1 _____[in words].

We further agree that no change or addition to or other modification of the terms of the Contract or of Works to be performed there under or of any of the Contract documents which may be made between_____[name of Employer] and the Contractor, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

The guarantee shall remain valid and in full effect from the date of the advance payment under the Contract until_____[name of Employer] receives full repayment of the same amount from the Contractor.

Notwithstanding anything mentioned above,

Our liability against this guarantee is restricted to Rs……..(Rupees ……only) and unless a claim in writing is lodged with us within 3 months of the date of expiry or the extended date of expiry of this guarantee all our liabilities

under this guarantee shall stand discharges.

IN WITNESS WHEREOF this guarantee has been duly executed on this .....day of .....

Yours truly,

Signature and seal:_____

Name of Bank / Financial Institution:_____

Address:_____

Date:_____ 1. An amount shall be inserted by the bank or financial institution representing the amount of the Advance Payment, and denominated in Indian Rupees.

Annexure – C (NA)

BANK GUARANTEE FOR RETENTION MONEY (NOT APPLICABLE)

To,

New Mangalore Port Authority,
Administrative Building,
Panambur,
Mangalore – 575 010.

1. In consideration of the Board Members of the New Mangalore Port Authority, Mangalore (hereinafter called "The Board" having agreed to refund _____ _____ (hereinafter called "the said contractor(s)") under the terms and conditions of an Agreement No._____ made between New Mangalore Port Authority and _____ (hereinafter called "the said Agreement") the retention money for the due fulfillment by the said contractor(s) of the terms and conditions contained in the said agreement on production of a bank guarantee for _____. We _____ (hereinafter referred to as "the Bank") at the request of M/s._____ do hereby undertake to pay the Board an amount not exceeding _____ on demand.

2. We _____ do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Board stating that the amount claimed is required to meet the recoveries due or likely to be due from the said Contractor(s). Any such demand made on the bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs._____
3. We _____ undertake to pay the Board any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any Court or Tribunal relating there to, our liability under this present being absolute and unequivocal.

   The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the Contractor(s) shall have no claim against us for making such payment.
4. We _____ further agree that the guarantee herein contained shall

remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Board under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till Engineer-in-charge on behalf of the Board certifies that the terms and conditions of the said Agreement have been fully and properly carried out by the said Contractor(s) and accordingly discharges this guarantee.

5. We _____ further agree with the Board that Board shall have the fullest liberty without our consent and without affecting in any manner our obligations here under to vary any of the terms and conditions of the said agreement or to extend time of performance by the said Contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Board against the said Contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor(s) or for any forbearance act or omission on the part of the Board or any indulgence by the Board to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision, have effect so relieving us.

6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

7. We _____ lastly undertake not to revoke this guarantee except with the previous consent of the Board in writing.

8. This guarantee shall be valid up to _____ unless extended on demand by Board Notwithstanding anything mentioned above, our liability against this guarantee is restricted to Rs._____ and unless a claim in writing is lodged with us within three months of the date of expiry or such extended date of expiry of this guarantee all our liabilities under this guarantee shall stand discharged.

   Notwithstanding anything contained herein.

1. Our liability under this Bank Guarantee restricted to a sum of Rs._____

_____Only).

2. This bank guarantee shall be valid up to _____We are liable to pay the guaranteed amount or any part thereof under this bank guarantee only and only if you serve upon us a written claim or demand on or before _____.

APPENDIX 1TO GENERAL CONDITIONS OF CONTRACT (NA)

DISPUTES REVIEW BOARD AGREEMENT (NOT APPLICABLE)

THIS AGREEMENT, made and entered into this ..... Day of.....20..... Between ..... ("the Employer") and..... ..... ("the Contractor"),and the Disputes Review Board ("the Board") consisting of One / three Board Members,

(1) .....

(2) .....

(3).....

[Note: Delete whatever is not applicable]

WITNESSETH, that

WHEREAS, the Employer and the Contractor have contracted for the construction of the ....

(Project name) .....

(the "Contract") and WHEREAS, the contract provides for the establishment and operation of the Board NOW THEREFORE, the parties hereto agree as follows :

1. The parties agree to the establishment and operation of the Board in accordance with this Board Agreement.
2. Except for providing the services required hereunder, the Board Members should not give any advice to either party or to the Engineer or his nominee concerning conduct of the Works.

The Board Members:

a. shall have no financial interest in any party to the contract or the Engineer or his nominee, or a financial interest in the contract, except for payment for services on the Board.
b. shall have had no previous employment by, or financial ties to, any party to the contract, or the Engineer or his nominee, except for fee based consulting services on other projects, all of which must be disclosed prior to appointment to the Board.
c. shall have disclosed in writing to the parties prior to signature of this Agreement any and all recent or close professional or personal or personal relationships with any director, officer, or employee of any party to the contract, or the Engineer or his nominee, and any and all prior involvement in the project to which the contract relates;

d. shall not, while a Board Member, be employed whether as a consultant or otherwise by either party to the contract, or the Engineer or his nominee, except as a Board Member.

e. shall not, while a Board Member, engage in discussion or make any agreement with any party to the contract, or with the Engineer or his nominee, regarding employment whether as a consultant or otherwise either after the contract is completed or after services as a Board Member is completed;

f. shall be and remain impartial and independent of the parties and shall disclose in writing to the Employer, the Contractor, the Engineer or his nominee, and one another any fact or circumstances which might be such to cause either the Employer or the Contractor to question the continued existence of the impartiality and independence required of Board Members.

3. Except for its participation in the Board's activities as provided in the contract and in this Agreement none of the Employer, the Contractor, the Engineer or his nominee, and one another any fact or circumstances which might be such to cause either the Employer or the Contractor to question the continued existence of the impartiality and independence required of Board Members.
4. The Contractor shall :
   a) furnish to each Board Members one copy of all documents which the Board may request including contract documents, progress reports, variation orders, and other documents, pertinent to the performance of the Contract.
   b) in co-operation with the Employer, co-ordinate the Site visits of the Board, including conference facilities, and secretarial and copying services.
5. The Board shall serve throughout the operation of the contract. It shall begin operation following execution of this Agreement, and shall terminate its activities after issuance of the taking over Certificate and the Board's issuance of its Recommendations on all disputes referred to it.
6. Board Member shall not assign or subcontract any of their work under this Agreement.
7. The Board Members are independent and not employees or agents of either the Employer or the Contractor.
8. The Board Members are absolved of any personal or professional liability arising from

the activities and the Recommendations of the Board.

9. Fees and expenses of the Board Member[s] shall be agreed to and shared equally by the Employer and the Contractor. If the Board requires special services, such as accounting, data research, and the like, both parties must agree and the costs shall be shared by them as mutually agreed.

10. Board Site visits :

a. The Board shall visit the Site and meet with representatives of the Employer and the Contractor and the Engineer or his nominee at regular intervals, at times of critical construction events, and at the written request of either party. The timing of Site failing agreement shall be fixed by the Board.

b. Site meetings shall consist of an informal discussion of the status of the construction of the works followed by an inspection of the works, both attended by personnel from the Employer, the Contractor and the Engineer or his nominee.

c. If requested by either party or the Board, the Employer will prepare minutes of the meetings and circulate them for comments of the parties and the Engineer or his nominee.

11. Procedure for disputes referred to the Board:

a. If either party objects to any action or inaction of the other party or the Engineer or his nominee, the objecting party may file a written Notice of Dispute to the other party with a copy to the Engineer or his nominee stating that it is given pursuant to Clause 65 and stating clearly and in detail the basis of the dispute.

b. The party receiving the Notice of Dispute will consider it and respond in writing within 7 days after receipt.

c. This response shall be final and conclusive on the subject, unless a written appeal to the response is filed with the responding party within 7 days of receiving the response. Both parties are encouraged to pursue the matter further to attempt to settle the dispute. When it appears that the dispute cannot be resolved without the assistance of the Board either party may refer the dispute to the Board by written Request for Recommendation to the Board, the other party and the Engineer or his nominee stating that it is made pursuant to Clause 65.

d. The Request for recommendation shall state clearly and in full detail the specific issues of the dispute to be considered by the Board.

e. When a dispute is referred to the Board, and the Board is satisfied that the dispute requires the Board's assistance, the Board shall decide when to conduct a hearing on the dispute. The Board may request that written documentation and arguments from both parties be submitted to each Board Members before the hearing begins.

The parties shall submit insofar as possible agreed statements of the relevant facts.

f. During the hearing, the Contractor, the Employer, and the Engineer or his nominee shall each have ample opportunity to be heard and to offer evidence. The Board's Recommendations for resolution of the dispute will be given in writing, to the Employer, the Contractor and the Engineer or his nominee as soon as possible, and in any event not more than 28 days after the Board's final hearing on the dispute.

12. Conduct of Hearings :

a. Normally hearing will be conducted at the Site, but any location that would be more convenient and still provide all required facilities and access to necessary documentation may be utilised by the Board. Private sessions of the Board may be held at any location convenient to the Board.

b. The Employer, the Engineer or his nominee and the Contractor shall have representatives at all hearings.

c. During the hearings, no Board Member shall express any opinion concerning the merit of any facet of the case.

d. After the hearing are concluded, the Board shall meet privately to formulate its Recommendations. All Board deliberations shall be conducted in private, with all individual views kept strictly confidential. The Board's Recommendations, together with an explanation of its reasoning shall be submitted in writing to both parties and to the Engineer or his nominee. The Recommendations shall be based on the pertinent contract provisions, applicable laws and regulations, and the facts and circumstances involved in the dispute.

e. The Board shall make every effort to reach a unanimous Recommendation. If this proves impossible, the majority shall decide, and the dissenting member any prepare a written minority report for submission to both parties.

[Note : Delete if it is one member Board]

13. If during the contract period, the Employer and the Contractor are of the opinion that the Dispute Review Board is not performing its functions properly; the Employer and the Contractor may together disband the Disputes Review Board. In such an event, the disputes shall referred to Arbitration straightaway.

The Employer and the Contractor shall jointly sign a notice specifying that the Board shall stand disbanded with effect from the date specified in the notice. The notice shall be posted by a registered letter with AD or delivery of the letter, even if he refuses to do so.

NEW MANGALORE PORT AUTHORITY
PANAMBUR, MANGALORE

"CONSTRUCTION OF SECURITY WATCH TOWER NEAR NORTHERN BREAK WATER AT NMPA"

TENDER DOCUMENT
VOLUME - II

NEW MANGALORE PORT AUTHORITY

CIVIL ENGINEERING DEPARTMENT

Tender no: CIVIL/Dy CE(C)/EE(C)/35/2023-24

Tender for

"Construction of Security Watch Tower Near Northern Break Water at NMPA"

Volume I	Section I	i) Notice Inviting Tenders i) Instructions to Tenderers ii) Annexure (1 to 13)
	Section II	i) Form of Agreement
	Section III	i) Conditions of Contract: Part A - E: General Conditions ii) Conditions of Contract : Part F: Special Conditions iii) Contract Data iv) Form of Securities (A & B) v) Appendix – I and Appendix - II
Volume II	Section IV	i) Technical Specifications
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	Section VII	i) Schedules (A & B)

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SECTION IV

TECHNICAL SPECIFICATIONS

A. GENERAL

1. INTRODUCTION

The intent of this technical specification covers construction of all civil works as covered in the scope of contract as per drawings supplied by Owner.

All civil works shall be carried out as per design / drawings standardized by the Consultant / Owner and the specification provided by the Consultant / Owner. All standard drawings are enclosed with the tender documents. In case any item is not covered under specification then the same shall be carried out as per CPWD specification and applicable Standards and Codes. Any item for which specification is not provided herein and is not covered under CPWD specification shall be executed as per manufacturer guidelines. All materials shall be of best quality conforming to relevant Standards and Codes. In case of any conflict between Standards / Code and Technical Specification, the provisions of Technical Specification shall prevail, and the Engineer's decision on interpretation shall be final.

The Contractor shall furnish all labor, tools, equipment, materials, temporary works, constructional plant and machinery, fuel supply, transportation and all other incidental items not shown or specified but as may be required for complete performance of the Works in accordance with drawings, specifications and direction of Owner.

Excavated earth is to be disposed from site as instructed, only into approved landfill areas and dump yard. The cost of excavation to include for necessary lead and lift as specified.

All materials including cement, reinforcement steel and structural steel etc. shall be arranged by the Contractor. All testing required shall be arranged by the Contractor at his own cost. The contractor shall execute the work as per the standard Field Quality Plan (FQP) of NMPT.

The bidder shall fully apprise himself of the prevailing conditions at the proposed site, climatic conditions including monsoon patterns, local conditions and site specific parameters and shall include for all such conditions and contingent measures in the bid, including those which may not have been specifically brought out in the specifications.

Level and date of concreting shall be marked on the building from outside at every floor level with proper paint, etc.

All levels and survey work shall be measured by total station and electronic level machine at all floors and places.

Brief Description of Works

The scope of work is defined in the Notice Inviting Tender. The Contractor shall provide all necessary materials, equipment and labour etc. for the execution and maintenance of the work till completion.

The work shall be executed in accordance with the specification stipulated in the Bill of Quantity and other bidding documents read along with CPWD (Central Public Works Department) specifications for civil works and IS codes with up-to-date revisions. For non-schedule items specification as given along with tender document and similar items of CPWD shall be applicable.

The list of references for civil works are CPWD specifications, relevant IS codes and best practices.

For deep excavations, necessary shoring is to be done, the design of which will be provided by the contractor, after assessing site and soil conditions, and work only to be commenced on site after the same is duly approved by NMPT. Any approval if required from the Mineral department or any other statutory body that has jurisdiction on such excavations has to be obtained by the contractor.

All earth used for back filling should be of approved quality.

Portland Cement of IS 8112 shall be used for all cement & concrete works. This will supersede other specifications of cement to be used for the works.

For ready mixed cement concrete, in addition to the CPWD specification, the following also to be noted:

The cost towards cement quantity reduced from the specified quantity in the item due to mixing of fly ash shall be deducted as per relevant BOQ item. The design mix shall be submitted to Engineer in Charge for approval.

All hard ware fittings shall be of best quality and shall be selected as per the Instructions of Engineer in Charge.

Site location, Boundaries and Possession

The location and boundaries of the Site are shown on the Drawing No.19/64-LP. The Contractor shall confine his activities strictly to the allotted site area(s) and shall not allow his personnel to trespass upon any other areas occupied by the Employer.

1.4 Site Datum and Base Lines

A base line shall be established within the working area by the Contractor. The base line shall be referenced to the site co-ordinate system (based on the Local Coordinates of New Mangalore Port). This bench mark and base line will be the basis for the setting-out for all the Works. The main levels and lines for each portion of the Works shall be established from the bench mark and base line by the Contractor.

1.5 Site Conditions

1.5.1 Location of Work

As per enclosed location plan.

1.5.2 Climate

The climate at Mangalore is tropical with high humidity and a maximum shade temperature of 36°C. The average annual rainfall is approximately 3330 mm and concentrated in the south-west monsoon months of June, July, August and September during which period the average rainfall is as much as 82% of the total annual rainfall.

1.5.3 Wind

The wind in the monsoon months of June, July and August are predominantly from south-west and west with a maximum intensity of 5 on the Beaufort Scale. The winds in the remaining months of the year are predominantly from the north-west and the maximum intensity during this period is also of 5 on the Beaufort Scale.

1.5.4 Cyclones

Even though Mangalore is within the cyclonic area of storms originating in the Arabian Sea and those that enter across the Indian Peninsula from Bay of Bengal, cyclones are not as severe or frequent as in the Bay of Bengal. The maximum wind speed so far recorded in cyclonic storm, generally does not exceed 62 kmph (16.9 m/sec.) except one during 1965 when the maximum speed recorded was 97 kmph (26.9 m/sec.)

1.5.5 Visibility

Thirty year period observations conducted by the Indian Meteorological Department reveal that poor visibility (visibility less than 4 Kms) is encountered for about 10 days in the south-west monsoon period. The maximum number of foggy days in a year is only 3.

1.5.6 Site Preparation

The Contractor shall furnish all necessary supervision, labour, materials, equipment and tools for Site Preparation, clearing and all other works. Clearing shall mean to completely demolish, remove and dispose with all leads, lifts and descents from the area marked, trees, bushes, deadfalls, embedded logs, dislodged roots, stumps, snogs, boulders, mounds, existing structures and other objectionable materials. The areas required to be cleared shall consist of the work Site, ditches, borrow pits, diversions and all other areas necessary for the construction work as directed by the Engineer-in-Charge.

Before any Temporary Works are commenced, the Contractor shall submit his proposal along with complete drawings of all Temporary Work, he may require for the execution of the Works in advance to the Engineer for approval. The Contractor shall also submit his

calculations relating to the design of temporary works, strength, etc. if required by the Engineer and shall carry out the modifications that the Engineer may require of such temporary works at Contractor's own cost. The Contractor shall be solely responsible for the stability and safety of all Temporary Work.

It will be the responsibility of the Contractor to make timely procurement of all materials and mobilize all essential equipment for both Temporary and Permanent Works.

1.6 Site Information

The detailed drawing No.19/64-LP of the construction site for adaptation of methodology for the construction. However, on account of this change in the geographical profile of site, no extra cost for additional arrangement required to be made will be paid for.

1.7 The Nature of Soil Profile

The site comprises of ordinary soil. The details furnished herein are only for the information/guidelines of the tenderers and the successful contractor shall not claim for any deviation in the actual subsoil profile encountered at site.

1.8 Records

Complete records of all operations connected with the work shall be kept by the Contractor. The Contractor shall submit to the Engineer-in-charge for approval his proposal of the manner of presentation of these records. Three copies of all such records shall be furnished to the Engineer-in-charge on completion of each test or operation.

B. WORKS

1. Shifting of the Big Rock Stones

Shifting of the Big Rock Stones of various size unable to shift manually including sorting the dismantled material, Shifting and placing the Stones in the adjacent areas along the sea wall. disposal of unserviceable material and stacking the serviceable material with all lifts and lead at the settled areas on the seawall and Northern Break Water up-to a lead of 500m as directed by the department.

2. EARTH WORKS

1.1 General

Before beginning excavation or filling, the Engineer-in-Charge and Contractor shall jointly survey and record all ground levels on the site. The area coming under cutting and filling shall be cleared of shrubs, rank vegetation, grass, brushwood, tree and saplings of girth up to 30 cm measured at a height of one meter above ground level and rubbish removed up to a distance of 50 meters outside the periphery of the area under clearance. The roots of trees and saplings shall be removed for the stilt floor construction level, whichever is lower, and the holes or hollows filled up with the earth, rammed and leveled.

1.2 Excavation

Excavation for roads, pavements, concrete drains, outfalls, various foundations, etc. shall be considered under this category.

The whole of the excavation for the works shall be carried out to the required widths, lengths and depths and within the approved lines and levels or as directed by the Engineer-in-Charge. Any excavation beyond such limits or instructions shall be made good by filling with M-10 concrete or other approved materials to the required compaction, by the Contractor, at his own expense to the satisfaction of the Engineer-in-Charge.

The Contractor shall provide all shoring, timbering or other approved support to the sides of the excavations as may be necessary to prevent any ground movement. The Contractor shall bear all responsibility connected with such shoring including dewatering notwithstanding the Engineer-in-Charge's Approval. Cost of all such shoring, etc. shall be deemed to be included in the prices.

All excavation except where otherwise noted shall be required to be kept completely free from water, from whatever source it may come at all times to the entire satisfaction of the Engineer-in-Charge. Cost of dewatering shall be deemed to have been included in the rates quoted.

The bottom of all excavations shall be trimmed and leveled and compacted properly to the satisfaction of the Engineer-in-Charge. A bottom layer of 150 mm thick shall be left

undisturbed and removed only when concrete is about to be placed in order to prevent softening or deterioration of the surface of the bottom of the excavation due to exposure.

A masonry pillar to serve as a bench mark will be erected at a suitable point in the area, which is visible from the largest area. This bench mark shall be constructed and connected with the standard bench mark as approved by the Engineer-in-Charge. Necessary profiles with strings stretched on pegs, bamboos or “Burjis” shall be made to indicate the correct formation levels before the work is started. The contractor shall supply labour and material for constructing bench mark, setting out and making profiles and connecting bench mark with the standard bench mark at his own cost. The pegs, bamboos or “Burjis” and the bench mark shall be maintained by the contractor at his own cost during the excavation to check the profiles.

The ground levels shall be taken at 5 to 15 metres intervals (as directed by the Engineer-in-Charge) in uniformly sloping ground and at closer intervals where local mounds, pits or undulations are met with. The ground levels shall be recorded in field books and plotted on plans. The plans shall be drawn to a scale of 5 metres to one cm or any other suitable scale decided by the Engineer-in-Charge. North direction line and position of bench mark shall invariably be shown on the plans. These plans shall be signed by the contractor and the Engineer-in-Charge or their authorized representatives before the earth work is started. The labour required for taking levels shall be supplied by the contractor at his own cost.

During the excavation the natural drainage of the area shall be maintained. Excavation shall be done from top to bottom. Undermining or undercutting shall not be done.

In firm soils, the sides of the trenches shall be kept vertical up to a depth of 2 metres from the bottom. For greater depths, the excavation profiles shall be widened by allowing steps of 50 cms on either side after every 2 metres from the bottom. Alternatively, the excavation can be done so as to give slope of 1:4 (1 horizontal: 4 vertical). Where the soil is soft, loose or slushy, the width of steps shall be suitably increased or sides sloped or the soil shored up as directed by the Engineer-in- Charge. It shall be the responsibility of the contractor to take complete instructions in writing from the Engineer-in-Charge regarding the stepping, sloping or shoring to be done for excavation deeper than 2 metres.

The excavation shall be done true to levels, slope, shape and pattern indicated by the Engineer-in- Charge. Only the excavation shown on the drawings with additional allowances for centering and shuttering or as required by the Engineer-in-Charge shall be measured and recorded for payment.

While carrying out the excavation for drain work care shall be taken to cut the side and bottom to the required shape, slope and gradient. The surface shall then be properly dressed. If the excavation is done to a depth greater than that shown on the drawing or as required by the Engineer-in-Charge, the excess depth shall be made good by the contractor

at his own cost with stiff clay puddle at places where the drains are required to be pitched and with ordinary earth, properly watered and rammed, where the drains are not required to be pitched. In case the drain is required is to be pitched, the back filling with clay puddle, if required, shall be done simultaneously as the pitching work proceeds. The brick pitched storm water drains should be avoided as far as possible in filled-up areas and loose soils. In all other cases where the excavation is taken deeper or made wider by the contractor, it shall be brought to the required level/width by the contractor at his own cost by filling in with earth duly watered, consolidated and rammed.

The excavation shall be done manually or by mechanical means as directed by Engineer-in-charge considering feasibility, urgency of work, availability of labour/mechanical equipments and other factors involved. Contractor shall ensure every safety measure for the workers. Neither any deduction nor extra payment will be made on this account.

1.2.1 Safety and Emergency Procedures

The Contractor shall take all necessary precautions to ensure stability of his excavations and shall take all necessary precautions and be responsible for the safety of personnel in the area of operation. He shall maintain, available for immediate use, a sufficient quantity of slurry to allow for any sudden loss. Should the loss continue despite the addition of the slurry and the stability of the trench be placed at risk, the Contractor shall backfill with lean mix concrete to preserve the stability of the trench and ensure the safety of neighbouring structures and utility services.

1.2.2 Obstructions

An obstruction is defined as material, the excavation of which hinders normal progress and the existence of which could not have been foreseen. Upon encountering an obstruction, the Contractor shall determine the method to be employed in removing the obstruction.

1.3 Disposal

Excavated materials deemed suitable by the Engineer-in-Charge for filling in other areas within a lead of five kilometers, shall be filled as directed by the Engineer-in-Charge.

Unsuitable or excess excavation material and debris shall be transported to spoil areas within a lead of five kilometers as defined and approved by the Engineer-in-Charge. Material shall be end dumped, graded and leveled at these areas to the grades and levels specified by the Engineer-in-Charge. Cost of such disposal shall be deemed to have been included in the price.

Backfill

Backfill shall contain no ashes, rubbish combustible or decomposable material, nor any other material, which the Engineer-in-Charge deems unsuitable for this purpose.

All material used as backfill / fill under structures or concrete slab or around structures or trenches and pits shall be placed in layers not exceeding 300 mm and compacted to a minimum of 95% of the maximum laboratory dry density as per IS: 2720 (Part 8) and as directed by the Engineer-in-Charge. Backfilling of trenches shall not commence till the respective piping and electrical cables/conduits have been approved by the Engineer-in-Charge.

Compaction Control of Fill Material

The Contractor shall provide all the testing equipment, facilities and personnel required for the work. The number and periodicity of tests required to be conducted at the Site of fill shall be determined by the Engineer. The Contractor shall submit to the Engineer-in-Charge prior to commencement of work a detailed execution plan indicating the method of compaction and the compaction tests he proposes to conduct. All compacting and testing equipment and method of compaction proposed by the Contractor shall be subject to the prior approval of the Engineer.

Control shall be exercised on each layer by taking at least one measurement of density for each 1000 square meters of compacted area or closer as required to yield the minimum number of test results for evaluating a day's work on statistical basis. The determination of density shall be in accordance with IS: 2720 (Part 28). Test locations shall be chosen only through random sampling techniques. Control shall not be based on the result of any one test but on the mean value of a set of 5-10 density determinations. The number of tests in one set of measurements shall be 6 as long as it is felt that sufficient control over borrow material and the method of compaction is being exercised. If considerable variations are observed between individual density results, the minimum number of tests in one set of measurements shall be increased to 10. The acceptance criteria shall be subject to the condition that the mean density is not less than the specified density plus: [1.65 – 1.65 / (No. of Samples) ^ 0.5] times the standard deviation.

However, for earthwork in shoulders (earthen) and in the sub grade, at least one density measurements shall be taken for every 500 Sq.m for the compacted area provided further that the number of tests in each set of measurements shall be at least 10. In other respects, the control shall be similar to that described earlier.

Earthworks and all components thereof should satisfy the following tests and codes:

Sl.No	I.S. No.	Description
1	IS 632	Gamma – BHC (Lindane) emulsifiable concentrates
2	IS 1200 (Part 1)	Method of measurement of Earth work
3	IS 1200 (Part	Method of measurement of Earth work (by Mechanical

	27)	Appliances)
4	IS 4081	Safety code for Blasting and related drilling operation
5	IS 4988 (Part 4)	Excavators
6	IS 6313 (Part 2)	Anti Termite measures in buildings (pre-construction)
7	IS 6313 (Part 3)	Anti Termite measures in buildings (post-construction)
8	IS 6940	Methods of test for pesticides and their formulations
9	IS 8944	Chloropyrifos emulsifiable concentrates
10	IS 8963	Chloropyrifos – Technical specifications
11	IS 12138	Earth moving equipments

3. Providing Steel Liner

Providing Steel Liner 10 mm thick for Curbs and 6 mm thick for Staining of Wells including Fabricating and Setting out as per Detailed Drawing including providing and fixing in position MS sheet 6mm thick casing, including cutting, rolling, welding , painting anti rust coating, transportation, loading, unloading, labour charges, fabrication, driving charges and placing in position for casting of 750mm dia. RCC Pile foundation including all incidental charges etc., complete as directed by the Department.

4. Pile Foundation

1101 DESCRIPTION

1101.1 This work shall consist of construction of all types of piles for structures in accordance with the details shown on the drawings and conforming to the requirements of these Specifications or as directed by the Engineer.

1101.2 The construction of pile foundations requires a careful choice of the piling system depending on subsoil conditions and loading characteristics and type of structure. The permissible limits of total and differential settlements, unsupported length of pile under scour, impact/entanglement of floating bodies and any other special requirements of project, are also equally important criteria for selection of the piling system. The method of installing tone piles, including details of the equipment shall be submitted by the Contractor and got approved from the Engineer before commencement of work.

1101.3 The work shall be carried out as per IS:2911 except as modified herein.

1102 SUBSURFACE Investigations

1102.1 The complete subsurface investigations of strata in which pile foundations are proposed shall be carried out in advance along with in-situ pile tests. For details of geo-

technical subsurface explorations, refer Section 2400 of these Specifications.

Borings should be carried up to sufficient depths so as to ascertain the nature of strata around the pile shaft and below the pile tip. Depth of boring shall not be less than:

i) 1.5 times estimated length of pile in soil or 15 m below the proposed founding level

ii) 15 times diameter of pile in ordinary / jointed rock but minimum 15 m in such rock

iii) 4 times diameter of pile in hard rock but minimum 3 m in such rock

1102.2 The subsurface investigations shall adequately define stratification of substrata including the nature and type of strata their variation, extent and specific properties. The investigations shall be adequate for the purpose of selection of appropriate piling system and for estimating design capacities for different diameters and length of piles.

1102.3 Pressure meter tests may be used in the case of rock, ground or soil for direct evaluation of strength and compressibility characteristics. Though these tests are of specialized nature, they are more appropriate for difficult/uncertain substrata and especially for important projects.

1102.4 For piles socketed into rock. it is necessary to determine the uni-axial compressive strength of the rock and its quality.

The investigations shall also include location of ground water table and other parameter including results of chemical tests showing sulphate and chloride content and any deleterious chemical content in soil and/or ground water, likely to affect durability.

103 TYPE OF PILES

1103.1 Piles may be of reinforced concrete, prestressed concrete, steel c and circular, square, hexagonal, octagonal, "H" or "I" Section in shape. They may be of soy: or hollow sections or steel cases filled with concrete. Timber piles may be used for temporary bridges. Cast in-situ concrete piles may be driven cast in-situ or bored cast in-situ. Pre-cast concrete piles also may be driven precast or bored precast. In bored precast pre-cast piles are lowered into pre-formed bores and annular space grouted.

1103.2 Minimum diameter of concrete pile shall be 1 m for river/marine for bridges beyond the water zone and bridges on land, the minimum diameter may 750 mm.

1104 MATERIALS 1104.1 the basic materials shat! Conform to Section 1000 of these Specifications The specifications for steel reinforcement, structural concrete, prestressed concrete aid structural steel to be used in pile foundations shall conform to Sections 1600, 1700. 1800 and 1900 respectively of these Specifications.

1104.2 Concrete in Piles For both precast and cast in in-situ piles, the grade of concrete, minimum cement content water cement ratio and slump at the time of placement shall be as per Table 1100-1 :

Table 1100-1 : Requirements for Concrete in Piles

	Cast in-situ Concrete by Tremie	Precast Concrete

Grade of concrete	M 35	M 35
Minimum cement content	400 kg/m3	400 kg/m3
Minimum water cement ratio	0.4	0.40
Slump (mm) as measured at the time of placement	150-200	50 - 75

The terms 'minimum cement content' and 'minimum water cement' ratio mentioned Table 1100-1, are to be based on total cementations material (inclusive of all mineral admixtures called additives) mentioned in Clause 1007 of these Specifications. Maximum limits for such additives shall be as specified in Clause 1716.2 of these Specifications.

105 TEST PILES

1105.1 Test piles which are shown on the drawings or specified in the contract or installed by the Contractor on his own to determine the lengths of piles to be furnished, shall confirm to the requirements for piling as indicated in these Specifications. Test piles which are used to arrive at the load carrying capacity shall not be incorporated in the structure.

All test odes shall be installed with the same type of equipment that is proposed to be used for piling in the actual structure

Test piles which are not to be incorporated in the completed structure shall be removed to at vast 6C0 mm below the proposed soffit level of pile cap and the remaining hole so formed shall be backfilled with earth or other suitable material.

Tile piles shall be load tested in accordance with provisions laid down in this Section.

1106 PRECAST CONCRETE PILES 1

106.1 General

Pre-cast concrete piles shall be of the size and shape as shown in the approved drawings square section is employed, the corners shall be chamfered by at least 25 mm unless otherwise specified on the drawings. The length of pile shall not normally exceed m However, where special equipment's for handling and installation are available to the satisfaction of the Engineer, longer length could be permitted.

1106.2 Stacking, Storing and Handling

care shall be taken that at all stages of transporting, lifting and handling, the piles are not damaged or cracked. During transport and stacking of piles, they shall be supported at the same points as those provided for lifting purposes. If the piles are put down temporarily handling, they shall be placed on trestles or blocks located at the same points.

piles shall be stored at least 300 mm above firm level ground, which is not liable to unequal subsidence or settlement under the weight of the stack of piles. They shall be placed on supports which are level and spaced so as to avoid bending. The supports in

different be vertically one above the other. Spaces shall be left round the piles to enable them to be lifted without difficulty. The order of stacking shall be such that the older be withdrawn without disturbing newer piles. Separate stacks shall be provided for differ-0, lengths of piles. Where piles are stacked in layers the number of layers shall not three. Whenever curing is needed during storage, arrangements shall be made to enable the piles to be watered. For detailed precautions with regard to curing operations for structure concrete, refer Section 1700 of these Specifications.

Before the operation of handling and driving the piles, the minimum periods counted from the time of casting shall be as indicated in Table 1100-2. Pre-stressed pile shall not be lifted or handled until fully stressed

1106.3 Lengthening of Piles

Where a pile is to have additional length cast on it ouring driving, the longitudinal reinforcement shall preferably be joined by full penetration butt welding. The concrete at the top of tone original pile shall be cut down to expose not less than 200 mm of the bars to avoid spilling of the concrete by heat of welding. The added bars have to be held accurately and rigidly in position during welding. Where facilities on site are insufficient to make proper butt welding practicable, the joint may be made by lapping. The reinforcement at the head of pile will need to be exposed for full anchorage length or 600 mm whichever is greater and the new bars over-lapped for this distance. Unless otherwise specified, the extension of the pile shall be formed to the same cross-sectional profile and with concrete of at least the same strength as that specified for the original pile. The stirrup spacing shall in no case be greater !Win 150 mm. Not more than one extension shall be permitted. In case more than one extension is permitted by the Engineer, only approved mechanical couplers shall be used.

Driving shall not be resumed until:

a) The strength of the concrete in the extension is at least equal to the specified characteristic strength of concrete in pile; and

b) The approval of the Engineer has been obtained

11064 Removal of Surplus Length Any length of pile surplus to that required for incorporation in the structure shall be cut off neatly and removed. During the process of cutting off, it shall be ensured that projecting reinforcement to be anchored into the pile cap and the pre-stressing strand-sewers are not damaged. When stripping pre-stressed concrete piles, sudden release of tendons shall be avoided. Reference may also be made to Clause 7.7.1 of IS:2911 (Part I, Section 3) in this collection.

1106.5 Risen Piles Level of top of each pile shall be taken after driving and again after all the piles are driven. Files which are found to have risen due to ground heave or as a result of driving adjacent piles, shall be re-driven to the original depth or resistance unless re-driving tests on adjacent does have shown this to be unnecessary.

1106.6 Manufacture The pile should be cast in one continuous operation from end to

end of each pile. Manufacture of precast concrete piles shall conform to the guidelines contained in Clause 7.1, 7.2 and 7.3 or IS:2911 (Part I, Section 3).

1601 Description

This work shall consist of furnishing and placing coated or uncoated mild steel or high strength deformed reinforcement bars of the shape and dimensions shown on the drawings and conforming to these Specifications or as approved by the Engineer.

1602 GENERAL Steel for reinforcement shall meet the requirements of Section 1000 of these Specifications. Reinforcement cements may be either mild steel or high strength deformed bars. They may be uncoated or coated with epoxy.

1603 PROTECTION OF REINFORCEMENT uncoated reinforcing steel shall be protected from rusting or chloride contamination. Reinforcements shall be free from rust, mortar, loose mill scale, grease, oil or paints. This may be ensured either by using reinforcement fresh from the factory or by thoroughly cleaning it using any suitable method such as sand blasting, mechanical wire brushing etc., as directed by the Engineer. Reinforcements shall be stored above the ground in a clean and dry condition, on blocks, racks or platforms and shall be suitably marked to facilitate inspection and identification.

Portions of uncoated reinforcing steel and dowels projecting from concrete, shall be protected within one week after initial placing of concrete, with a brush coat of neat cement mixed with water to a consistency of thick paint. This coating shall he removed by lightly tapping 3 hammer or other tool not more than one week before placing of the adjacent pour of concrete Coated reinforcing steel shall be protected against damage to the coating. If the math n the bars is damaged during transportation or handling and cannot be repaired, the same; all be rejected.

In case of fusion bonded epoxy coated reinforcement or hot dipped galvanized bars used, reference shall be made Clause 1010.3.2 of Section 1000 of these specifications.

1604 BENDING OF REINFORCEMENT Bar bending schedule shall be furnished by the Contractor and got approved by the Engineer before start of work. Reinforcing steel shall conform to the dimensions and shapes given in the approved Bar Bend- Schedules.

Bars shall be bent cold to the specified shape and dimensions or as directed by the; using a proper bar bender, operated by hand or power to obtain the correct shape of bends. Bars shall not be bent or straightened in a manner that will damage the parent material the coating. Bars bent during transport or handling shall be straightened before being used on shall not be heated to facilitate straightening.

1605 PLACING OF REINFORCEMENT

a) The reinforcement cage should generally be fabricated in the hard ground level and then shifted and placed in position. The rein' shall be placed strictly in accordance with the drawings and shall be assembled in position only when the structure is otherwise read, for placing of concrete. Prolonged time gap between assembling of reinforcement

and casting of concrete, which may result in rust formation on the surface of the bars, shall not be permitted.

b) Reinforcement bars shall be placed accurately in position -. now on the drawings. The bars, crossing one another shall be tied together at every intersection with binding wire (annealed), conforming V IS:280 to make the skeleton of the reinforcement rigid such that the reinforcement does not get displaced during placing of concrete, or any other operation. The diameter of binding wire shall not be sc that' 1 mm.

c) Bars shall be kept in poston usually by the following methods:

i) In case of beam and slab construction, industrially produced polymer cover blocks of thickness equal to the specified cover shall be placed between the bars and formwork, subject satisfactory evidence that the polymer composition is no harmful to concrete and reinforcement. Cover blocks made of concrete may be permitted by the Engineer, provided they have the sari* strength and specification as those of the member.

ii) In case of dowels for columns and walls, the vertical reinforcement shall be kept in position by means of timber templates with ,lots cut in them accurately, or with cover blocks tied to the reinforcement Timber templates shall be removed after the concreting has progressed upto a level just below their location.

iii) Layers of reinforcements shall be separated by spacer bars at approximately one meter intervals. The minimum diameter of spacer bars shall be 12 mm or equal to maximum size of main reinforcement or maximum size of coarse aggregate, whichever is greater. Horizontal reinforcement shall not be allowed to sag between supports.

Necessary stays, blocks, metal chairs, spacers, metal hangers, supporting wires etc. or other subsidiary reinforcement shall be provided to fix the reinforcement firmly in its correct position. v) Use of pebbles, broken stone, metal pipe, brick, mortar or wooden blocks etc., as devices for positioning reinforcement shall not be permitted. d) Bars coated with epoxy shall be placed on supports that do not damage the coating. Supports shall be installed in a manner such that planes of weakness are not created in hardened concrete. The coated reinforcing steel shall be held in place by use of plastic or plastic coated binding wires especially manufactured for the purpose. Refer Section 1000 of these Specifications for other requirements. Placing and fixing of reinforcement shall he inspected and approved by the Engineer before concreting is commenced.

1606 BAR SPLICES 1606.1 Lapping All reinforcement shall be furnished in full lengths as indicated on the drawing. No splicing of bars, except where shown on the drawing, shall be permitted without approval of the Engineer. The lengths of the splice shall be as indicated on drawing or as approved by the Engineer. Where practicable, overlapping bars shall not touch each other, and shall be kept apart by 25 mm or 1.25 times the maximum size of coarse aggregate, whichever is greater. If this is not feasible. overlapping bars shall be bound with annealed steel binding wire not less than 1 mm diameter and twisted tight in such a manner as to maintain minimum clear cover to the

reinforcement from the concrete surface. Lapped splices shall be staggered or located at points along the span where stresses are low.

1700 DESCRIPTION

The work shall consist of producing, transporting, placing and compacting of structural concrete including fixing formwork and temporary works etc. and incidental construction in accordance with these Specifications and in conformity with the lines, grades and dimensions, as shown on the drawings or as directed by the Engineer.

5. 4.1. MATERIAL

Water, cement, fine aggregate or sand, surkhi, and fly ash shall be as specified in Chapter 3.0 – Mortar.

4.1.1 Coarse Aggregate

4.1.1.1 General: Aggregate most of which is retained on 4.75 mm IS Sieve and contains only as much fine material as is permitted in IS 383 for various sizes and grading is known as coarse aggregate. Coarse aggregate shall be specified as stone aggregate, gravel or brick aggregate and it shall be obtained from approved/ authorized sources.

(a) Stone Aggregate: It shall consist of naturally occurring (uncrushed, crushed or broken) stones. It shall be hard, strong, dense, durable and clean. It shall be free from veins, adherent coating, injurious amounts of disintegrated pieces, alkali, vegetable matter and other deleterious substances. It shall be roughly cubical in shape. Flaky and elongated pieces shall be avoided. Aggregates from other than natural resources shall comply with the requirements of IS 383.

(b) Gravel: It shall consist of naturally occurring (uncrushed, crushed or broken) river bed shingle or pit gravel. It shall be sound, hard and clean. It shall be free from flat particles of shale or similar laminated material, powdered clay, silt, loam, adherent coating, alkali, vegetable matter and other deleterious substances. Pit gravel shall be washed if it contains soil materials adhering to it. These shall conform to IS 383 unless otherwise specified.

(c) Brick Aggregate: Brick aggregate shall be obtained by breaking well burnt or over burnt dense brick/ brick bats. They shall be homogeneous in texture, roughly cubical in shape and clean. They shall be free from unburnt clay particles. Soluble salt, silt, adherent coating of soil, vegetable matter and other deleterious substances. Such aggregate should not contain more than one percent of sulphates and should not absorb more than 10% of their own mass of water, when used in cement concrete. It shall conform to IS 306 unless otherwise specified.

(d) Light weight aggregate such as sintered fly ash aggregate may also be used provided the Engineer-in-Charge is satisfied with the data on the proportion of concrete made with them.

4.1.1.2 Deleterious Material:

Coarse aggregate shall not contain any deleterious material, such as pyrites, coal,

lignite, mica, shale or similar laminated material, clay, alkali, soft fragments, sea shells and organic impurities in such quantity as to affect the strength or durability of the concrete. Coarse aggregate to be used for reinforced cement concrete. Coarse aggregate to be used for reinforced cement concrete shall not contain any material liable to attack the steel reinforcement. Aggregates which are chemically reactive with alkalis of cement shall not be used. The maximum quantity of deleterious material shall not be more than five percent of the weight of coarse aggregate when determined in accordance with IS 2386.

4.1.1.3 Size and Grading

(i) Stone aggregate and gravel: It shall be either graded or single sized as specified. Nominal size and grading shall be as under:-

(a) Nominal sizes of graded stone aggregate or gravel shall be 40, 20, 16, or 12.5 mm as specified. For any one of the nominal sizes, the proportion of other sizes as determined by the method prescribed in Appendix 'A' of Chapter 4 shall be in accordance.

4.1.1.4 Stacking: Aggregate shall be stacked on a hard, dry and level patch of ground. When stack piling, the aggregate shall not form pyramids resulting in segregation of different sized materials. It shall be stacked separately according to nominal size of coarse aggregates. Stacking shall be done in regular stacks, of height not exceeding 100 cm. 4.1.1.5 Testing: Coarse aggregate shall be tested for the followings (as per IS 2386) (a) Determination of particle size and shape (Appendix 'A' of Chapter 4) (b) Estimation of organic impurities (as per IS 2386 - Part II) (c) Surface moisture (Appendix 'B' of Chapter 4) (d) Determination of 10% fine value (Appendix 'C' of Chapter 4) 4.1.1.6 Measurements: The aggregates shall be measured in stacks and paid for after making a deduction of 7.5% of the gross measurements of stacks in respect of aggregates of nominal size 40 mm and above. No deduction from the gross measurements of the stacks is to be made in respect of aggregate of nominal size below 40 mm. 4.1.2 Chemical Admixtures When required, admixtures of approved quality shall be mixed with concrete, as specified. The admixtures shall conform to IS 9103 and as specified in Chapter 5 - R.C.C

4.1.2.1 Admixtures may be any one of the following classes for use in concrete:-

(a) Water Reducing Admixtures

(b) Retarding Admixtures

(c) Accelerating Admixtures.

(d) Water Reducing and Retarding Admixtures.

(e) Water Reducing and Accelerating Admixtures.

(f) Permeability reducing (water proofing) Admixtures.

4.1.2.2 Liquid Admixtures: Admixtures introduced into the concrete as liquids generally fall into the following categories.

(a) Air Entraining.

(b) Water Reducing.

(c) Water Reducing Retarders.

(d) Retarders.

(e) Water Reducing Accelerators.

(f) Accelerators.

4.1.2.3 Dosage of these admixtures may vary according to manufacturer's specification.

4.1.2.4 Two or more admixtures may not be compatible in the same solution. It is therefore mandatory that when two admixtures manufactured by the same manufacturers is being used simultaneously, the manufacturer shall certify their compatibility. In case the two or more admixtures are produces by different manufacturers, then, before their use in concrete, test shall be performed by the manufacturer to establish their compatibility, all such test reports shall be furnished to the Engineer-in-Charge for his approval before their use in concrete

4.1.2.5 Some admixture may be in the form of powder, particle or high concentration liquids which may require mixing with water prior to dosing. Under these conditions water in solution shall be considered as part of total water content in the batch in order to maintain the water-cement ratio.

4.1.2.6 Admixture manufacturer's recommendation shall be carefully followed so as to ensure complete solution of the product or to prepare a standard solution of uniform strength for easier use.

4.1.2.7 Certain admixtures may contain significant amounts of finely divided insoluble materials or active ingredients which may or may not be readily soluble. It is essential for such admixtures that precautions be taken to ensure that these constituents be kept in a state of uniform suspension before actual batching. When relatively small amounts of powered admixtures are to be used directly, these shall be pre-blended with cement.

4.1.2.8 Admixtures are sold under various trade names and may be in the form of liquids or powders. The proprietary name and the net quantity of content shall be clearly indicated in each package or container of admixtures. The admixtures shall be uniform within each batch and uniform between all batches.

4.1.2.9 No admixtures shall be accepted for use in concrete unless these are tested in accordance with IS 9103 and the test results are approved by the Engineer-in-Charge.

4.2.4 Batching To avoid confusion and error in batching, consideration should be given to using the smallest practical number of different concrete mixed on any site or in any one plant. In batching concrete, the quantity of both cement and aggregate shall be determined by mass; admixture, if solid, by mass: liquid admixture may however be measured in volume or mass: water shall be weighed or measured by volume in a calibrated tank (see also IS 4925). For projects having sanctioned more than 100 Cores, the concrete shall be sourced from ready mixed concrete plant or from captive on site or off site automatic batching and mixing plants. The concrete produced and supplied by

ready mixed concrete plants shall be in accordance with IS 4926. In case of concrete from captive on site or off site automatic batching and mixing plants, similar quality control shall be followed.

Ready- mixed concrete supplied by ready-mixed concrete plant shall be preferred. For large and medium project sites the concrete shall be sourced from ready-mixed concrete plants or from on site or off site batching and mixing plants (see IS 4926).

4.2.4.1 In case of batch mixing plant at site the grading of aggregate shall be controlled by obtaining the coarse aggregate in different sizes and blending them in right proportions, the different sizes being stocked in separate stock piles. The material should be stock-piled for several hours preferably a day before use. The grading of coarse and fine aggregate should be checked as frequently as possible, the frequency for a given job being determined by the Engineer-in-Charge to ensure that the specified grading is maintained.

For concave fillet welds the actual throat thickness shall be not less than 0.7 times the specified leg length. For convex fillet welds, the actual throat thickness shall be not less than 0.9 times the specified leg length.

7.2.12. **Preparation of joint faces**

If preparation or cutting of material is necessary, this shall be done by shearing, chipping, grinding, machining, thermal cutting or thermal gouging. When shearing is used the effect of work hardening shall be taken care of to ensure that there is no cracking of the edges. Removal of 1 mm to 2 mm from a cut face normally eliminates the layer of hardness.

7.2.13. **Fusion faces**

Fusion faces and adjacent surfaces shall be free from cracks, notches or other irregularities which might be the cause of defects or would interfere with the deposition of the weld. They shall also be free from heavy scale, moisture, oil, paint and any other substance which might affect the quality of weld or impede the progress of welding.

7.2.14. **Assembly for welding**

Jigs and manipulators should be used, where practicable, so that the welding can be carried out in the most suitable position. Jigs shall maintain the alignment with the minimum restraint so as to reduce the possibility of lock in stresses.

7.2.15. **Alignment of butt joint**

The root edges or root faces of butt joints shall not be out of alignment by more than 25 per cent of the thickness of the thinner material for material up to 12 mm thick or by more than 3 mm for thicker material. For certain applications closer tolerances may be necessary for proper alignment.

7.2.16. **Fit up of parts jointed by fillet welds**

The edges and surfaces to be jointed by fillet welds shall be in as close contact as possible since any gap increases the risk of cracking but in no case should the gap exceed 3 mm.

7.2.17. **Tack welds** (Fig.1)

Tack welds shall be not less than the throat thickness or leg lengths of the root run to be used in the joint. The length of the tack weld shall not be less than four times the thickness of the thicker part or 50 mm whichever is similar. If smaller tack welds are desired, these shall be so indicated.

Where the tack weld is incorporated in a welded joint, the shape of the tack shall be suitable for incorporation in the finished weld and it shall be free from cracks and other deposition faults.

7.2.18. **Protection from weather**

Surface to be welded shall be dry. When rain or snow is falling or during periods of high wind, necessary precautions shall be taken for outdoor welding arc. Warming shall be carried out at all ambient temperatures below 10 degree C.

7.2.19. **Inter–run cleaning**

Each run of weld bead and each layer of weld shall be thoroughly cleaned of slag, spatters, etc. before depositing subsequent bead or weld with particular reference to thorough cleaning of toes of the welds. Visible defects such as cracks, cavities and other deposition faults, if any, shall be removed to sound metal before depositing subsequent run or layer of weld.

7.2.20. **Welding procedure**

Welding shall be carried out only by fully trained and experienced welders as tested and approved by the engineer. Qualification tests for welders as well as tests for approval of electrodes will be carried out as per IS: 823-1964. The nature of test for performance qualification for welders shall commensurate with the quality of welding required on this work as judged by the engineer. The steel structures shall be automatically, semi automatically or manually welded. Welding shall be only after the checks have been carried out. Welding procedures and Tests for welders shall be conducted as per IS: 9595 and approved by the engineer. The welder shall mark with his identification mark on each element welded by him. When welding is carried out in open air steps shall be taken to protect the places of welding against wind or rain. The electrodes wire and parts being weld on shall be dry. Before beginning the welding operation each joint shall be checked to assure that the parts to be welded are clean and root gaps provided as per IS: 9595. For continuing the welding of seams discontinued due to some reasons the end of the discontinued seam shall be melted in order to obtain a good continuity. Before resuming the welding operation the groove as well as the adjacent parts shall be well cleaned for a length of approximately 50 mm. For single butt welds (in V, ½ V or U) and double butt welds (in K, double U, etc.) the re-welding of the root butt is mandatory but only after the metal deposition on the root has been cleaned by back gouging 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 multilayer 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 unacceptable deformation appears in the welded parts. (b) due margin is provided to compensate for contraction due to welding in order to

avoid any high permanent stresses. The defects in welds must be rectified according to IS: 9595-1980 and as per instruction of engineer.

7.2.21. **Approval and testing of welders**

The contractor shall satisfy the engineer that the welder is suitable for the work upon which they will be employed.

7.2.22. **Weld inspection**

The weld seems shall satisfy the following

a) Shall correspond to design shapes and dimensions.(b)Shall not have any defects such as cracks, incomplete penetration and fusion under cuts, rough surfaces, burns, blow holes and porosity etc. beyond permissible. During the welding operation and approval of finished elements inspections and tests shall be made as shown in Table 1 below

Table 1 Extent of inspection and testing

Sl .No	Inspection of test	Coverage	Procedure	Evaluation and remedy of defects
1	Inspection of weld seam Appearance	All welds	Naked eye or lens	All faulty welds shall be rectified.
2	Checking of sizes	Atleast one for each weld seam	Ordinary measuring instruments (Rule template)	Should faulty weld be found, all welds shall be checked and all defects shall be rectified.
	Mechanical test for welding procedure, performance & electrodes.		As per IS: 9595	As per IS: 9595

The mechanical characteristics of the welded joints shall be as in IS: 9595.

7.2.23. **Quality of welds and corrections**

Welded joints shall be from defects that would impair the service performance of the construction. All welds shall be free from incomplete penetration, incomplete fusion, slag inclusion, burns, un-welded crators, undercuts and cracks in the weld metal or in the heat affected zone, porosity etc. Unacceptable undercutting shall be made good by grinding. In case of shrinkage cracks, cracks in parent plate and crator, defective portions shall be removed down to sound metal and re-welded. Whenever corrections necessitate the deposition of additional weld metal, electrode of a size not exceeding 4 mm may be used. Rectification of welds by caulking shall not be permitted.

7.2.24. **Cleaning -** All welds shall be cleaned of slag and other deposits after completion; till the work is inspected and approved, painting shall not be done.

7.2.25. **Plaining of ends**

Plaining of ends of members like Column ends shall be done by grinding where so specified. Plaining of but welded member shall be done after these have been assembled and the edges be removed with grinding machine or file.

The following tolerances shall be permitted on members that have been plained

a) The length of member having both ends plained max ± 2 mm with respect to design.
b) Level difference between plained surface = 0.3 mm.
c) Deviation between plained surface and member axis = max 1 /5000.

7.2.26. **Safety and health**

The contractor shall ensure that the safety requirements and health provisions laid down in IS: 818-1968 Code of Practice for safety and health requirements in electric and gas welding and cutting operations are complied with during welding operations. The contractors shall also provide equipment for eye and face protection during welding as laid down in IS: 1179-1967. Fire precautions shall be taken in accordance with IS: 3016-1982 Code of Practice for fire precautions in welding and cutting operations.

7.2.27. **Erection**

Erection works shall be performed in accordance with the general construction schedule. A scheme shall be worked before the commencement of the erection which shall also contain rules for safety precautions as detailed in IS: 7205-1973. (Safety Code for erection of structural steel work).

Anchor bolts for fastening of steel structures shall be set in designed position and grouted along with foundations. Alternatively anchor bolts should be provided in the concrete foundations with bolt boxes and anchor channels for the purpose of flexibility and grouted after final alignment and leveling of column. The gaps between the bearing surface of foundation and bottom of the structures to be erected shall be filled properly by cement grouting. Grouting shall be done after the verification and proper positioning of the structures but before encasing the structures with concrete if specified. Damaged structural members shall be examined and rectified or replaced as directed. The erected parts of the structure shall be stable during all the stages of errection; and structural elements to be erected shall be stable and strong to bear erection loads. Working on the already erected structures is permitted only after they are finally fixed. Erection of structures of each tier high structures shall be executed only after the relevant fastening of lower tier by the permanent or temporary fastening devices as per schedule of execution of work and certified for safety. The joint and mating surface including the mating planes, strips and filler or spacers shall be cleaned of dust, rust and water.

Erected structural members shall be firmly fastened by bolts and drifts, permanent or provisional tacking, crossing bars and so on before the erection crane book is removed. The trusses shall be lifted only at nodes. The trusses above 12 m span shall not be slinged at the apex, as it will develop compression stresses in the bottom tie member. It shall be lifted by

slinging at two mid points of rafters, which shall be temporarily braced by a wooden member of suitable section. After the trusses are placed in position, purlins and wind bracings shall be fixed as soon as possible. The end of truss which faces the prevailing winds shall be fixed with holding down bolts and the other end kept free to move. In case of small truss of span say up to 12 m the free end of the truss shall be laid on steel plate as per design and the holes for holding down bolts shall be made in the form of oblong slot so as to permit the free movement of the truss end. For large spans, the free end of the truss shall be provided with suitable rocker and roller bearing where indicated.

7.2.28. **Erection joints**

While erecting, holes to be riveted shall be fitted with temporary bolts and drifts of diameters equal to those of the holes. It is necessary to initial drifts for accurate matching of holes. Number of bolts and drifts shall not be less than 40 per cent of total number of holes. Forces applied to drifts shall be same as approved for rivets. Number of drifts shall be 10 per cent of number of holes.

The number, size and length of tack welds in erection joints bearing erection forces shall be as indicated. For the erection joints which do not bear the erection forces the length of tack welds shall be minimum 10 per cent of the designed weld length of the joints.

Welding, riveting and final fastening or permanent bolts shall be done only after the inspection of the structural elements for their positions. Head bolts and nuts shall perfectly be in touch with the surfaces of structures and washers.

7.2.29. **Tolerance allowed in erection**

Building without crane - The maximum Tolerance for line and level of steel structure shall be +/ 3.00 mm on any part of the structure. The structure shall not be out of plumb more than 5.00 mm each 10 metre section in height and not more than 7.00 mm per 30 metre section. These tolerances shall apply to all parts of structure unless otherwise specified.

Tolerance allowed in erection of steel structure containing cranes shall be as per following Table.

Table

Component	Description		Tolerance allowed
Main columns And roof posts	a i	Shifting of columns axis at foundation level with respect to building line: In longitudinal direction	± 5.00 mm
	ii	In lateral direction	± 5.00 mm
	b	Deviation of both major column axis from vertical between foundation and other member connection levels:	

	i	For a column upto and including 10 m height	± 5.00 mm from true vertical.
	ii	For a column greater than 10 m but less than 40 m height	± 5.00 mm from True vertical for any 10 M length measured between connection levels but not more than ± 8.00 mm for 30 m length.
	c	For adjacent pairs of columns across the width of the building prior to placing of truss.	± 5.00 on true span
	d	For any individual column deviation of any bearing or resting level from levels shown on drawings.	± 5.00 mm

	e	For adjacent pairs of columns either across the width of buildings or longitudinally level difference allowed between bearing or seating level supposed to be at the same level.	5.00 mm
Trusses	a	Deviation at centre of span or upper chord member from vertical plane running through centre of bottom chord.	1/500 of the span or 10 mm whichever is less.
	b	Lateral displacement of top chord at centre of span from vertical plane running through centre of supports.	1/250 of depth of truss or 20 mm whichever is less.

7.3. **Steel reinforcement**

Steel reinforcement for concrete - Steel reinforcement shall be mild steel bars, deformed bars, steel wire fabrics and of grade / types as indicated.

Mild Steel Bars shall be of grade I or grade II indicated and conforming to IS: 432 (Part I)-1982 and (part II) (Annexure 7-A.7 & 7-A.8) Specification for mild steel and medium tensile steel bars. Alternatively mild steel shall be of grade Fe 410S conforming to IS: 226-1975 of or grade Fe 4100 conforming to IS: 1977-(1975) as indicated. The limitations, on the use of mild steel bars or of grade Fe 4100 as given under structural steel shall apply. Deformed Bars shall conform to IS: 1786-1979 Specifications for High strength deformed bars and wires for

concrete reinforcement- enclosed as Annexure 7-A.9. Fabric reinforcement shall conform to IS: 1566-(1982) Specification for hard drawn steel wire fabrics for concrete reinforcement.

7.3.5. **Tolerance on size of reinforcement bars**

The tolerance on diameter of the mild steel bars shall be ± 0.5 mm for bars up to and including 25 mm with a total margin of 1mm and ± 0.75 mm for bars above 25 mm dia with total margin of 1.5 mm. The tolerance on the diameter in the case of coiled round bars shall be ± 0.5 mm up to and including 12 mm diameter with a total margin of 1 mm. Measurement shall be taken at point sufficiently away from the ends ensuring exclusion of heavy ends.

7.3.6. **Tolerance on weight**

The tolerance on weight of plain and deformed round shall be ± 4 per cent with a total margin of 8 per cent for bars up to and including 8 mm diameter and ± 2.5 percent for bars over 8 mm diameter with a total margin of 5 percent.

Tolerance on weight of fabric reinforcement shall be ± 6 per cent.

7.3.7. **Freedom from defects**

All finished bars shall be well and cleanly rolled to the dimensions and weights specified; these shall be sound and free from cracks, surface flaws, laminations and rough, jagged and imperfect edges and other defects and shall be finished in a workman like manner.

Steel reinforcement shall be stored as to prevent distortion and corrosion. Any reinforcement that has deteriorated or corroded or is considered defective by the engineer shall not be used in the work. Bars of different classification, sizes and lengths shall be stored separately to facilitate use in such sizes and lengths as to minimise wastage in cutting from the standard lengths.

7.3.8. **Bends and hooks forming end anchorages**

Ends of plain round mild steel bars shall be bent to radius of not less than 2 diameters and the straight portion beyond the curve shall not be less than 4 diameters unless otherwise indicated. In the case of deformed bars, bends shall be made to radius of 4 times the diameter of the bar and straight portion beyond the curve shall not be less than 4 diameters, unless otherwise indicated. Ends of deformed bars are not bent to form hooks. In the case of binders, stirrups, links, etc., the straight portion beyond end of the curve at the end shall be not less than 8 times the nominal size of the bar

Bars specified to be formed to radii exceeding those given in Table X of IS 2502-1963 Code of practice for bending and fixing of bars for concreting, need not be bent but the required curvature may be obtained during the placing.

7.3.9. **Bending of bars**

Bars shall be bent to shape cold except that bars larger than 25 mm in size may be bent hot at cherry red heat (not exceeding 850 degree C). Hot bar shall not be cooled by quenching. A bar which shows any sign of cracks at a bend shall be rejected.

Fig. 1 Welds and Rivets

7.3.10. **Splicing**

Where bars required are longer than those carried in stock, splices shall be provided as far as possible, away from the section of maximum stress and be staggered. The use of short length bars shall not be permitted. IS: 456-1978 Code of practice for plain and reinforced concrete recommends

that splices in flexural members should not be at sections where the bending moment is more than 50 per cent of the moment of resistance ; and not more than half the bars shall be spliced at a section.

7.3.11. **Lap splices**

Lap splices shall not be used for bars larger than 36 mm dia, larger diameter bars may be welded, in cases where welding is not practicable, lapping of bars larger than 36 mm dia may be permitted in which case additional spirals shall be provided around the lapped bars. Lap length shall be not less than 30 diameters for flexural tension and direct tension and not less than 24 diameters for compression. When bars of two different diameters are to be spliced the lap length shall be calculated on the basis of diameter of the smaller bar. End bearing splices shall be used only for the bars in compression. The ends of the bars shall be square out and concentric bearing ensured by suitable devices. When larger diameters have to be welded to avoid congestion rather than lapped for splicing, the method of welding shall be as directed. The location of staggered welds at heights or position shall be convenient for welding.

7.3.12. **Spiral reinforcement**

Spirals shall be provided with one and a half extra turns at both top and bottom. Where necessary to splice the spiral it shall be done by a lap of one and a half turns or by shop welding.

7.3.13. **Placing and fixing of bars**

Reinforcements shall be placed in position as per detailed design drawing and shall be secured at that position. In case of delay occurring between fixing of reinforcement and concreting, the position of the reinforcement shall be checked prior to concreting. Bars crossing each other shall be secured by binding wire (annealed) of size not less than 0.9 mm, and conforming to IS: 280-1977. Specification for mild steel wire, in such a manner that they will not slip over each other at the time of fixing and concreting. Every compression bar shall be tied at least in two perpendicular directions.

7.3.14. **Cover blocks**

Cover blocks generally of cement mortar shall be used to ensure the required cover for the reinforcement. The mortar or concrete used for the cover blocks or rings shall be not leaner than the mortar or concrete in which they would be embedded.

7.3.15. **Spacers**

Where multiple rows of reinforcement are provided distances between successive rows shall be properly maintained while concreting by providing suitable spacer bars.

7.3.16. **Placing reinforcements**

All mill scale, loose or scaly rust, oil and grease or any coating that will destroy or reduce bond shall be thoroughly cleaned off the steel reinforcement with a stiff wire brush or other

approved means before it is placed in forms. Steel reinforcement when placed in the forms shall be properly braced, supported, or otherwise held firmly in position so that placing and ramming / vibrating of concrete does not displace it. It shall be ensured that all the reinforcement can be properly placed. Congestion of steel shall be avoided at points where members intersect.

7.3.17. **Tolerance in placing of reinforcement**

Unless otherwise indicated, reinforcement shall be placed within following tolerance.

(a) For effective depth 200 mm or less ± 10 mm (b) For effective depth more than 200 mm or ± 15 mm

The cover shall in no case be reduced by more than 1/3 of specified cover or 5 mm whichever is less.

7.3.18. **Steel wire fabric reinforcement**

Hard drawn steel fabric shall conform to IS 1566-1982 – Specification for hard drawn steel wire fabric for concrete reinforcement, MESH size, weight, size of wire for square and oblong welded shall be indicated. The fabric shall be formed by spacing the main and the cross wire, which shall be fixed at the point of intersection by electric welding.

Since fabric is supplied in long rolls it is rarely necessary to have a joint of the main wires. In structural slab laps in regions, of maximum stress shall be avoided. When splicing of welded wire fabric is to be carried out, lap splices of wires shall be made so that overlap measured between the extreme cross wires shall be not less than the spacing of cross wires plus 10 cm. For edge laps a lap of 5 cm shall be provided.

7.3.19. **Welding of reinforcement**

Welding of bars where indicated or agreed to by the engineer, in writing, in lieu of lapping shall be done in accordance with IS: 2751-1979, Code of practice for welding of concrete construction. Welding in general shall be done as described for structural steel work.

Bars up to and including 20 mm dia shall be lap welded and those larger than 20 mm dia shall be butt welded. In case of lap welds, the length of lap shall be five times the dia or 100 mm whichever is greater. The throat thickness shall not be less than 3 mm for bars up to 16 mm dia and 5 mm for bars over 16 mm dia and up to 20 mm dia.

7.3.20. **Butt welding**

Where it is not possible to rotate bars for welding in flat positions the axis of the bars shall be horizontal and the respective axis of welds shall be vertical. The edge preparation for inclined bars shall be such that welding is done only on sides. All the bars to be butt welded shall be aligned and set up in position with their axis in one straight line. This may be done in a jig or by means of a clamp or by using guides. Rotation of the bars shall be avoided, until they are adequately welded.

7.3.21. **Lap welding**

Edge preparation is not necessary for lap welds.

7.3.22. **Finish**

The profile of the welds shall be uniform, slightly convex and free from overlap at the toes of the welds. The weld face shall be uniform in appearance throughout its length. The welded joint shall be free from undercut. The joints in the weld run shall be as smooth as practicable and shall show no pronounced hump or crater in the weld surface. The surface of the weld shall be free from porosity, cavities and trapped slag.

7.4. SPECIFICATIONS FOR STEEL WORK IN SINGLE SECTION FIXED INDEPENDENTLY WITH CONNECTING PLATE

7.4.1. The steel work in single sections of R. S. joists, flats, Tees Angles fixed independently with or without connecting plate, is described in these clauses.

7.4.2. **Fabrication**

The steel sections as specified shall be straightened and cut square to correct lengths and measured with a steel tape. The cut ends exposed to view shall be finished smooth. No two pieces shall be welded or otherwise jointed to make up the required length of a member.

All straightening and shaping to form, shall be done by pressure. Bending or cutting shall be carried out in such a manner as not to impair the strength of the metal.

7.4.3. **Painting**

All surfaces which are to be painted, oiled or otherwise treated shall be dry and thoroughly cleaned to remove all loose scale and loose rust. Surfaces not in contact but inaccessible after shop assembly, shall receive the full specified protective treatment before assembly. This does not apply to the interior of sealed hollow sections. Part to be encased in concrete shall not be painted or oiled. A priming coat of approved steel primer i.e. red oxide zinc chrome primer conforming to IS: 2074 shall be applied before any member of steel structure are placed in position or taken out of workshop.

7.4.4. **Erection**

Steel work shall be hoisted and placed in position carefully without any damage to itself and other building work and injury to workmen. Where necessary mechanical appliances such as lifting tackle winch etc shall be used. The suitability and capacity of all plant and equipment used for erection shall be to the satisfaction of the engineer.

7.4.5. **Measurements**

The work as fixed in place shall be measured in running metres correct to a millimeter and weights calculated on the basis of standard tables correct to the nearest kilogram.

Unless otherwise specified, weight of cleats, brackets, packing pieces, bolts, nuts, washers, distance pieces, separators, diaphragm, gussets (taking overall square dimensions) fish plates, etc., shall be added to the weight of respective items. In riveted work, allowance is to be made for weight of rivet

heads. Unless otherwise specified an addition of 2.5% of the weight of structure shall be made for shop and site rivet heads in riveted steel structures.

No deduction shall be made for rivet / or bolt holes (excluding holes for anchor or holding down bolts).

Deduction in case of rivet or bolt hole shall however be made if its area exceeds 0.02 sqm.
The weight of steel sheets, plates and strips shall be taken from relevant Indian Standards based on 7.85 kg/m2 for every millimetre sheet thickness. For rolled sections, steel rods and steel strips, weight given in relevant Indian Standards shall be used.

7.4.6. **Rate**

Rate includes the cost of labour and materials required for all the operations described above.

9.33. **SPECIFICATIONS FOR DOOR, WINDOW AND VENTILATOR FRAMES**

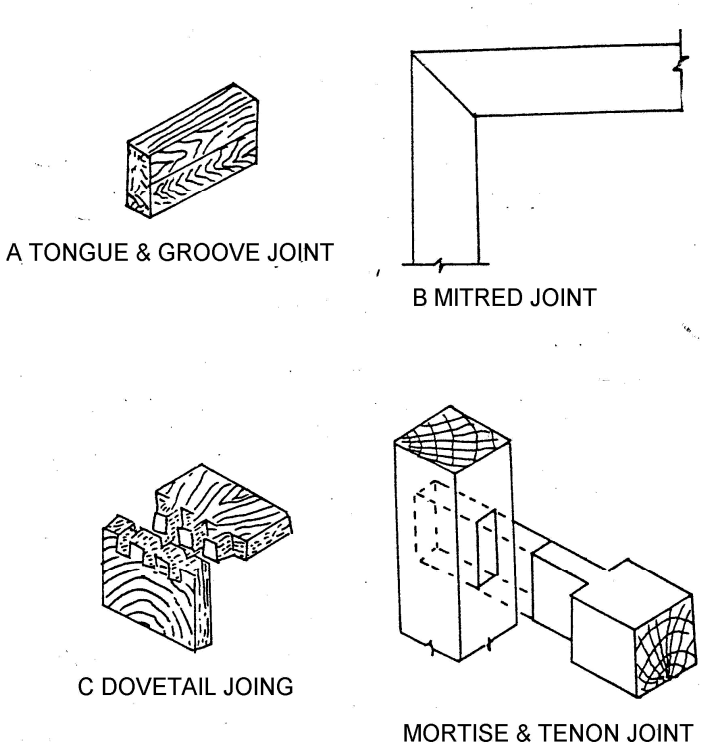
9.33.1. Timber for door, window and ventilators frames shall be as specified. Timber shall be sawn in the direction of the grains. All members of a frame shall be of the same species of timber and shall be straight without warp or blow. Frames shall have smooth, well-planed (wrought) surfaces except the surfaces touching the walls, lintels, sill etc., which may be left clean sawn. Rebates, rounding or moulding shall be done before the members are jointed into frames. The depth of the rebate for housing the shutters shall be 15 mm, and the width of the rebates shall be equal to the thickness of the shutters. A tolerance of +/- 3 mm and 2 mm shall be permitted in the specified finished dimensions of timber sections in frames.

9.33.2. **Joints -** The frames shall have dovetail joints Fig. 1. The Jamb posts shall be through tenoned in to the mortise of the transoms to the full thickness of the transoms and the thickness of the tenon shall be not less than 2.5 cm. The tenons shall closely fit into the mortise without any wedging or filling. The contact surface of tenon and mortise before putting together shall be glued with polyvinyl acetate dispersion based adhesive conforming to IS: 4835 or adhesive conforming the WBP or MR grade of IS: 851 and pinned with 10 mm dia hard wood dowels, or bamboo pins or star shaped metal pins. The joints shall be at right angles when checked from the inside surfaces of the respective members. The joints shall be pressed in position. Each assembled door frame shall be fitted with a temporary stretcher and a temporary diagonal brace on the rebated faces.

9.33.3. **Fixing of frames -** The frames shall be got inspected approved by the engineer before being pinned, oiled or otherwise treated and before fixing in position. The surface of the frames abutting masonry or concrete and the portions of the frames embedded in floors shall be given a coating of coal tar. Frames shall be fixed to the abutting masonry or concrete with hold fasts or metallic fasteners as specified. After fixing, the jamb posts of the frames shall be plugged suitably and finished neat. Vertical members of the door frames shall be embedded in the floor for the full thickness of the floor finish and shall be warping during construction. A minimum of three hold fasts shall be fixed on each side of door and window frames one at centre point and other two at 30 cm from the top and bottom of the frames. In case of window and ventilator frames of less than 1 m in height two hold fasts shall be fixed on each side at quarter point of the frames. Hold fasts and metallic fasteners shall be measured and paid for separately.

9.33.4. **Measurements -** Wood work wrought, framed and fixed shall be measured for finished dimension without any allowance for the wastage or for dimensions beyond specified

dimension without any allowance for the wastage or for dimension beyond specified dimensions. However, in case of members having mouldings, roundings or rebates and members of circular or varying sections, finished dimensions shall be taken as the sides of the smallest square or rectangle from which such a section can be cut. Length of each member shall be measured over all to the nearest cm so as to include projection for tenons. Width and thickness shall be measured to the nearest mm and the quantity shall be worked out in unit of 10 cubic decimetre in whole numbers.



6. Fig. 1 Joints in timber

9.33.5. **Rate -** The rate shall include the cost of material and labour involved in all the operational described above except the hold fasts or metallic fasteners which will be paid for separately.

SPECIFICATIONS FOR READY MIXED CONCRETE

4.5.1 Ready Mixed Concrete - Concrete delivered at site or into the purchaser's vehicle in a plastic condition and requiring no further treatment before being placed in the position in which it is to set and harden.

4.5.1.1 Agitation-The process of continuing the mixing of concrete at a reduced speed during transportation to prevent segregation.

4.5.1.2 Agitator-Truck mounted equipment designed to agitate concrete during transportation to the site of delivery.

4.5.1.3 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.

4.5.2 Types

For the purpose of this standard, the ready-mixed concrete shall be one of the two types, according to the method of production and delivery as specified in 4.5.3.1 and 4.5.3.2.

4.5.2.1 Centrally-mixed concrete – Concrete produced by completely mixing cement, aggregates, admixtures, if any and water at a stationary central mixing plant and delivered in containers fitted with agitating devices, except that when so agreed to between the purchaser and the manufacturer, the concrete may be transported without being agitated.

4.5.2.2 Truck-mixed concrete - Concrete produced by placing cement, aggregates and admixtures, if any, other then those to be added with mixing water, in a truck mixer at the batching plant, the addition of water and admixtures to be added along with mixing water,

and the mixing being carried out entirely in the truck mixer either during the journey or on arrival at the site of delivery. No water shall be added to the aggregate and cement until the mixing of concrete commences.

4.5.3. Materials

4.5.3.1 Cement - The cement used shall be ordinary Portland cement or low heat Portland cement conforming to IS: 269-1989 or 8112-1989 or 1226:1987 or Portland slag cement conforming to IS: 455-1989 or 'Portland-pozzolana cement conforming to IS: 1489-1991 or rapid hardening Portland cement conforming to IS: 8041-1976 as may be specified by the purchaser at the time of placing the order. If the type is not specified, ordinary Portland cement shall be used.

Fly ash when used for partial replacement of cement, shall conform to the requirements of IS:3812 -1981

4.5.3.2. Aggregates - Unless otherwise agreed to between the purchaser and the manufacturer, the aggregates shall conform to IS: 383-1970. Fly ash when used as fine aggregate shall conform to the requirements of IS: 3812-1981.

4.5.3.3. Water used for concrete shall conform to the requirements of IS: 456-2000.

4.5.3.4, Admixtures – Admixtures shall only be used when so agreed to between the purchaser and the manufacturer. The admixtures shall conform to the requirements of IS: 456-2000, 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: 3812-1981.

4.5.3.5, Measurement and storage of materials – Measurement and storage of materials shall be done in accordance with the requirements of IS: 456-2000.

4.5.4 Basis of supply

4.5.4.1 Depending upon the agreement between the purchaser and the manufacturer, the ready-mixed concrete shall be manufactured and supplied on either of the following basis:

a) Specified strength based on 28-day compressive strength of 15-cm cubes tested in accordance with IS: 456-2000.

b) Specified mix proportion.

Note - Under special circumstances and subject to the agreement between the purchaser and the supplier, strength of concrete in (a) above may be based on 28-day or 7-day flexural strength of concrete instead of compressive strength of 15-cm cube tested in accordance with IS: 456-2000.

When the concrete is manufactured and supplied on the basis of specified strength, the responsibility for the design of mix shall be that of the manufacturer and the concrete shall conform to the requirements.

When the concrete is manufactured and supplied on the basis of specified mix proportion, the responsibility for the design of the mix shall be that of the purchaser and the concrete shall conform to the requirements.

4.5.4.2 Measurement of Ready-mixed concrete

The basis of purchase shall be the cubic meter of plastic concrete as delivered to the purchaser.

The volume of plastic concrete in a given batch shall be determined from the total mass of the batch divided by the actual mass per m^3 of concrete. The total mass of the batch shall be calculated either as the sum of the masses of all materials, including water, entering the batch or as the net mass of concrete in the batch as delivered. If the purchaser wishes to verify the total mass, of the batch, this shall be obtained from the gross and tare masses of the vehicle on a stamped weigh bridge. The mass per m^3 shall be determined in accordance with the method given in IS:1199-1959.

4.5.5 General requirements

4.5.5.1. In addition to the requirements specified in this standard and subject to such modifications as may be agreed to between the purchaser and the manufacturer at the time of placing order, the ready-mixed concrete shall generally comply with the requirements of IS:456-2000.

Unless otherwise agreed to between the purchaser and the supplier, the minimum quantity of cement and the details regarding proportioning and works control shall be in accordance with IS:456-2000.

When a truck mixer agitator is used for mixing or 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 work, the slump of the concrete is less than that specified; such additional water to bring the slump within required limits shall be injected into the mixer under such pressure and direction of flow that the requirements for uniformity specified in Appendix. A are met.

Unless otherwise agreed to between the purchaser and the supplier, when a truck mixer or agitator is used for transporting concrete, the concrete shall be delivered to the site of work and discharge shall be complete within 1½ hour (when the prevailing atmospheric temperature is above 20º C) and within 2 hours (when the prevailing atmospheric temperature is at or below 20º 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.

4.5.5.2 Temperature - The temperature of the concrete at the place and time of delivery shall be not less than 5º C. Unless otherwise required by the purchaser, no concrete shall be delivered, when the site temperature is less than 2.5º C and the thermometer reading is falling.

The temperature of the concrete shall not exceed 5º C above the prevailing shade temperature, when the shade temperature is over 20º C. The temperature of concrete mass on delivery shall not exceed 40º C.

4.5.5.3. Sampling and testing - Adequate facilities shall be provided by the manufacturer for the purchaser to inspect the materials used, the process of manufacture and the methods of delivery of concrete. He shall also adequate facilities for the purchaser to take

samples of the materials used.

Unless otherwise agreed to between the purchaser and the supplier, the sampling and testing of concrete shall be done in accordance with the relevant requirements of IS: 456-2000, IS:1199-1959 and IS: 516-1959

Consistency or workability – The tests for consistency or workability shall be carried out in accordance with requirements of IS: 1199-1959 or by such other method as may be agreed to between the purchaser and the manufacturer.

4.5.5.4. 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 mentioned below.

Compressive strength - The concrete shall be deemed to comply with the strength requirements when both the following conditions are met:

a) The mean strength determined from any group of four consecutive test results compiles with the appropriate limits in col. 2 of Table.

b) Any individual test result complies with the appropriate limits in col.3 of Table.

Flexural strength - When both the following conditions are met, the concrete complies with the specified flexural strength.

a) The mean strength determined from any group of four consecutive test results exceeds the specified characteristic strength by at least 0.3 N/mm².

b) The strength determined from any test result is not less than the specified characteristic strength less 0.3 N/mm².

4.5.5.5. Quantity of concrete represented by strength test results - The quantity of concrete represented by a group of four consecutive test results shall include the batches from which the first and last samples were taken together with all intervening batches.

For the individual test result requirements given in col.2 of Table 9 or in item (b) of 16.2 only the particular batch from which the sample was taken shall be at risk.

Where the mean rate of sampling is not specified the maximum quantity of concrete that four consecutive test results represent shall be limited to 60m³.

f the concrete is deemed not to comply, the structural adequacy of the parts affected shall be investigated and any consequential action as needed shall be taken.

Concrete of each grade shall be assessed separately.

Concrete is liable to be rejected if it is porous or hone-combed, its placing has been interrupted without providing a proper construction joint, the reinforcement has been displaced beyond the tolerances specified, or construction tolerances have not been met. However, the hardened concrete may be accepted after carrying out suitable remedial measures to the satisfaction of the engineer-in-charge.

Table 9 Characteristic compressive strength compliance requirement

Specifi	Mean of Group of 4 Non-Overlapping	Individual Test Results in

ed Grade	Consecutive Test Results in N/mm².	N/mm².
(1)	(2)	(3)
M15	≥ fα +0.825 x established standard deviation (rounded off to nearest 0.5 N/mm².	≥ fα N/mm².
M 20 or above	fα + 3 N/mm², whichever is greater + 0.825 x established standard deviation (rounded off to nearest 0.5 N/mm²) or ≥ fα +4 N/mm², whichever is greater	≥ fα N/mm².
Note:- In the absence of established value of standard deviation, the value given in Table 8 of IS:456-2000 may be assumed, and attempt should be made to obtain results of 30 samples as early as possible to establish the value of standard deviation.		

4.5.5.6 Cost of testing – Unless otherwise agreed to between the purchaser and the manufacturer, the cost of the tests carried out in accordance with the requirements of this specification shall be borne as follows:

a) By the manufacturer if the results show that the concrete does not comply with the requirements of this standard.

b) By the purchaser if the results show that the concrete complies with the requirements of this standard.

4.5.5.7 Manufacturer's records and certificates – The manufacturer shall keep batch records of the quantities by mass of all the solid materials, of the total amount of water used in mixing and of the results of all tests. If required by the purchaser, the manufacturer shall furnish certificates, at agreed intervals, giving this information.

4.5.6. Concrete manufactured and supplied on the basis of specified strength

4.5.6.1 The purchaser shall supply the following information for guidance of the manufacturer :

a) The type of cement to be used;

b) The maximum size and type of the aggregate;

c) The type of admixtures to be used;

d) The minimum acceptable compressive strength of flexural strength or both, determined from samples of plastic concrete taken at the place and time of delivery, in accordance with requirements of IS:456-2000.

e) The slump or compacting factor or both, or other requirements for consistency or workability at the place and time of delivery of the concrete;

f) The ages at which the test cubes or beams are to be tested, and the frequency and the

number of tests to be made; and

g) Any other requirements.

4.5.6.2 Tolerances – Unless otherwise agreed to between the purchaser and the manufacturer, the concrete shall be deemed to comply with the requirement of these standard, if the results of tests where applicable, lie within the tolerances specified.

4.5.6.3. Consistency of workability – The slump (average of two tests) shall not differ from the specified value by ± 10 mm for a specified slump of 75mm or less and ± 25mm when the specified slump is greater than ± 75m. The compacting factor average of two tests shall be within 0.03 of the value specified. If any other method of determining consistency is to be used, a suitable tolerance shall be agreed to between the purchaser and the manufacturer. The test for consistency or workability shall be completed within 15 minutes of the time of receipt of the ready-mixed concrete at the site.

4.5.6.4. Aggregates – When tested in accordance with IS: 2386(Part I)-1963, the quantity of aggregate larger than the maximum size specified by the purchaser shall not exceed 5 percent of the quantity of coarse aggregate and all such excess shall pass through sieve (conforming to IS: 460 (Part 1-3)-1985 of the next higher size.

4.5.7. Concrete manufactured and supplied on the basis of mix proportion

4.5.7.1 The purchaser shall supply the following information for guidance of the manufacturer:

a) The type of the cement to be used;

b) The sizes and types of the aggregate;

c) The type of admixtures to be used;

d) The proportions of the mix including the maximum water cement ration at the place and time of delivery of the concrete;

e) The minimum mixing time after addition of the water; and

f) Any other requirements.

Tolerances – Unless otherwise agreed to between the purchaser and the manufacturer, the concrete shall be deemed to comply with the requirements of this standard, if the result of tests where applicable, lie within the tolerance specified.

Cement content – The cement content, as shown by the samples taken, shall be not less than 95 percent of that specified.

Ratio of coarse to fine aggregates – The ratio of coarse to fine aggregates, as indicated by the sample taken, shall neither exceed nor fall below the ration specified by the purchaser by more than 10 percent.

Water / cement ratio - ± 5 percent of the specified value.

Consistency or workability – The slump shall not differ from the amount specified by ± 10mm for a specified slump of 75 mm or less and ± 25mm when the specified a slump is greater than 75mm. The compacting factor shall be within ± 0.03 of the value specified. If any other method of determining consistency is used, a suitable tolerance shall be agreed to

between the purchaser and the supplier.

APPENDIX A

Concrete uniformity requirement

A-1 Tests

A-1.1 The variation within a batch as provided in Table 10 shall determined for each property listed as the difference between the highest value and the lowest value obtained from the different portions of the same batch. For this specification the comparison shall be between two samples, representing the first and last portions of the batch being tested. Test results conforming to the limits of five of the six tests listed in Table I shall indicate uniform concrete within the limits of this specification. Analysis of concrete samples shall be made in accordance with the relevant requirements of IS: 1159-1959.

A.2. Coarse aggregate content

A-2.1 Coarse aggregate content shall be determined using the following equation:

$$p = \frac{c}{b} \times 100$$

Where

P= Percentage of coarse aggregate by mass in concrete;

c= saturated surface dry mass in kg of aggregate retained on 4.75 mm IS Sieve, resulting from washing all material finer than this sieve from the fresh concrete; and

b= mass of sample, in kg of fresh concrete in unit mass container.

Table 10 Requirements for uniformity of concrete

Sl. No.	Test	Requirement expressed as maximum permissible difference in results of tests or samples representing the first and last portions or concrete batch
1	2	3
i)	Mass per cubic meter calculated to an air-free basis	16 kg/m³
ii)	Air-content, percent by volume of concrete	1.0
iii)	Slump:	
	If average slump is 10cm or less	2.5 cm
	If average slump is 10 to 15 cm	3.8 cm
iv)	Coarse aggregate content, percent (portion by mass of each sample	6.0

	retained on 4.75-mm IS Sieve)	
v)	Unit mass of air-free mortar, percent based on average for all comparative samples tested	1.6
VI)	Average compressive strength at 7 days for each comparative test specimens, percent	7.5

A-3. Unit mass of air free mortar

A-3.1 Unit mass of air free mortar shall be calculated as follows:

$$M = \frac{b - c}{V = \left\{ \frac{V \times A}{100} + \frac{c}{1000G} \right\}}$$

Where

M= Unit mass of air free mortar in Kg/m³

b= mass of concrete sample in unit mass container in kg,

c= saturated-surface-dry mass of aggregate in kg retained on 4.75mm IS Sieve,

V= Volume of unit mass container in m³

A= air content of concrete in percent measured in accordance with the relevant requirements of IS:1199-1959*, and

G = specific gravity of coarse aggregate.

3.STEEL, IRON AND ALLUMINIUM WORKS

7.1 **Materials**

7.1.1. **Steel -** All finished steel shall be well and cleanly rolled to the dimensions and weight specified by Bureau of Indian Standards subject to permissible tolerances as per IS: 1852. A List of BI Standards applicable to this section is Annexure 7-A.1. The finished materials shall be reasonably free from cracks, surface flaws laminations, rough and imperfect edges and all other harmful defects.

7.1.2. Steel sections, shall be free from excessive rust, scaling and pitting and shall be well protected. The decision of the engineer regarding rejecting any steel section on account of any of the above defects shall be final and binding.

7.1.3. Structural steel work shall conform to the following requirements. The following varieties of steel should be used for structural purposes

7.1.4. **S.T. 42S -** The standard quality steel designated as ST–42S, conforming to IS: 226 shall be used for all types of structure (riveted or bolted) including those subject to dynamic loading and where fatigue, wide fluctuation of stresses are involved, as for example crane gantry girders, road and rail bridges etc. It is also suitable for welded structures provided that the thickness of materials does not exceed 20 mm.

7.1.5. **S.T. 42W -** The fusion welding quality steel designated as S.T. 42W, conforming to IS: 2062 shall be used for structures subject to dynamic loading (Wind load is not to be considered as dynamic load for this purpose) where welding is employed for fabrication and where fatigue, wide fluctuation of, stresses reversal of stress and great restraint are involved as for example, crane gantry girders and road and rail bridges.

7.1.6. **S.T. 420 -** The ordinary quality steel designated as S. T. 420 conforming IS: 1977 shall be used for structures not subjected to dynamic loading other than wind loads where welding is not employed or / and structures not situated in earth quake zones or / and design has not been based on plastic theory.

7.1.7. **S.T. 320 -** The ordinary quality steel designated as S. T. 420 conforming to IS: 1977 shall be used for doors, window frames, window bars, grills, steel gates, hand railing, builders hardware, fencing post, tie bars etc.

7.1.8. Casting shall be cast from cast iron of grade FG 150 conforming to IS: 210-1978, Specification for grey iron castings. The castings shall be sound, clean and free from porosity, blow holes, hard spots, cold shuts (i.e. irregularities due to casting at too low a temperature), distortion and other harmful defects. They shall be well dressed and fettled, accurately moulded in accordance with the pattern/drawing and shall be of uniform thickness except where the design necessitates variation. Abrupt changes in the section of adjoining members shall be avoided as far as possible. Unless otherwise indicated edges of castings shall be rounded and internal angles finished with an angle fillet. No welding or repairs shall be carried out, unless otherwise indicated.

7.1.9. **Rivets -** Rivets shall be made from rivet bars of mild steel as per IS: 1148-1982. High tensile rivet bars shall conform to IS: 1149-1982.

7.1.10. **Bolts -** These are of two type's namely turned and fitted bolts and black bolts. Turned & fitted bolts are turned to exact diameter in automatic lathe. For these bolts, whether reamed or drilled bolts, the same unit stresses are allowed as for rivets. In case of black bolts which are not finished to exact sizes, a lower working stress other than for turned bolts is adopted. They shall conform to IS: 1367 Technical supply conditions for threaded steel fasteners.

7.1.11. **Electrodes -** The electrodes required for metal arc welding shall be covered electrodes and shall conform to IS: 814-1991.

7.2. **Workmanship – General**

7.2.1. Structural steel work riveted, bolted or welded shall be carried out described in IS: 800-1984, Code of practice for use of structural steel in general building construction.

7.2.2. **Straightening and bending -** All material shall be straight and if necessary, before being worked shall be straightened and flattened by pressure, unless required to be of curvilinear form and shall be free from twists. Straightening of steel by hammer blows is not permitted. All bending and cutting shall be carried out in cold condition, unless otherwise directed, in such manner as not to impair the strength of the metal.

7.2.3. **Cutting and machining -** Member shall be cut mechanically by saw or shear or by oxyacetylene flame. All sharp rough or broken edges and all edges of joints which are subjected to tensile or oscillating stresses shall be grounded. No electric metal arc cutting shall be allowed. All edges cut by oxyacetylene pores shall be cleaned of impurities and slag prior to assembly, cutting tolerance shall be as follows (a) For member connected at ends ± 1 mm. (b) Elsewhere ± 3 mm.

When compression members depend on contact surfaces for stress transmission, then ends of columns and bases together with gussets, angles and channels (after riveting / welding together) shall be accurately measured so that the parts connected butt over the entire surfaces of contact. Columns at bases or at caps or at butt joints need to be machined.

7.2.4. **Holes -** All holes shall be accurately marked and drilled. Holes through more than one thickness shall preferably be drilled together after the members are assembled and tightly clamped or bolted together. In such cases, if required, these parts shall be separated after drilling and burrs removed. For thickness of materials less than 16 mm the holes may be punched 3 mm less in diameter than the required size and may be reamed to the full diameter after assembly. Finished holes for rivets and black bolts shall be more than 1.5 mm (2.0 mm for rivets and bolts of diameter more than 25 mm) in diameter larger than the diameter of rivets and bolts passing through them. All matching holes for rivets shall be so prepared that a gauge 0.8 mm diameter less than the hole can pass freely through the members assembled for riveting. Holes other than those required for close tolerance may be punched full size through material not less than 12 mm thick.

All holes shall have their axis perpendicular to the surface bored through Holes through two or more members shall be truly concentric. No rivet or bolt hole shall be nearer the edge of the member than a distance equal to its own diameter. Holes shall not be formed by gas cutting process.

7.2.5. **Assembly**

7.2.5.1. **Laying out -** Steel structure shall be laid out on a level platform to full scale and to full size or in parts as shown on working drawings or as directed by engineer. Wooden templates 12 mm to 19 mm thick or metal sheet templates shall be made to correspond to each member and part; rivet holes shall be marked accurately on them and drilled. The templates shall be laid on the steel members and holes for riveting and bolting marked on them. The ends of the steel members shall also be marked for cutting. The base of steel columns and the positions of anchor bolts shall be carefully set out. The component parts shall be assembled in such a manner that they are neither twisted nor otherwise damaged and shall be so prepared that the specified cambers, if any, are provided. All box sections shall be sealed so as to prevent the access of moisture to the inside of the members.

Assembly shall be done by using assembly fixtures, jigs and stands which facilitate high quality assembly with proper safety. Misalignment and distortion of parts after assembly

shall not be allowed; only thoroughly straightened parts free from burrs, grease, rust, etc. shall be allowed for assembly.

Temporary connection of parts during assembly shall be done in the following way:

a) For welded structures joining shall be done by means of tack weld, fastening devices and fixtures.

b) For riveted and bolted structures joining shall be done by adequate number of bolts. If tack welding is permitted, in such cases the same shall be removed after the work is over.

c) For riveted structures in which holes are to be drilled after assembly, joining shall be done by appropriate fixtures.

Tack welding shall be done on the side and along the line of the weld. Tack weld dimension all be minimum, welding being carried out with similar electrodes as the final welding and the tacks shall completely fuse with the final weld metal. In case splicing is necessary, the individual members shall be spliced first before assembly and before final welding with other members.

For riveted structures, members shall be well tightened by assembly bolts in every third hole maximum distance between bolts shall not exceed 500 mm. To prevent stiffening drift pins shall be used 30 per cent of the assembly bolts. After tightening, the gap between members to be jointed shall be checked by 0.2 mm thick feeler gauge which should not go inside by more than 2 mm, looseness of bolts shall be checked by tapping with a test hammer.

7.2.6. **Riveting**

Riveting shall be done by pneumatic riveting or hydraulic riveting equipment, riveting of diameter less than 10 mm may be fitted cold. In cold riveting the rivets are driven with the aid of powerful pneumatic or electrical clamps and the holes filled with sufficient tightness. However where such facilities are not available, hand riveting may be permitted by the engineer.

Members to be riveted shall be properly pinned, or bolted and rigidly held together while riveting. Rivets shall be heated uniformly throughout the length without burning or excess scaling and shall be of sufficient length to provide ahead of standard dimension. They shall, when driven, completely fill the holes and if countersunk, the countersinking shall be fully filled by the rivet. Any proudness of countersunk head shall be dressed off flush. All loose, burnt and badly formed or otherwise defective rivets shall be cut out and replaced before the structure is loaded. The heads of rivets shall be central to shanks and shall grip the assembled members firmly. In cutting out rivets care shall be taken so as not to injure the assembled members. Caulking or recupping shall not be permitted.

7.2.7. **Bolting**

Bolt heads and nuts shall be of such length as to project one clear thread beyond the nuts when fixed in position, and these shall fit in the holes without any shake. The nuts shall fit in the threaded ends of bolts properly.

Round washers shall be placed under the heads and nuts of permanent bolts. Maximum two washers for one nut and one for each bolt head shall be used. Both threads shall be outside the limits of joining members and unthreaded portion of bolt shall not be outside the washer.

Where there is risk of the nuts being removed or becoming loose due to vibration or reversal of stresses, these shall be secured from slackening by the use of lock-nuts or spring washers, as directed by the engineer. Bolts, nuts and washers shall be thoroughly cleaned and dipped in double boiled linseed oil before use. Quality of lightening of bolts shall be inspected by tapping them with a hammer. The bolt shall not be shaken or shifted. The bolts shall be tightened starting from centre of the joint towards the edge.

7.2.8. **Welding**

Welding shall be done by metal arc process unless otherwise permitted by the engineer, in writing, in accordance with IS: 816-1969 Code of Practice for use of metal arc welding of general construction in mild steel, and IS: 9595-1980. Recommendation of Metal Arc Welding, regarding workmanship welding method, welding procedure with suitable electrodes and wire flux, combinations, quality of welds, correction of weld faults etc.

7.2.9. **Preparation of members for welding**

Assembly of structural members shall be made with proper jigs and fixtures to ensure correct positioning of members (angles, axis, nodes etc.).

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. Generally no special edge preparation shall be required for members under 8 mm thick.

Edge preparation (beveling) denotes cutting of the same so as to result in V, X, K or U seam shapes as per IS: 9595-1980.

The members to be assembled shall be clean and dry on the welding edges. Under no circumstances shall wet, greasy rust of 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 20 mm shall be cleaned (Until metallic polish is achieved). When assembling members proper care shall be taken of welding shrinkage and distortions, as the drawing dimensions cover finished dimensions of the structure. The elements shall be got checked and approved by the engineer before assembly wherever it is specified. The permissible tolerances for assembly of members preparatory to welding shall be as per IS: 9595. After assembly has been checked, temporary tack welding in position shall be done by electric welding; keeping in view finished dimensions of the structure. Preheating of members to be joined to be carried put as per standards wherever necessary.

7.2.10. **Butt welds** (Fig. 1)

The form of joint, angle between fusion faces, gap between parts and the welding procedure shall be such that the welded joint shall comply with the design requirements. The ends of butt joints in plate shall be welded so as to provide full throat thickness. In the gas welded condition, the weld face shall be proud of the surface of the parent metal. Where a flush surface is required, the excess metal shall be dressed off. Where no dressing is to be carried out, the permissible weld profile shall be as specified in the relevant IS.

For butt weld, where these are to be welded for both sides, certain welding procedures allow this to be done without back going, but where complete penetration cannot be achieved, the back of the first run shall be gouged out to clean sound metal before welding is started on the gouged outside.

7.2.11. **Fillet Welds** (Fig. 1)

A fillet weld as deposited shall be not less than the specified dimensions indicated as throat thickness and/or leg thickness taking into account penetration processor partial penetration. For concave fillet welds the actual throat thickness shall be not less than 0.7 times the specified leg length. For convex fillet welds, the actual throat thickness shall be not less than 0.9 times the specified leg length.

7.2.12. **Preparation of joint faces**

If preparation or cutting of material is necessary, this shall be done by shearing, chipping, grinding, machining, thermal cutting or thermal gouging. When shearing is used the effect of work hardening shall be taken care of to ensure that there is no cracking of the edges. Removal of 1 mm to 2 mm from a cut face normally eliminates the layer of hardness.

7.2.13. **Fusion faces**

Fusion faces and adjacent surfaces shall be free from cracks, notches or other irregularities which might be the cause of defects or would interfere with the deposition of the weld. They shall also be free from heavy scale, moisture, oil, paint and any other substance which might affect the quality of weld or impede the progress of welding.

7.2.14. **Assembly for welding**

Jigs and manipulators should be used, where practicable, so that the welding can be carried out in the most suitable position. Jigs shall maintain the alignment with the minimum restraint so as to reduce the possibility of lock in stresses.

7.2.15. **Alignment of butt joint**

The root edges or root faces of butt joints shall not be out of alignment by more than 25 per cent of the thickness of the thinner material for material up to 12 mm thick or by more than 3 mm for thicker material. For certain applications closer tolerances may be necessary for proper alignment.

7.2.16. **Fit up of parts jointed by fillet welds**

The edges and surfaces to be jointed by fillet welds shall be in as close contact as possible since any gap increases the risk of cracking but in no case should the gap exceed 3 mm.

7.2.17. **Tack welds** (Fig.1)

Tack welds shall be not less than the throat thickness or leg lengths of the root run to be used in the joint. The length of the tack weld shall not be less than four times the thickness of the thicker part or 50 mm whichever is similar. If smaller tack welds are desired, these shall be so indicated.

Where the tack weld is incorporated in a welded joint, the shape of the tack shall be suitable for incorporation in the finished weld and it shall be free from cracks and other deposition faults.

7.2.18. **Protection from weather**

Surface to be welded shall be dry. When rain or snow is falling or during periods of high wind, necessary precautions shall be taken for outdoor welding arc. Warming shall be carried out at all ambient temperatures below 10 degree C.

7.2.19. **Inter–run cleaning**

Each run of weld bead and each layer of weld shall be thoroughly cleaned of slag, spatters, etc. before depositing subsequent bead or weld with particular reference to thorough cleaning of toes of the welds. Visible defects such as cracks, cavities and other deposition faults, if any, shall be removed to sound metal before depositing subsequent run or layer of weld.

7.2.20. **Welding procedure**

Welding shall be carried out only by fully trained and experienced welders as tested and approved by the engineer. Qualification tests for welders as well as tests for approval of electrodes will be carried out as per IS: 823-1964. The nature of test for performance qualification for welders shall commensurate with the quality of welding required on this work as judged by the engineer. The steel structures shall be automatically, semi automatically or manually welded. Welding shall be only after the checks have been carried out. Welding procedures and Tests for welders shall be conducted as per IS: 9595 and approved by the engineer. The welder shall mark with his identification mark on each element welded by him. When welding is carried out in open air steps shall be taken to protect the places of welding against wind or rain. The electrodes wire and parts being weld on shall be dry. Before beginning the welding operation each joint shall be checked to assure that the parts to be welded are clean and root gaps provided as per IS: 9595. For continuing the welding of seams discontinued due to some reasons the end of the discontinued seam shall be melted in order to obtain a good continuity. Before resuming the welding operation the groove as well as the adjacent parts shall be well cleaned for a length of approximately 50 mm. For single butt welds (in V, ½ V or U) and double butt welds (in K, double U, etc.) the re-welding of the root butt is mandatory but only after the metal deposition on the root has been cleaned by back gouging 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 multilayer 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 unacceptable deformation appears in the welded parts. (b) due margin is provided to compensate for contraction due to welding in order to avoid any high permanent stresses. The defects in welds must be rectified according to IS: 9595-1980 and as per instruction of engineer.

7.2.21. **Approval and testing of welders**

The contractor shall satisfy the engineer that the welder is suitable for the work upon which they will be employed.

7.2.22. **Weld inspection**

The weld seems shall satisfy the following

b) Shall correspond to design shapes and dimensions.(b)Shall not have any defects such as cracks, incomplete penetration and fusion under cuts, rough surfaces, burns, blow holes and porosity etc. beyond permissible. During the welding operation and approval of finished elements inspections and tests shall be made as shown in Table 1 below

Table 1 Extent of inspection and testing

Sl .No	Inspection of test	Coverage	Procedure	Evaluation and remedy of defects
1	Inspection of weld seam Appearance	All welds	Naked eye or lens	All faulty welds shall be rectified.
2	Checking of sizes	Atleast one for each weld seam	Ordinary measuring instruments (Rule template)	Should faulty weld be found, all welds shall be checked and all defects shall be rectified.
	Mechanical test for welding procedure, performance & electrodes.		As per IS: 9595	As per IS: 9595

The mechanical characteristics of the welded joints shall be as in IS: 9595.

7.2.23. **Quality of welds and corrections**

Welded joints shall be from defects that would impair the service performance of the construction. All welds shall be free from incomplete penetration, incomplete fusion, slag inclusion, burns, un-welded crators, undercuts and cracks in the weld metal or in the heat

affected zone, porosity etc. Unacceptable undercutting shall be made good by grinding. In case of shrinkage cracks, cracks in parent plate and crator, defective portions shall be removed down to sound metal and re-welded. Whenever corrections necessitate the deposition of additional weld metal, electrode of a size not exceeding 4 mm may be used. Rectification of welds by caulking shall not be permitted.

7.2.24. **Cleaning -** All welds shall be cleaned of slag and other deposits after completion; till the work is inspected and approved, painting shall not be done.

7.2.25. **Plaining of ends**

Plaining of ends of members like Column ends shall be done by grinding where so specified. Plaining of but welded member shall be done after these have been assembled and the edges be removed with grinding machine or file.

The following tolerances shall be permitted on members that have been plained

d) The length of member having both ends plained max ± 2 mm with respect to design.

e) Level difference between plained surface = 0.3 mm.

f) Deviation between plained surface and member axis = max 1 /5000.

7.2.26. **Safety and health**

The contractor shall ensure that the safety requirements and health provisions laid down in IS: 818-1968 Code of Practice for safety and health requirements in electric and gas welding and cutting operations are complied with during welding operations. The contractors shall also provide equipment for eye and face protection during welding as laid down in IS: 1179-1967. Fire precautions shall be taken in accordance with IS: 3016-1982 Code of Practice for fire precautions in welding and cutting operations.

7.2.27. **Erection**

Erection works shall be performed in accordance with the general construction schedule. A scheme shall be worked before the commencement of the erection which shall also contain rules for safety precautions as detailed in IS: 7205-1973. (Safety Code for erection of structural steel work).

Anchor bolts for fastening of steel structures shall be set in designed position and grouted along with foundations. Alternatively anchor bolts should be provided in the concrete foundations with bolt boxes and anchor channels for the purpose of flexibility and grouted after final alignment and leveling of column. The gaps between the bearing surface of foundation and bottom of the structures to be erected shall be filled properly by cement grouting. Grouting shall be done after the verification and proper positioning of the structures but before encasing the structures with concrete if specified. Damaged structural members shall be examined and rectified or replaced as directed. The erected parts of the structure shall be stable during all the stages of errection; and structural elements to be erected shall be stable and strong to bear erection loads. Working on the already erected structures is permitted only after they are finally fixed. Erection of structures of each tier high structures shall be executed only after the relevant fastening of lower tier by the

permanent or temporary fastening devices as per schedule of execution of work and certified for safety. The joint and mating surface including the mating planes, strips and filler or spacers shall be cleaned of dust, rust and water. Erected structural members shall be firmly fastened by bolts and drifts, permanent or provisional tacking, crossing bars and so on before the erection crane book is removed. The trusses shall be lifted only at nodes. The trusses above 12 m span shall not be slinged at the apex, as it will develop compression stresses in the bottom tie member. It shall be lifted by slinging at two mid points of rafters, which shall be temporarily braced by a wooden member of suitable section. After the trusses are placed in position, purlins and wind bracings shall be fixed as soon as possible. The end of truss which faces the prevailing winds shall be fixed with holding down bolts and the other end kept free to move. In case of small truss of span say up to 12 m the free end of the truss shall be laid on steel plate as per design and the holes for holding down bolts shall be made in the form of oblong slot so as to permit the free movement of the truss end. For large spans, the free end of the truss shall be provided with suitable rocker and roller bearing where indicated.

7.2.28. **Erection joints**

While erecting, holes to be riveted shall be fitted with temporary bolts and drifts of diameters equal to those of the holes. It is necessary to initial drifts for accurate matching of holes. Number of bolts and drifts shall not be less than 40 per cent of total number of holes. Forces applied to drifts shall be same as approved for rivets. Number of drifts shall be 10 per cent of number of holes.

The number, size and length of tack welds in erection joints bearing erection forces shall be as indicated. For the erection joints which do not bear the erection forces the length of tack welds shall be minimum 10 per cent of the designed weld length of the joints. Welding, riveting and final fastening or permanent bolts shall be done only after the inspection of the structural elements for their positions. Head bolts and nuts shall perfectly be in touch with the surfaces of structures and washers.

7.2.29. **Tolerance allowed in erection**

Building without crane - The maximum Tolerance for line and level of steel structure shall be +/ 3.00 mm on any part of the structure. The structure shall not be out of plumb more than 5.00 mm each 10 meter section in height and not more than 7.00 mm per 30 meter section. These tolerances shall apply to all parts of structure unless otherwise specified.

Tolerance allowed in erection of steel structure containing cranes shall be as per following Table.

Table

Component	Description	Tolerance allowed

Main columns And roof posts	a i	Shifting of columns axis at foundation level with respect to building line: In longitudinal direction	± 5.00 mm
	ii	In lateral direction	± 5.00 mm
	b	Deviation of both major column axis from vertical between foundation and other member connection levels:	
	i	For a column upto and including 10 m height	± 5.00 mm from true vertical.
	ii	For a column greater than 10 m but less than 40 m height	± 5.00 mm from True vertical for any 10 M length measured between connection levels but not more than ± 8.00 mm for 30 m length.
	c	For adjacent pairs of columns across the width of the building prior to placing of truss.	± 5.00 on true span
	d	For any individual column deviation of any bearing or resting level from levels shown on drawings.	± 5.00 mm

	e	For adjacent pairs of columns either across the width of buildings or longitudinally level difference allowed between bearing or seating level supposed to be at the same level.	5.00 mm

Trusses	a	Deviation at centre of span or upper chord member from vertical plane running through centre of bottom chord.	1/500 of the span or 10 mm whichever is less.
	b	Lateral displacement of top chord at centre of span from vertical plane running through centre of supports.	1/250 of depth of truss or 20 mm whichever is less.

2. RELEVANT BIS CODE FOR TECHNICAL SPECIFICATION

S. No.	IS Code	Description
A. STEEL REINFORCEMENT		
1	IS:1785	Cold Drawn Stress relieved wire (Part I).
2	IS:1786	Specification for Cold Twisted Steel Bars for Concrete Reinforcement.
3	IS:2751	Code of Practice for Welding of M.S.Bars.
4	IS:5525	Recommendation for detailing of Reinforcement in Reinforced Concrete Works.
5	IS:6006	Uncoated Stress Relieved Strand for Prestressed Concrete.
6	IS:14268	Specifications for uncoated stress Relieved Low Relaxation Seven Ply Strand for Prestressed Concrete.
7	IS:800	General Construction in Steel
8	IS:816	Metal-arc welding for general construction in mild steel
9	IS:817	Training & Testing of metal-arc welders
10	IS:226	Structural Steel Sections
11	IS:2062	Weldable Structural Steel
12	IS:814	Welding Electrodes
13	IS:919	Recommendations for limits and fits for Structural Engineering.
14	IS:1477	Code of Practice for painting of ferrous metals in buildings.

15	IS:1977	Structural Steel (Ordinary quality)
16	IS:7205	Safety Code for erection of structural steel work
17	IS:7215	Tolerances for fabrication of steel structures
18	IS:8500	Weldable structural steel (medium and high strength qualities).

3. SPECIFICATIONS FOR REINFORCEMENTS IN CONCRETE

4.6.3.1. General requirements - Steel conforming to para 4.6.1.2. for reinforcement shall be clear and free from loose mill scales, dust, loose rust, coats of paints, oil or other coatings which may destroy or reduce bond. It shall be stored in such a way as to avoid distortion and to prevent deterioration and corrosion. Prior to assembly of reinforcement on no account any oily substance shall used for removing the rust.

(1). Assembly of reinforcement - Bars shall be bent correctly and accurately to the size and shape as shown in the detailed drawing or as directed by engineer. Preferably bars of full length shall be used. Necessary cutting and straightening is also included. Over lapping of bars, where necessary shall be done as directed by the engineer. The overlapping bars shall not touch each other and these shall be kept apart with concrete between them by 25 mm or 1 ¼ times the maximum size of the coarse aggregate whichever is greater. But where this is not possible, the overlapping bars shall be bound together at intervals not exceeding twice the dia. Of such bars with two strands annealed steel wire of 0.90 mm to 1.6 mm twisted tight. The overlaps / splices shall be staggered as per directions of the engineer. But in no case the over lapping shall be more than 50% of cross sectional area at one section.

(2). Bonds and hooks forming end anchorages - Reinforcement shall be bent and fixed in accordance with procedure specified in IS 2502, code of practice for bending and fixing of bars for concrete reinforcement. The details of bends and hooks are shown below for guidance.

a) U-Type hook - In case of mild steel plain bars standard U-type hook shall be provided by bending ends of rod into semicircular hooks having clear diameter of the bar

Note-In case of work in seismic zone, the size of hooks at the end of the rod shall be eight times the diameter of bar or as given in the structural drawing.

b) Bends - Bend forming anchorage to a M.S. plain bar shall be bent with an internal radius equal to two times the diameter of the bar with a minimum length beyond the bend equal to four times the diameter of the bar.

(3). Anchoring bars in tension - Deformed bars may be used without end anchorages provided, development length requirement is satisfied. Hooks should normally be provided for plain bars in tension. Development length of bars will be determined as per clause 25.2.1 of IS: 456-2000.

(4). Anchoring bars in compression - The anchorage length of straight bar in compression shall be equal to the 'Development length' of bars is compression as specified in of IS: 456-

2000. The projected length of hooks, bends and straight lengths beyond bend, if provided for a bar in compression, shall be considered for development length.

(5). Binders, stirrups, links and the like - In case of binders, stirrups, links etc. the straight portion beyond the curve at the end shall be not less than eight times the nominal size of bar.

(6). Welding of bars - Whenever facility for electric arc welding is available, welding of bars shall be done in lieu of overlap. The location and type of welding shall be got approved by the engineer. Welding shall be as per IS: 2751 for mild steel bars and for cold worked bars.

4.6.3.2 Placing in position - Fabricated reinforcement bars shall be placed in position as shown in the drawings or as directed by the engineer. The bars crossing one another shall be tied together at every intersection with two stands of annealed steel wire 0.9 to 1.6 mm thickness twisted tight to make the skeleton of the steel work rigid so that the reinforcement does not get displaced during deposition of concrete.

Track welding in crossing bars shall also be permitted in lieu of bending with steel wire if approved by engineer.

The bars shall be kept in correct position by the following methods -

a) In case of beam and slab construction precast cover blocks of cement mortar 1:2 about 4x4 cm section and of thickness equal to the specified cover shall be placed between the bars and shuttering, so as to secure and maintain the requisite cover of concrete over reinforcement.

b) In case of cantilevered and doubly reinforced beams or slabs, the vertical distance between the horizontal bars shall be maintained by introducing chairs, spacers or support bars of steel at 1.0 meter or at shorter spacing to avoid sagging.

c) In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them; or with block of cement mortar 1:2 of required size suitably tied to the reinforcement to ensure that they are in correct position during concreting.

d) In case of R.C.C. structure such arches, domes, shells, storage tanks etc. a combination of cover blocks, spaces and templates shall be used as directed by engineer.

Tolerance on placing of reinforcement - Unless otherwise specified by the engineer, reinforcement shall be placed within the following tolerances -

Tolerance in spacing

		Tolerance in spacing
a)	For effective depth 200 mm or less	± 10
b)	For effective depth More than 200 mm	± 15

The cover shall in no case be reduced by more than one third of specified cover or 5 mm

whichever is less.

Bending at construction joints - Where reinforcement bars are bent aside at construction joints and afterwards bent back into their original position care should be taken to ensure that at no time the radius of the bend is less than 4 bars diameters for plain mild steel or 6 bar diameters for deformed bars. Care shall also be taken when bending back bars to ensure that the concrete around the bars in not damaged.

4.6.3.3. Measurements - Reinforcement including authorised spacer bars and laps shall be measured in length of different diameters, as actually (not more than as specified in the drawings.) used in the work nearest to a centimeter and their weight calculated on the basis of standard weight given in Table 14 below. Wastage and unauthorized overlaps shall be paid for. Annealed steel wire required for binding or tack welding shall not be measured, its cost being included in the rate reinforcement.

Wherever tack welding is used in lieu of binding, such welds shall not be measured. Chairs separators etc. shall be provided as directed by the engineer and measured separately and paid for.

Table 14 Cross-sectional area and mass of steel bar

Nominal size mm	Cross sectional area sq.mm	Mass per meter run kg
6	28.3	0.222
7	38.5	0.302
8	50.3	0.395
10	78.6	0.617
12	113.1	0.888
16	201.2	1.58
18	254.6	2.00
20	314.3	2.47
22	380.3	2.98
25	491.1	3.85
28	616.0	4.83
32	804.6	6.31
36	1018.3	7.99
40	1257.2	9.85
45	1591.1	12.50
50	1964.3	15.42

Note - These are as per clause 5.2 of IS 1786.

4.6.3.4. Rate - The rate for reinforcement shall include the cost of labour and materials required for all operations described above such as cleaning of reinforcement bars, straightening, cutting, as required of directed including tack welding on crossing of bars in lieu of binding with wires.

4.6.4 SPECIFICATIONS FOR CONCRETING

The concrete shall be done as specified. The proportion by volume of ingredients shall be as specified.

4.6.4.1Consistency - The concrete which will flow sluggishly into the forms and around the reinforcement without any segregation of coarse aggregate from the mortar shall be used. The consistency shall depend on whether the concrete is vibrated on or hand tamped. It shall be determined by slump test as n[prescribed in chapter " concrete under para 4.2.3 workability"

Where considered necessary, the workability of the concrete may also be ascertained by compacting factor test and VEE BEE censistometer method specified in IS: 1199. For suggested ranges of values of workability of concrete by the above two methods, reference may be made to IS: 456.

4.6.4.2 Placing of concrete

Concreting shall be commenced only after engineer has inspected the centering, shuttering and reinforcement as placed and passed the same. Shuttering shall be clean and free from all shaving, saw dust, pieces of wood, or other foreign material and surfaces shall be treated as prescribed.

In case of concreting of slabs and beams, wooden plank or cat walks of chequered MS plates or bamboo chlies or any other suitable material supported directly on the centering by means of wooden blocks or lugs shall be provided to convey the concrete to the place of deposition without disturbing the reinforcement in any way. Labour shall not be allowed to walk over the reinforcement.

In case of columns and walls, it is desirable to place concrete without construction joints. The progress of concreting in the vertical direction shall be restricted to one meter per hour.

The concrete shall be deposited in its final position in a manner to preclude segregation of ingredients. In deep trenches and footings concrete shall be placed through chutes or as directed by the engineer. In case of columns and walls, the shuttering shall be so adjusted that the vertical drop of concrete in not more than 1.5 meters at a time.

During cold weather, concreting shall not be done when the temperature falls below 4.5° c. the concrete placed shall be protected against frost by suitable converting. Concrete damaged by frost shall be removed and work redone.

During hot weather precaution shall be taken to see that the temperature of wet concrete does not exceed 38°C. no concrete shall be laid within half of the closing time of the day, unless permitted by the engineer.

It is necessary that the time taken between mixing and placing of concrete shall not exceed 30 minutes so that the initial setting process is not interfered with

4.6.4.3 Compaction - Concrete shall be compacted into dense mass immediately after placing by means of mechanical vibrators designed for continuous operations. The engineer may however relax this conditions at his discretion for certain items, depending on the thickness of the members and feasibility of vibrating the same and permit hand compaction

instead. Hand 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 corners of the from. The layers of concrete shall be so placed that the bottom layer does not finally set before the top layer is placed. The vibrators shall maintain the whole of concrete under treatment in an adequate state of agitation, such that de-aeration and effective compaction is attained at a rate commensurate with the supply of concrete from the mixers. The vibration shall continue during the whole period occupied by placing of concrete, the vibrators being adjusted so that the centre of vibrations approximates to the centre of the mass being compacted at the time of placing.

Concrete shall be judged to be properly compacted, when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. When this condition has been attained, the vibrator shall be stopped in case of vibrating tables and external vibrators. Needle vibrators shall be withdrawn slowly so as to prevent formation of loose pockets in case of internal vibrators. In case both internal and external vibrators are being used, the internal vibrator shall be first withdrawn slowly after which the external vibrators shall be stopped so that no loose pocket is left in the body of the concrete. The specific instructions of the makers of the particular type of vibrator used shall be strictly complied with. Shaking of reinforcement for the purpose of compaction should be avoided. Compaction shall be completed before the initial setting starts, i.e. within 30 minutes of addition of water to the dry mixture.

4.6.4.4 Construction joints - Concreting shall be carried out continuously up to the construction joints, the position and details of which shall be as shown in structural drawing or as indicated in Fig. 26 or as directed by engineer. Number of such joints shall be kept to minimum. The joints shall be kept at places where the shear force is the minimum. These shall be straight and shall be at right angles to the direction of main reinforcement.

In case of columns the joints shall be horizontal and 10 to 15 cm below the bottom of the beam running into the column head. The portion of the column between the stepping off level and the top of the slab shall be concreted with the beam.

When stopping the concrete on a vertical plane in slabs and beams, an approved stop-board (see Fig.26C) shall be placed with necessary slots for reinforcement bars or any other obstruction to pass the bars freely without bending. The construction joints shall be keyed by providing a triangular or trapezoidal fillet nailed on the stop-board. Inclined or feather joints shall not be permitted. Any concrete flowing through the joints of stop-board shall be removed soon after the initial set. When concrete is stopped on a horizontal plane, the surface shall be roughened and cleaned after the initial set.

When the work has to be resumed, the joint shall be thoroughly cleaned with wire brush and loose particles removed. A coat of neat cement slurry at the rate of 2.75 kg of cement per square meter shall then be applied on the roughened surface before fresh concrete is laid.

4.6.4.5 Expansion joints - Expansion joints shall be provided as shown in the structural drawings or as indicated in Fig. 10 to 25 or as directed by engineer, for the purpose of general guidance. However it is recommended that structures exceeding 45 m in length shall be divided by one or more expansion joints. The filling of these joints with bitumen filler, bitumen felt or any such material and provision of copper plate, etc. shall be paid for separately in running meter. The measurement shall be taken up to two places of decimal stating the depth and width of joint.

4.6.4.6 Curing - After the concrete has begun to harden i.e. about 1 to 2 hours after its laying, it shall be protected from quick drying by covering with moist gunny bags, sand, canvass Hessian or any other material approved by the engineer. After 24 hours of laying of concrete, the surface shall be cured of ponding with water for a minimum period of 7 days from the date of placing of concrete.

4.6.4.7 Finishing - In case of roof slabs the top surface shall be finished even and smooth with wooden trowel, before the concrete begins to set.

Immediately on removal of forms, the R.C.C work shall be examined by the engineer, before any defects are made good.

The work that has sagged or contains honey combing to an extent detrimental to structural safety or architectural concept shall be rejected as given for visual inspection test.

Surface defects of a minor nature may be accepted. On acceptance of such a work by the engineer, the same shall be rectified as follows -

1) Surface defects which require repair when forms are removed, usually consist of bulges due to movement of forms, ridges at form joints, 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 chipped out, the edges being cut as straight as possible and perpendicularly to the surface, or preferable slightly undercut to provide a key at the edge of the path.

2) Shallow patches are first treated with a coat of thin grout composed of one part of cement and one part of fine sand and then filled with mortar similar to that used in the concrete. The mortar is placed in layers not more than 10 mm thick and each layer is given a scratch finish to secure bond with the succeeding layer. The last layer is finished to match 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.

3) Large and deep patches require filling up with concrete held in place by forms. Such patches are reinforced and carefully dowelled to the hardened concrete.

4) Holes left by bolts are filled with mortar carefully packed into places in small amounts. The mortar is mixed as dry as possible, with just enough water so that it will be tightly compacted when forced into place.

5) Tiered holes extending right through the concrete may be filled with mortar with a

pressure gun similar to the gun used for greasing motor cars.

6) Normally, patches appear darker than the surrounding concrete, possibly owing to the presence on their surface of less cement laitance. Where uniform surface colour is important, this defect shall be remedied by adding 10 to 20 percent of white Portland cement to the patching mortar, the exact quantity being determined by trial.

7) The same amount of care to cure the material in the patches should be taken as with the whole structure. Curing must be started as soon as possible, after the patch is finished to prevent early drying. Damp Hessian may be used but in some locations it may be difficult to hold it in place. A membrane curing compound in these cases will be most convenient.

c). The exposed surface of R.C.C work shall be plastered with cement mortar 1 -3 (1 cement - 3 fine sand) of thickness not exceeding 6 mm to give smooth and even surface true to line and form. Any RCC surface which remains permanently exposed to view in the completed structure shall be considered exposed surface for the purpose of this specification.

Where such exposed surface exceeding 0.5 sq.m in each location is not plastered with cement mortar 1:3 (1 cement to 3 fine sand) 6 mm thick, necessary deduction shall be made for plastering not done.

d). The surface which is to receive plaster or where it is to be joined with brick masonry wall, shall be properly roughened immediately after the shuttering is removed, taking care to remove the laitance completely without disturbing the concrete. The roughening shall be done by hacking. Before the surface is plastered, it shall be cleaned and wetted so as to give bond between concrete and plaster.

e). The surface of RCC slab on which the cement concrete of mosaic floor is to be laid shall be roughened with brushes while the concrete is green. This shall be done without disturbing the concrete.

4.6.4.8 Strength of concrete - The compressive strength on work tests for different mixes shall be as given in Table 15 below -

Table 15

Concrete mix (Nominal mix on volume basis)	Compressive strength in (kg/sq cm)	
	7 days	28 days
1:1:2	210	315
1:1 ½ : 3	175	265
1:2:4	140	210

4.6.4.9 Testing of concrete

(1). Regular mandatory tests on the consistency and workability of the fresh concrete shall be done to achieve the specified compressive strength of concrete. These will be of two types Mandatory Lab. Test

Mandatory Field Test

(3). Results of Mandatory Field Test will prevail over Mandatory Lab. Test.

a) Work Test-Mandatory Lab. Test shall be carried out as prescribed.

b) Mandatory Field Test (Hammer Test), shall be carried out as prescribe in Annexure 4.A.2

(4). Additional test - Additional test, if required, shall be carried out as prescribed in Annexure 4.A.7

(5). Slump test - This test shall be carried out as prescribed in Annexure 4.A.1

(6). Visual inspection test - The concrete will be inspected after removal of the form work as described. The question of carrying out mandatory test or other tests described in Annexure 4-A.2 and 4-A.4 will arise only after satisfactory report of visual inspection.

The concrete is liable to be rejected, if,

(i) It is porous or honeycombed.-

(ii) Its placing has been interrupted without providing a proper construction joint;

(iii) The reinforcement has been displaced beyond tolerance specified; or construction tolerance has not been met.

However, the hardened concrete may be accepted after carrying out suitable remedial measures to the satisfaction of the engineer at the risk and cost of the contractor.

4.6.4.10 Standard of acceptance

(1). Mandatory lab test - For concrete sample and tested as prescribed in Annexure 4- A.2 the following requirement shall apply.

Out of six sample cubes, three cubes shall be tested at 7 days and remaining three cubes at 28 days, if found necessary.

(2). 7days' tests

(a). Sampling - The average of the strength of three specimens shall be accepted as the compressive strength of the concrete provided the variation In strength of individual specimen is not more than ± 15% of the average. Difference between the maximum and minimum strength should not exceed 30% of average strength of three specimen. If the difference between maximum and minimum strength exceeds 30% of the average strength, then 28 days' test shall have to be carried out.

(a). Strength - If the actual average strength of sample accepted in para 'sampling' above is equal to or higher than specified strength up to 15% then strength of the concrete shall be considered in order. In case the actual average strength of sample accepted in the above para is lower than the specified or higher by more than 15% then 28 days' test shall have to be carried out to determine the compressive strength of concrete cubes.

(3). 28 days' test

(a) The average of the strength of three specimen be accepted as the compressive strength of any individual cube shall neither be less than 70% nor higher than 130% of the specified strength.

(b) If the actual average strength of accepted sample exceeds specified strength by more

than 30%, the engineer, if he so desires may further investigate the matter. However, if the strength of any individual cube exceeds more than 30% of specified strength, it will be restricted to 130% only for computation of strength.

(c) If the actual average strength of accepted sample is equal to or higher than specified strength upto30% then strength of the concrete shall be considered in order and the concrete shall be accepted at full rates.

(d) If the actual average strength of accepted sample is less than specified strength but not less than specified strength but not less than 70% of specified strength, the concrete may be accepted at reduced rate at the discretion of engineer.

(e) If the actual average strength of accepted sample is less than 70% of specified strength, the engineer shall reject the defective portion of work represented by sample and nothing shall be paid for the rejected work. Remedial measures necessary to retain the structure shall be taken at the risk and cost of contractor. If, however, the engineer so desires, he may order additional tests (see Annexure 4-A.4) to be carried out to ascertain if the structure can be retained. All the charges in connection with these additional tests shall be borne by the contractor.

(4). Acceptance criteria of mandatory field test

(A) Preparation of standard test cubes for calibration of rebound hammer at site

(a) In the beginning the standard test cubes of specified mix shall be prepared by field units before undertaking any concrete work in each project.

(b) At least 18 standard cubes necessary for formation of one specimen of specified mix, shall be cast by site staff well in advance. From these 18 cubes any 3 cubes may be selected at random to be tested for crushing strength of 7 days. The crushing strength obtained should satisfy the specified strength for the mix as per specification or agreement. If the strength is satisfactory then the remaining cubes will form the standard samples for calibration of rebound hammer. In case of failure, the site staff should totally reject the samples and remove them also and then make another set of samples by fresh mixing or alternatively, out of the remaining 15 cubes 3 cubes will be tested on 28 days. If the 28 days' tests are found satisfactory then remaining 12 cubes will form the standard sample for calibration at 28 days' strength otherwise all samples shall be rejected and whole procedure repeated to form a fresh specimen. All the results shall be recorded in a register.

(c) No concreting will be allowed unless the standard specimen cubes are obtained.

The criteria for acceptance and calibration of hammer will be 28 days' strength. the 7 days' strength is only to facilitate the work to start.

(d) No work (for the concrete cast between 8th day) shall be allowed to be paid unless 28 days' cube strength is obtained. For the concrete cast between 8th and 28th day, the decision to make the payment may be taken by the engineer on the basis of existing criteria. Concrete work will be rejected if 28 days' strength falls short as per acceptance criteria. No further work will be allowed till the acceptable standard cubes are obtained.

(e) Frequency - It will be once in each quarter or as per the direction and discretion of engineer. Whenever the acceptance criteria is changed or concrete mix or type of cement is changed or engineer feels it necessary for recorded reasons with the approval of the authority according technical sanction, fresh specimen shall be prepared.

(B) Calibration of hammer

(a) Simultaneously, same three cubes to be tested on 28 days as referred in para A (b) above shall be used to correlate the compressive strength of their concrete with rebound number as per procedure described in para 5.2 of the IS: 13311 (Part 2) "Indian standard for non-destructive testing of concrete Method of test by rebound hammer which is given below in para B (b). the average of values of the rebound number (minimum readings) obtained in respect of same three cubes passing on 28 days' work test shall form the datum reference for remaining cubes for the strength of cubes.

(b) The concrete cubes specimens are held in a compression testing machine under a fixed load, measurements of rebound hammer taken and then compressive strength determined as per IS: 516. The fixed load required is of the order of 7N / mm^2 when the impact energy of the hammer is about 2.2 NM.

If the specimens are wet cured, they should be removed from wet storage & kept in the laboratory atmosphere for about 24 hours before testing. Only the vertical faces of the cubes as cast should be tested for rebound number. At least nine readings should be taken on each of the three vertical faces accessible in the compression testing machine when using rebound hammers. The points of impact on the specimen must not be nearer than 20 mm from each other. The same points must not be impacted more than once.

(c) The rebound number of hammer will be determined on each of the remaining (18-3-3=12) cubes. Whenever the rebound number of hammer of any individual cube varies by more than ± 25% from the datum readings referred to in para B(a) above, that cube will be excluded and will not be considered for standard specimen cubes for calibration. It must be ensured that at least 8 cubes out of 12 that is 66.6% are within the permissible range of variation of rebound number i.e. ± 25% or otherwise whole procedure shall have to be repeated and fresh specimen prepared.

These 8 cubes will form one standard sample in the beginning before commencement of work and shall be kept carefully for the visiting officers who will calibrate their hammers on these cubes.

(d) This calibration will be done by field staff with their hammer and then chart of calibration giving the details of the average readings, date & month of casting, mix of the concrete etc. shall be prepared and signed by engineer and will be duly preserved for future reference as and when required.

(C) Preservation of cubes at site - Standard sample cubes cast shall be carefully preserved at site under the safe custody of AE or his representative for making them available together with the charts, to the any other senior departmental officers, during their inspection of the

work.

(D) Testing at site - (D-2) Testing will be done generally by non-destructive methods like rebound hammers etc. Each field Division / Sub Division / Unit will purchase rebound hammers and keep them in working order at work site. Testing will be done only by hammers, which are dully calibrated.

(D-3) The relative strength of actual field work will be tested with reference to strength of these standard cubes and calibration charts of a hammer for determining the rebound number on the field work. The hammer will be used as per manufacturer's guidelines at various locations chosen at random. The number of location / reading on each wall, beam or column etc. shall not be less than 12. All the readings should be within the ± 25% range of values prescribed in calibration chart normally. However, reading indicating good strength will be when it is at par with calibrated value between 100% & 125% and very good if more than 125%. Any value between 100% & 75% of calibrated value shall be considered satisfactory. Values from 75% to 50% shall be considered for fragment at rates reduced on prorata basis. The concrete indicating rebound number less than 50%of calibrated value shall be rejected and not paid for.

(E) Acceptance of field tests and strength - If the relative strength of actual field work is found satisfactory considering the calibration charts with reference to the standard cube test kept at site, the representative work will be considered satisfactory. If the work is considered below satisfactory, the same will be dealt as stated in para D-3 above.

(F) 7 days' Strength in rare cases only - Normally cube crushing strength on 28 days' test shall form the basis of acceptance. However in rare cases of time bound projects / urgent repairs 7 days' cube test strength criteria may be adopted on similar lines using 7 days' standard test cubes and calibration graphs / curves /charts for 7 days' in lieu of 28 days' and testing work done at 7 days'.

(G) Precautions

(G-1) The testing shall be done generally as per the guidelines of manufacturer of the apparatus and strictly in accordance with the procedure laid down in clause 6 of IS: 13311 (part 2) Indian Standard for Non-Destructive Testing of concrete-Method of Test by Rebound Hammer.

(G-2) The rebound hammers are influenced by number of factors like type of cement aggregate, surface conditions, moisture content, age of concrete etc. Hence care shall be taken to compare the cement, aggregate etc. and tested under the similar surface conditions having more or less same moisture content and age. However effect of age can be ignored for concrete between 3 days & 3 months old.

4.6.4.11 Measurement

4.6.4.11.1. Dimensions shall be measured nearest to a cm except for the thickness of slab which shall be measured correct to 0.5 cm.

4.6.4.11.2. The areas shall be worked out nearest to 0.01 sq. mt. The cubical contents shall

be worked out to nearest 0.01 cubic meters.

4.6.4.11.3. Reinforced cement concrete whether cast-in-situ or present shall be classified and measured separately as follows.

(a) Raft, footing, bases of columns etc. and mass concrete. (b) walls (any thickness) including attached pilasters, buttresses, plinth and string course, fillets etc. (c) suspended floors, roofs, landings and balconies. (d) Shelves (e) Chajjas (f) Lintel, beams and Bressummers. (g) Columns, pillars, piers, abutments, posts and struts. (h) Stair-cases including waist or waist less slab but excluding landing except in (l) below. (j) Spiral stair-case (including landing). (k) Arches, arch ribs, domes and vaults. (l) Chimneys and shafts. (m) Well steining. (n) Vertical and horizontal fins individually or forming box, louvers and fascias. (o) Kerbs, steps and the like. (p) String course, bands, coping, bed plates, anchor blocks, plain window sills and the like. (q) Moldings as in cornices window sills etc.

Shell, dome and folded plates. (r) Extra for shuttering in circular work in plan.

4.6.4.11.4 No deduction shall be made for the following -

(a) Ends of dissimilar materials (e.g. joists, beams post girders, rafters, purlin trusses, corbels steps etc.) up to 500 sq cm in cross-section

(b) Opening up to 0.1sq.m.

Note-In calculating area of openings up to 0.1sq.m the size of opening shall include the thickness of any separate lintels or sills. No extra labour for forming such opening or voids shall be paid for.

(c) The volume occupied by reinforcement.

(d) The volume occupied by water pipes, conducts etc. not exceeding 25 sq cm each in cross sectional area. Nothing extra shall be paid for leaving and finishing such cavities and holes.

4.6.4.11.5 Measurement shall be taken before any rendering is done in concrete members. Measurement will not include rendering. The measurement of R.C.C. work between various units shall be regulated as below -

(a) Slabs shall be taken as running continuously through except when slab is monolithic with the beam. In that case it will be from the face to face of the bream.

(b) Beams shall be measured from face to face of columns and shall include haunches, if any, between columns and beam. The depth of the bottom of beam shall be from the bottom of slab to the bottom of beam and slabs are not monolithic. In case of monolithic construction where slabs are integrally connected with beam, the depth of beam shall be from the top of the slab to the bottom of beam.

(c) The columns measurement shall be taken through.

(d) Chajjas along with its bearing on wall shall be measured in cubic meter nearest to two places of decimal. When Chajjas is combined with Lintel, slab or beam, the projecting portion shall be measured as Chajjas, built in bearing shall be measured as per item of Lintel, slab or beam in which chhajja bears.

(e) Where the band and Lintels are of the same height and the band serves as Lintel, the portion of the band to be measured as lintel shall be for clear length of opening plus twice the over all depth of band.

4.6.4.12. Tolerances - Subject to the condition that structural safety is not impaired and architectural concept does not hamper, the tolerances in dimensions of R.C.C members shall be as specified in the drawing by the designer. Whenever these are not specified, the permissible tolerance shall be decided by the engineer after consultations with the Designer, if necessary.

When tolerances in dimensions are permitted, following procedure for measurements shall apply.

(a). If the actual dimensions of R.C.C members do not exceed or decrease the design dimensions of the members plus or minus tolerance limit specified above, the design dimensions shall be taken for the purpose of measurements.

(b). If the actual dimensions exceed the design dimensions by more than the tolerance limit, the design dimensions only shall be measured for the purpose of payment.

(c). If the actual dimensions decrease more than the tolerance limit specified, the actual dimensions of the RCC members shall be taken for the purpose of measurement and payment.

(d). For acceptance of RCC members whose dimensions are not exactly as per design dimension of engineer shall be final. For the purpose of payment, however, the clarification as given in para a, b & c above shall apply

4.6.4.13 Rate

The rate includes the cost of materials and labour involved in all the operations described above except for the cost of centering and shuttering.

On the basis of mandatory lab tests, in case of actual average compressive strength being less than specified strength but upto 70% of specified strength, the rate payable shall be in the same proportion as actual average compressive strength bears to the specified compressive strength.

Example

1. Average compressive strength in 80% of specified strength. Rate payable shall be 80% of agreement rate.

2. In case average compressive strength in less than 70% of the specified strength, the work represented by the sample shall be rejected.

3. However, on the basis of mandatory field test, where they prevail, the rates of the work represented by samples showing actual compressive strength less than specified strength shall be worked out as per para above. In addition, engineer may order for additional tests (see Annexure 4-A.4) to be carried out at the cost of contractor to ascertain if the portion of structure where in concrete represented by the samples has been used, can be retained on the basis of these test. Engineer may take further remedial measures as necessary to retain

the structure at the risk and cost of the contractor.

Where throating or plaster drip or molding is not required to be provided in RCC Chajjas, deduction for not providing throating or plaster drip or molding shall be made from the item of R.C.C. In Chajjas. The measurement for deduction item shall be measured in running meters direct to a cm of the edge of chhajja.

No extra payment for richer mix which projects into any meter from another member during concreting of junctions of beams and columns etc. will be made except to the extent structurally considered necessary and when so indicated in the structural drawing. The payments for work done under items of different mixes shall be limited strictly to what is indicated in the structural drawings.

4.6.8. SPECIFICATIONS FOR DESIGN MIX CONCRETE.

Definition - Design mix concrete is that concrete in which the design of mix i.e. the determination of proportions of cement, aggregate & water is arrived as to have target mean strength for specified grade of concrete.

It will be designed based on the principles given in IS 456-2000 and 23 “Hand book for design mix concrete”.

In order to ensure that not more than the specification proportion of test results is 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 as target mean strength.

4.6.8.1. Materials

Cement - One of the following types of cement as specified shall be used -

1. Ordinary Portland Cement 33 grade conforming to IS: 269.
2. Ordinary Portland Cement 43 grade conforming to IS: 8112.
3. Ordinary Portland Cement 53 grade conforming to IS: 2269.
4. Rapid hardening Portland Cement Conforming to IS: 8041.
5. Blast Furnace slag cement conforming to IS: 455.

However for severe conditions of sulphate content in sub soil water, special literature on use of sulphate resisting cement may be referred to.

Coarse aggregate - This shall be specified in para 4.1.2 and subparas.

Fine aggregate - This shall be grading zone I, II, or III as specified under para 3.1.4 and subparas.

Water - It shall conform to the requirement as laid down in IS: 456 para and para 4.6.1.1. of this section.

Grades of concrete - The compressive strength of various grades of designation concrete shall be as given in table 16 below -

Table 16

Grades designation	Compressive strength on 15 cm cubes min at 7 days	Specified characteristic compressive strength at 28 days (N/mm2)

	(N/mm2)	
M 15	10.0	15
M 20	13.5	20
M 25	17.0	25
M 30	20.0	30
M 35	23.5	35

Note - In the designation of a concrete mix letter M refer the mix and the number to the specified characteristic compressive strength of 15 cm-cubes at 28 days expressed in N/mm^2.

4.6.8.2 Scope - The procedure described below for design mix is for concrete up to grade M-35 which are generally used for reinforced concrete structure. Minimum grade of concrete for design mix will be M-20 normally. However in cases of projects having some parts of M-15 also in addition to M-20 to M-35 grade, then design mix concrete will cover M-15 grade as an exception only.

4.6.8.3 Data for mix design - The following basic data are required to be specified for design of concrete mix.

Characteristic compressive strength of concrete at 28 days.

(1) Degree of workability desired.

(2) Limitation on water cement ratio and minimum cement content to ensure adequate durability.

(3) Type of maximum size of aggregate to be used.

(4) Standard deviation of compressive strength of concrete.

Minimum cement content required in Reinforced cement concrete to ensure durability under specified conditions of exposure, will be in accordance with IS: 456. However it shall not be less than 300 Kgs $/m^3$ of concrete for 33 grade cement.

(a). Standard Deviation of concrete for each grade shall depend upon the degree of quality control expected to be exercised at site. As per IS: 10262 the values of standard deviation for various grades of concrete for different degree of control shall be specified in Table. 17.

Table 17

Grade of concrete	Standard Deviation for different degree of control in N/mm^2		
	Very good	Good	Fair
M-15	2.5	3.5	4.5
M-20	3.6	4.6	5.6
M-25	4.3	4.3	6.3
M-30	5.0	6.0	7.0

M-35	5.7	6.7	7.7

Degree of quality control expected under different site conditions are described in Table18

Table 18

Degree of	Condition of production of concrete
Very good	Fresh cement from single source and regular test, weigh batching of all materials, aggregates grading and moisture content, control of water added, frequent supervision, regular workability and strength tests and field laboratory facilities,
Good	Carefully stored cement and periodic test, weigh batching of all materials, controlled water, graded aggregate supplied, occasional grading and moisture tests, periodic check of workability and strength, intermittent supervision and experienced workers.
Fair	Proper storage of cement, volume batching of all aggregates allowing for bulking of sand, weigh batching of cement, water content controlled by inspection of mix and occasional supervision and tests

4.6.8.4. **Target strength for mix design -** The target mean strength for a specified grade concrete depends upon the quality control (expressed by standard deviation) and accepted proportion of results of the strength tests below the characteristic strength (Fck) and is given by relation,

TcK = fck + t.s

Tck – target mean compressive strength at 28 days

Fck – characteristic compressive strength at 28 days

s – standard Deviation

t – a statistical figure depending upon the accepted proportion of low test results and number of tests.

Note - According to IS: 456 & IS: 1343 the characteristic strength is defined as that value below which not more than 5% (1 in 20) results are expected to fall. In such case value of t will be 1.65 and equation will reduce to Tck = fck+1.65 s.

Selection of proportions - Since different cement, aggregate, of different maximum size, grading surface texture shape, produce concrete of different compressive strength for the same free water cement ratio, the relationship between strength and free water cement ratio corresponding to 28 days' strength of cement of various grades is given in Fig.1 of IS: 10262 and is reproduced below in chart 1.

28 days strength of cement tested according IS: 4031-1968

A = 31.9 – 36.8 N/mm² (325-375 kg /cm²)

B = 36.8 – 41.7 N/mm² (375-425 kg /cm²)

C = 41.7 – 46.6 N /mm² (425-475 kg /cm²)

D = 46.6 – 51.5 N /mm² (475-525 kg /cm²)

E = 51.5 – 56.4 N/mm² (525-575 kg/cm²)

F = 56.4 - 61.3 N /mm² (575-625 kg /cm²)

Chart 1- Relationship between free water cement ratio and concrete strength for different cement strengths.

(a) **The free water cement ratio** selected from Chart 1 above should be checked against the limiting water cement ratio for requirement of durability as given in IS: 456 and the lower of the two values is to be adopted.

(b) **Estimate of air control** - The amount of entrapped air for normal mix (non air entrained) concrete as per IS: 10262 are given in Table 19.

Table 19.

Nominal maximum size of aggregate	Entrapped air as percentage of volume of concrete
10 mm	3.0
20 mm	2.0
40 mm	1.0

(c) **Selection of water content and fine to total aggregate ratio -** Based on experience, empirical relationship have been established between quantity of water per unit volume of concrete and ratio of fine aggregate to total aggregate by absolute volume for desired workability. The estimated values for concrete up to M35 grade are given in Table 20.

Table 20.

Nominal maximum size of aggregate in mm	Water content in kgs per cubic meter of concrete	Sand as % age of total aggregate by absolute volume
10	208	40
20	186	35
40	165	30

A) The values given in Table 19. are based on the following conditions -

i) Crushed coarse aggregate conforming to IS: 383 and para 4.1.2 of this specification

ii) Fine aggregate consisting of natural sand conforming to grading zone II of IS: 383 water cement ratio (by mass) of 0.6 and

iii) Workability corresponding to compacting factor of 0.8.

B) For other conditions of workability, water cement ratio, grading of fine aggregate and for round aggregate, certain adjustment in quantities of mixing water and fine to total aggregate ratio as given in Table 19 are to be made as per IS: 10262. These are explained in Table 21 below –

Table 21.

Change of conditions stipulated for	Adjustment required in	
	Water content	Percentage of fines to total aggregate
For sand conforming to grading Zone I & III of IS -383	0	+1.5% for Zone I -1.5% for Zone III
Increase or decrease in the value of compacting factor by 0.1 For increase For decrease	+3.0 % -3.0%	0
For each 0.05 increase or decrease in free water-cement ratio For increase For decrease	0 0	+1.0 % -1.0 %
For rounded aggregates	-15 kg / mm^3	-7

C) Comparison of consistency measurement by various methods-

Workability description	Slump mm	Compacting factor
Extremely dry	--	--
Very stiff	--	0.70
Stiff	0-25	0.75
Stiff plastic	25-50	0.85
Plastic	75-100	0.90
Flowing	150-175	0.95

Calculation of aggregate content - With the quantities of water and cement per unit volume of concrete and ratio of fine to total aggregate content per unit volume of concrete to be calculated from the following equations -

$$V = \left\{ w + \frac{C}{Sc} + \frac{1}{p} \times \frac{fa}{Sfa} \right\} \times \frac{1}{1000}$$

$$V = \left\{ w + \frac{C}{Sc} + \frac{1}{1-p} \times \frac{fa}{Sca} \right\} \times \frac{1}{1000}$$

V = absolute volume of fresh concrete which is equal to gross volume (m^3), minus the volume of entrapped air.

W = mass of water (kg) per m^3 of concrete

C = mass cement (kg) per m3 of concrete

P = ratio of fine aggregate to total aggregate by absolute volume

Sc = specific gravity of cement

Fa, Ca = aggregate (kg) per m^3 of concrete respectively (total masses of fine aggregate and coarse aggregate)

Sfa, Sca = Specific gravities of saturated surface dry fine aggregate and coarse aggregate respectively **Calculation of batch masses -** The masses of various ingredients for concrete for design mix of a particular batch size may be calculate as described above.

4.6.8.5 **Production of controlled concrete -** The calculated mix proportion shall be checked by means of trial batches. Quantities of materials worked out as described above shall be termed as trial mix no.1. The quantities of materials for each trial mix shall be sufficient for at least three 150 mm size cube concrete specimens and concrete required to carry out workability test according to IS: 1199.

Workability of Trial Mix No.1 shall be measured. The mix shall be carefully observed for freedom from segregation and bleeding and its finishing properties. If the measured workability of Trial Mix No.1 is different from the stipulated value, the water content shall be adjusted according to Table 22 corresponding to the required changes in compacting factor. With this adjustment in water content, the mix proportions shall be recalculated keeping the free water-cement ratio at the preselected value which will comprise Trial Mix No.2. In addition, two more Trial Mixes No 3 and 4 shall be made with the water content same as Trial Mix No.2 and varying the free water cement ratio by (+) 10 per cent and (-) 10 per cent of the preselected value. For these two additional trial mixes No.3 and 4, the mix proportions are to be recalculated for the altered condition of free water-cement ratio with suitable adjustments in accordance with Table 22.

Fresh trial mixes are to be made for different types and brands of cement, alternative source of aggregates, maximum size and grading of aggregates.

4.6.8.6. **Batching -** In proportioning concrete, the quantity of both cement and aggregate should be determined by mass. Cement shall be used on the basis of mass and should be weighed separately from the aggregate. Water should be either measured by volume in calibrated tanks or weighed. Any solid admixture that may be added may be measured by

mass. Liquid and paste admixture by volume or mass. Batching plant where used should conform to IS: 4925. All measuring equipment should be maintained in a clean serviceable condition and their accuracy periodically checked.

Except where it can be shown to the satisfaction of engineer that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate should controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions when required, the different sizes being stocked in separate stock piles. The material should be stock-piled for several hours preferably a day before use. The grading of coarse and fine aggregate should be checked as frequently as possible, the frequency for a given job being determined by engineer to ensure that the specified grading in maintained.

It is important to maintain the water-cement ratio constant at its correct value. To this end, determination of moisture contents in both fine and coarse aggregate shall be made as frequently as possible, the frequency for a given job being determined by the engineer according to weather conditions. The amount of the water to be added shall be adjusted to compensate for any observed variations in the moisture contents. For the determination of moisture content in the aggregates, IS: 2386 (part 3) may be referred to. The allow for the variation in mass of aggregate due to variation in their moisture content, suitable adjustments in the masses of aggregates shall also be made. In the absence of exact data, only in the case of nominal mixes, the amount of surface water may be estimated from the values given in the Table 22.

Table 22 (Surface water carried by aggregate) (Clause 4.6.8.4)

Aggregate	Approximate quantity of surface water	
	Percent by mass	Litres/m^3
Very wet sand	7.5	20
Moderately wet sand	5.0	80
Moist sand	2.5	40
Moist gravel to crushed rock	1.25-2.5	20-40

4.6.8.7. **Mixing -** Concrete shall be mixed in mechanical mixer. The should mixer comply with IS -1791. It shall be fitted with hopper. The mixing shall be continuous until there is uniform distribution of the material and the mass is uniform in colour and consistency. If there is segregation after unloading from the mixer, the concrete should be remixed. The mixing time shall be not less than 2 minutes.

4.6.8.8. **Laying -** It shall be done as specified under para 4.2.4 of this specification.

4.6.8.9. **Curing -** It shall be done as specified under para 4.3.4 of this specification

4.6.8.10. **Approval of design mix -** The preliminary test for approval of design mix shall consists of three sets of separate tests and each set of test shall be conducted on six specimens. Not more than one set of six specimens shall be made on any particular day. Of the six specimens of each set, three shall be tested at seven days and remaining three at 28 days. The preliminary tests at seven days are intended only to indicate the strength to be attained at 28 days.

4.6.8.11. **Work strength test -** Work strength test shall be conducted in accordance with IS - 516 on random sampling. Each test shall be conducted on ten specimens, five or which shall be tested at 7 days and remaining five at 28 days. Not less than one work test consisting of testing of test on 10 cubes shall be carried out for every 30 cubic meter of concrete or less as per the lot size as specified below -

Lot size - Concrete under acceptance shall be notionally divided into lots for the purpose of sampling, before commencement of work. The delimitation of lots shall be determined by the following -

No individual lot shall be more than 30 m^3 in volume.

1) At least one cube forming an item of the sample representing the lot shall be taken from the concrete of same grade and mix proportions cast in any day.
2) Different grades or mixes of concrete shall be divided into separate lots.
3) Concrete of a lot shall be used in the same identifiable unit of the structure.

4.6.8.12. **Standard of acceptance**

a) The average strength of group of cubes cast for each day shall not be less than the specified work cube strength. 20 per cent of cubes cast for each day may have values less than the specified strength provided that the lowest value is not less than 85% of the specified strength.

b) Concrete strength less than specified may as a special case be accepted in a member with the approval of engineer provided that the maximum stress in the member under the maximum design live load does not exceed the permissible safe stress appropriate to the lower strength of the concrete.

c) Concrete which does not meet the strength requirements as specified but has a strength greater than that of the lowest value of 85% may, at the discretion of the designer, be accepted as being structurally adequate without further testing.

d) Concrete of each grade shall be assessed separately.

e) Concrete shall be assessed daily for compliance.

f) Concrete is liable to be rejected if it is porous or honey combed, its placing has been interrupted without providing a proper construction joint, the reinforcement has been displaced beyond the tolerances specified, or construction tolerances have not seen met. However, the hardened concrete may be accepted after carrying out suitable remedial measures to the satisfaction of the engineer.

4.6.8.13. An example illustration the mix design for concrete mix M 20 grade is given below

Design stipulation

a	Characteristic compressive strength required in the field at 28 days	20N/mm²
b	Maximum sizes of aggregate	20 MM (angular crushed)
c	Degree of workability	0.9 compacting factor (slump 75 mm)
d	Degree of quality control	Good
e	Type of exposure	Mild

Test data of material

a	Cement used - ordinary Portland cement satisfying the requirements of IS: 269-1989	
b	Specific gravity of cement	3.15
c	Specific gravity of	
i)	Coarse aggregate	2.60
ii)	Fine aggregate (natural sand)	2.60
d	Water absorption of	
i)	Coarse aggregate	0.5 percent
ii)	Fine aggregate (natural sand)	1.0 percent
e	Free surface moisture of	
i)	Coarse aggregate	Nil (absorbed moisture also nil)
ii)	Fine aggregate (natural sand)	2.0 percent

Sieve analysis

a) Coarse aggregate

IS sieve Size mm	Analysis of course aggregate fraction (Percent passing)		Percentage of different fraction		
			I	II	Combined
20	100	100	60%	40%	100%
10	0	71.2	60%	40%	100%
4.75		9.4	0	28.5%	28.5%
2.63		0		3.7%	3.7%

The grading of combined fraction I and II in the ratio of 60 and 40 conform to Table 10 described above.

b) Fine aggregate

IS sieve sizes	Fine aggregate (percent passing)
100	-
2.36 mm	100
1.18 mm	93
600 micron	60
300 micron	12
150 micron	2

The sand conforms to grading zone III.

Target mean strength - As described earlier for degree of quality control 'good' the value of standard deviation is 4.6, therefore with a tolerance factor of 1.65 the value of target mean strength for specified characteristic cube strength = 20 + 1.65 x 4.6 = 27.6 N/mm².

Selection of water cement ratio - From chart 1, the free water cement ratio required for target mean strength of 27.6 N/mm² is 0.50. This is lower than the maximum value of 0.65 prescribed for mild exposure.

Selection of water and sand content - From Table 8 for 20 mm nominal maximum size aggregate and sand conforming to grading zone II water content as per cum concrete is 186 kg and sand content percentage of total aggregate by absolute volume is equal to 35%. For change in value of water cement ratio compacting factor, and sand belonging to zone III the following adjustment is required.

Change in condition	Adjustment required in	
	Water content	Percentage in total aggregate
For decrease in water cement Ratio by (0.6-0.5) i.e.0.10	0	-2
For increase in compacting Factor by (0.9-0.8) I.e. 0.10	+3	0
For the conforming Grading zone III	0	-1.5
Total	3	-3.5

Therefore, the required water content = 186+186/100 x3 =186+3.58 =191.6 kg / m^3

And required sand content = 35 – 3.5 = 31.5 percent

Determination of Cement Content

Water-Cement ratio = 0.5

Water = 191.6 kgs

Cement = 191.6 / 0.5 = 383 kg / m^3

Thus cement content is adequate for mild exposure condition as per IS: 456-2000 as described in table below.

Determination of coarse and fine aggregate content

From Table 18 for specified maximum size of aggregate of 20 mm, the amount of entrapped air in wet concrete is 2 per cent. Taking this into account and applying equations given above.

0.98 m^3 = 191.6 +383/3.15 + 1/0.315. fa / 2.60) x 1/ 1000

and

0.98 m^3 = 191.6 +383/3.15 + 1/0.315. Ca / 2.60) x 1/ 1000

or fa = 546 kg / m^3 and ca = 1187 kg / m^3

The mix proportion now works out -

Water	Cement	Fine aggregate	Coarse aggregate
191.6	383 kg	546 kg	1187 kg
or 0.5	1	1.42	3.0

For 50 kg cement, the quantity of materials are worked out as below -

a)	Cement	= 50 kg.
b)	Sand	= 71 kg
c)	Coarse aggregate	154.5 kg.
	Fraction I - 92.7	
	Fraction II - 61.8	
d)	Water	
1	For water cement ratio of 0.5 quantity	= 25.0 kg.
2	Extra quantity of water to be added for absorption in coarse aggregate at 0.5% by mass	= 154.5 / 100x0.5 = 0.77 kg.
3	Quantity of water to be deducted for free moisture in sand at 2% by mass	= (-) 171.0/100x2=(-)1.42 kg.

Therefore actual quantity of water = 25.00 + 0.77 – 1.42 = 24.35 kg

Actual quantity of sand required after allowing for mass of free moisture

= 71.0 +1.42=72.42 kg

Actual quantity of Coarse aggregate

Fraction I = 92.7 – (0.6 x 0.77) = 92.24

Fraction II = 61.8 – (0.4 x 0.77) = 61.49

Therefore the actual quantities of different constituent required for mix are -

Water = 24.35 kg

Cement = 50 kg

Sand = 72.42 kg

Coarse aggregate Fraction I = 92.42 kg Fraction II = 61.49 kg

Measurements shall be done in accordance with paras above.

Tolerances - Paras above shall apply.

Rate – Paras above shall apply with the exception regarding limitations for actual average compressive strength being less than specified strength which shall be governed by para above for acceptance and prorata rates worked out accordingly.

4. SPECIFICATIONS CEMENT PLASTERING

15 mm thick lime plaster shall be done on rough side of single or half brick work. The average thickness of plaster shall not be less than 15 mm and the minimum thickness of the plaster at any place shall not be less than 10 mm. All other details shall be as specified in 15.1.

15.3. SPECIFICATIONS FOR 18 MM LIME PLASTER (TWO COATS WORK)

15.3.1. The details of scaffolding and preparation of surface and mortar shall be as specified in 15.1.

15.3.2. Application of Plaster - The plaster shall be applied in two coats. I.e., 12 mm under coat and then 6 mm finishing coat and shall have an average final thickness of not less than 18 mm.

15.3.2.2. 12 mm under coat - This shall be applied in the same manner as specified under 12 mm lime plaster except that (a) the finishing after the mortar has been brought to a level with the wooden straight edge, shall be done with wooden float only (b) during the process lime putty solution shall not be applied.

The surface shall be further roughened by furrowing about 2 mm deep with a scratching tool diagonally both ways to form a key for the finishing coat. The scratched lines shall be at not more than 15 cm apart. The surface shall be kept wet till the finishing coat is applied.

15.3.2.3. 6 mm Finishing Coat - The finishing coat shall be applied a day or two after the under coat has set. The latter shall not be allowed to dry out, before the finishing coat is laid on. The finishing coat shall be applied in a uniform thickness of slightly more than 6 mm. The method of application shall be as described except that the surface shall not be beaten with bamboo strips. The final thickness of the top coat shall be 6 mm.

15.3.3. Thickness - The thickness of the under coat of plaster specified shall be exclusive of the thickness of key. The average thickness of the under coat shall not be less than 12 mm whether the wall treated is of brick or stone. In the case of brick work the minimum thickness over any portion of the surface shall not be less than 10 mm while in the case of stone work, the minimum thickness over the bushing shall not be less than 6 mm.

15.3.4. 26 mm finishing coat shall be uniformly 6 mm thick over the under coat in the

case of both brick and stone masonry.

15.3.5. Specifications for other details such as Finish, Curing, Precautions, Measurements, and Rate etc. shall be as described.

15.5. SPECIFICATIONS FOR CEMENT PLASTERING

15.5.0. The cement plaster shall be 12 mm, 15 mm or 20 mm thick as specified in the item.

15.5.1. Scaffolding and preparation of surface shall be as specified in 15.1

15.5.2 Mortar - The mortar of the specified mix using the type of sand described in the item shall be used. It shall be as specified. For external work and under coat work, the fine aggregate shall conform to grading IV. For finishing cost work the fine aggregate conforming to grading zone V shall be used.

15.5.3. Application - The specifications as in 15.1.4 shall apply except in the following respects -

a) Beating with thin bamboo strips shall not be done on the cement plaster, and

b) No lime putty solution shall be applied on the face when finishing. Further the plastering and finishing shall be completed within half an hour of adding water to the dry mortar.

15.5.4. Thickness - Where the thickness required as per description of the item is 20 mm the average thickness of the plaster shall not be less than 20 mm whether the wall treated is of brick or stone. In the case of brick work, the minimum thickness over any portion of the surface shall be not less than 15 mm while in case of stone work the minimum thickness over the bushings shall be not less than 12 mm.

15.5.5. Curing - Curing shall be started as soon as the plaster has hardened sufficiently not to be damaged when watered.

The plaster shall be kept wet for a period of at least 7 days. During this period, it shall be suitably protected from all damages at the contractor's expense by such means as the engineer may approve. The dates on which the plastering is done shall be legibly marked on the various sections plastered so that curing for the specified period thereafter can be watched.

Specifications for Finish, Precautions, Measurements and Rate shall be as described in 15.1

15.6. SPECIFICATIONS FOR CEMENT PLASTER WITH A FLOATING COAT OF NEAT CEMENT

15.6.0. The cement plaster shall be 12, 15 or 20 mm thick, finished with a floating coat of neat cement, as described in the item.

15.6.1. Specifications for this item of work shall be same as described except for the additional floating coat which shall be carried out as below.

When the plaster has been brought to a true surface with the wooden straight edge (clause 13.5.3 It shall be uniformly treated over its entire area with a paste of neat cement and rubbed smooth, so that the whole surface is covered with neat cement coating. The quantity of cement applied for floating coat shall be 1 kg per sqm. Smooth finishing shall be

completed with trowel immediately and in no case later than half an hour of adding water to the plaster mix. The rest of the specifications as described in 15.5.3 shall apply.

15.7. SPECIFICATIONS FOR 18 MM CEMENT PLASTER (TWO COAT WORK)

15.7.1. The specification for scaffolding and preparation of surface shall be as described in 15.5

15.7.2. Mortar - The mix and type of fine aggregate specified in the description of the item shall be used for the respective coats. It shall be as specified in section 0.5. Generally the mix of the finishing coat shall not be richer than the under coat unless otherwise described in item.

Generally coarse sand shall be used for the under coat and fine sand for the finishing coat, unless otherwise specified for external work and under coat work, the fine aggregate shall conform to grading zone IV. For finishing coat work the fine aggregate conforming to grading zone V shall be used.

15.7.3. Application

15.7.3.1. The plaster shall be applied in two coats i.e. 12 mm under coat and then 6 mm finishing coat and shall have an average total thickness of not less than 18 mm.

15.7.3.2. 12 mm under coat -This shall be applied as specified except that when the plaster has been brought to a true surface a wooden straight edge and the surface shall be left rough and furrowed 2 mm deep with a scratching tool diagonally both ways, to form key for the finishing coat is applied.

15.7.3.3. 6 mm finishing coat - The finishing coat shall be applied after the under coat has sufficiently set but not dried and in any case within 48 hours and finished in the manner as specified.

15.7.4. Specifications for Curing, Finishing, Precautions, Measurements and Rate shall be as described in 15.5

15.8. SPECIFICATIONS FOR 6 MM CEMENT PLASTER ON CEMENT CONCRETE AND REINFORCED CEMENT CONCRETE WORK

15.8.0 Scaffolding - Stage scaffolding shall be provided for the work. This shall be independent of the walls.

15.8.1. Preparation of Surface - Projecting burrs of mortar formed due to the gaps at joints in shuttering shall be removed. The surface shall be scrubbed clean with wire brushes. In addition concrete surface to be plastered shall be pock marked with a pointed tool, at spacing of not more than 5 cm centers, the pock being made not less than 3 mm deep. This is to ensure a proper key for the plaster. The mortar shall be washed off and surface, cleaned of all oil, grease etc. and well wetted before the plaster is applied.

15.8.2. Mortars - Mortar of the specified mix using the types of sand described in the item shall be used. It shall be as specified.

15.8.3. Application -To ensure even thickness and a true surface, gauges of plaster 15 x 15 cm, shall be first applied at not more than 1.5 m intervals in both directions to serve as

guides for the plastering. Surface of these gauged areas shall be truly in the plane of the finished plaster surface. The plaster shall be then applied in a uniform surface to a thickness slightly more than the specified thickness and shall then be brought to true and even surface by working a wooden straight edge reaching across the gauges. Finally the surface shall be finished true with a trowel or with wooden float to give a smooth or sandy granular texture as required. Excess trowel ling or over working of the floats shall be avoided. The plastering and finishing shall be completed within half an hour of adding water to the dry mortar.

15.8.4. Plastering of ceiling shall not be commenced until the slab above has been finished and centering has been removed. In case of ceiling of roof slabs, plaster shall not be commenced until the terrace work has been completed. These precautions are necessary in order that the ceiling plaster is not disturbed by the vibrations set up in the above operations.

15.8.5. Finish - The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness as required. The work shall be tested 15.8.5 frequently as the work proceeds with a true straight edge not less than 2.5 m long and with plumb bobs. All horizontal lines and surfaces shall be tested with a level and all jambs and corners with a plumb bob as the work proceeds.

15.8.6. Thickness - The average thickness of plaster shall not be less than 6 mm. The minimum thickness over any portion of the surface shall not be less than 5 mm.

15.8.7. Curing - The specifications shall be as detailed in 15.5

15.8.8. Precautions - These shall be as described in 15.1.8.

15.8.9. Measurements

15.8.9.1. Length and breadth shall be measured correct to a cm. and its area shall be calculated in sq.m correct to two places of decimal. Dimensions before plastering shall be taken.

15.8.9.2. Thickness of plaster shall be exclusive of the thickness of the key i.e., depth or rock marks and hacking.

15.8.9.3. Plastering on ceiling at height greater than 5 m above the corresponding floor level shall be so described and shall be measured separately stating the height in stages of 1 m or part thereof.

15.8.9.4. Plastering on the sides and soffits of the projected beams of ceiling at a height greater than 5 m above the corresponding floor level shall be measured and added to the quantity as measured under 15.8.9.3.

15.8.9.5. Plastering on spherical and groined ceiling and circular work not exceeding 6 m in radius, shall be measured and paid for separately.

15.8.9.6. Flowing soffits (Viz. portion under spiral stair case etc.) shall be measured and paid for separately.

15.8.9.7. Ribs and mouldings on ceiling shall be measured as for cornices; deductions being

made from the plastering on ceiling in case the width of the moulding exceed 15 cm.

15.8.9.8. The mode of measurement of exterior plaster and patch plastering (in repairs) shall be as laid down in 15.1.9.8

15.8.9.9. Deduction shall not be made for openings or for ends of columns, or columns caps of 0.5 sqm each in area and under. No additions will be made either for the plastering of the sides of such openings. For openings etc. of areas exceeding 0.5 sqm deduction will be made for the full opening but the sides of such openings shall be measured for payment.

15.8.10. Rate - The rate shall include the cost of all labour and materials involved in all the operations described above.

15.9. **SPECIFICATIONS FOR 6 MM CEMENT PLASTER FOR SLAB BEARING**

15.9.0. Cement plaster shall be 6 mm thick finished with a floating coat of neat cement and thick coat of lime wash on top of walls for bearing of slabs.

15.9.1. Application - The plaster shall be applied over the cleaned and wetted surface of the wall. When the plaster has been brought to a true surface with a wooden straight edge (Clause 15.5.3) it shall be uniformly treated over its entire area with a paste of neat cement and rubbed smooth, so that the whole surface is covered with neat cement coating. The quantity of cement applied for floating coat shall be 1 kg per sqm. Smooth finishing shall be completed with trowel immediately and in no case later than half an hour of adding water to the plaster mix. The rest of the specifications described in 15.5.3 shall apply.

15.9.2. Lime wash - This shall be applied in a thick coat after curing the plaster for three day

15.9.3. Measurements - Length and breadth shall be measured correct to a cm and area worked out in sqm correct to two places of decimal.

15.9.4. Rate - The rate shall include the cost of all labour and materials involved in all the operations described above.

1. SPECIFICATIONS FOR ALUMINIUM WINDOWS

(Extract of IS: 1949-1961)

1. **Scope –** Deals with aluminium windows suitable for use in industrial buildings and designed to suit openings based on a module of 10 cm.

2. **Designation –** By symbols IN (to indicate industrial window) x Width expressed in number of modules x Type (F = fixed sash; C = centre hung sash; B = bottom-hung sash; T = top-hung sash) x Height expressed in number of modules.

Examples:

a) IN 10 C 15 indicate window for opening 10 module wide (100 cm) by 15 module high (150 cm) with centre-hung ventilator.

b) Composite windows

IN 10 C 10/IN 10 C 10

IN 10 C 15/IN 10 C 15

Indicates the combination of four windows, two of the type IN 10 C 10 on top and two of the type IN 10 C 15 at bottom, all the four of them coupled both horizontally and vertically.

3. **Sizes and tolerances**

a) Sizes

IN10C10	IN22C10	IN16C15	IN10C20	IN22C20	IN16F10
IN10T10	IN22T10	IN16T15	IN10T20	IN22T20	IN16F15
IN10B10	IN22B10	IN16B15	IN10B20	IN22B20	IN16F20
IN16C10	IN10C15	IN22C15	IN16C20	IN10F10	IN22F10
IN16T10	IN10T15	IN22T15	IN16T20	IN10F15	IN22F15
IN16B10	IN10B15	IN22B15	IN16B20	IN10F20	IN22F20

b) Ventilators (opening part of a sash) shall be of one size and designed to fit into outer frame of IN 10 C 10 and with 1.2-mm clearance.

c) Tolerance for overall dimensions ± 3 mm.

Note – The overall width and height of window is smaller than dimensions of modular opening by 2.5 cm, allowing a clearance of 1.25 cm all round. Thus, width and height of INC10C5 = 97.5 x 147.5 cm.

4. **Material**

a) Aluminium extruded section: IS Designation HE9 – WP. Hollow sections shall conform to IS Designation HV9 – WP.

b) Cord-eyes, pulleys, brackets and catch plates shall be of aluminium or galvanized or cadmium plated steel.

c) Pivots, peg stays and spring catches shall be of non-ferrous metal.

d) Glass panes - Shall weigh 7.5 kg/m2. Sizes of glass panes shall be as given below:

Pane Designation	a	b	c	d	e	f
Width (mm)	265	300	290	300	300	290
Height (mm)	420	420	455	455	490	490

Note: For number of glass panes for each type of window sees Fig.5 of the standard.

5. **Holes for fixing, coupling and glazing –** Holes for fixing and coupling sashes shall be provided in the web of the outside frame sections and of outer ventilator frame sections where these occur at the perimeter of the sash. Holes for glazing chips shall also be provided, one hole being located in web of the section or tee, on each side of each pane.

6. **Fitting and fixing materials**

6.1. Centre-hung ventilators shall be mounted on a pair of cup-pivots made out of aluminium alloy sheet or chromium plated brass and each pivot consisting of a inner and outer cup, permitting the swinging of the ventilator through at least 85°. The ventilator shall be so balanced that it can remain open in any desired position.

6.2. Centre–hung and bottom-hung ventilators shall have cast aluminium or bronze spring catch in the centre of the top section, suitable for operation by hand or pole (chord in case of centre-hung).

6.3. Bottom-hung and top-hung ventilators shall be hung on aluminium alloy hinges. The former shall be provided with a pair of aluminium alloy folding side arms (to limit the opening) and the latter with a 300 mm long peg stay. Alternatively, top-hung ventilator may be provided with 30-cm cam opener.

6.4. Two spring glazing clips per pane shall be provided

7. **Composite windows –** Shall be dispatched unassembled, but complete with necessary components. Each coupling member will increase the overall height or width by 25 mm.

8. **Finish -** Matt, scratch-brush or polished may be anodized additionally. A thick layer of transparent lacquer, based on methacrylates or cellulose butyrate, shall be applied, by the suppliers, to protect the surface from action of wet cement during installation. This lacquer coating shall be removed after installation is completed.

2. SPECIFICATIONS FOR GLAZED TILE FLOORING

14.15.1. White glazed tiles - The tiles shall be of approved make and shall generally conform to IS: 777. They shall be flat, and true to shape and free from blisters crazing, chips, welts, crawling or other imperfections detracting from their appearance. The tiles shall be tested as indicated in Appendix of IS: 777.

The tiles shall be square or rectangular of nominal size such as 150 x 150 mm, 100 x 100 mm, 100 X200 mm or as directed by the engineer. The thickness of the tiles shall be 5 mm, or 6 mm as specified. The length of all four sides shall be measured correct to 0.1 mm and average length breadth shall not vary more than ± 0.8 mm from specified dimension. The variation of individual dimension from average value of length/breadth shall not exceed ± 0.5 mm. Tolerance in thickness shall be ± 0.4 mm.

Note 1: Where tiles of nominal sizes of 150 x 150 mm or 100 x 100 mm are not available tiles of nominal sizes 152 mm x 152 mm or 108 mm x 108 mm may be allowed to be used with prior approval of the engineer.

Note 2: The actual size of tiles supplied shall be 1 mm less so that with 1 mm joint, the tile when laid shall conform to the nominal size.

The top surface of the tiles shall be glazed and glaze shall be either glossy or matt as specified. The underside of the tiles shall not have glaze on more than 5% of the area in order that the tile may adhere properly to the base. The edges of the tiles shall be preferably free from glaze. However, any glaze if unavoidable, shall be permissible on only up to 50 per cent of the surface area of the edges.

14.15.2. Coloured tiles - Only the glaze shall be coloured as specified. The sizes and specifications shall be the same as for the white glazed tiles.

14.15.3. Decorative tiles - The type and size of the decorative tiles shall be as follows

Decorated white black ground tiles

The size of these tiles shall be 152 x 152 x 6 mm and / or 108 x 108 x 6 mm.

ii) Decorated and having colored back ground

The sizes of the tiles shall be 152 x 152 x 6 mm and / or 108 x 108 x 6 mm.

14.15.4. Preparation of surface and laying

Base concrete or the RCC slab on which the tiles are to be laid shall be cleaned, wetted and mopped. The bedding for the tile shall be with cement mortar 1:3 (1cement: 3 coarse sand) or as specified. The average thickness of the bedding shall be 10 mm while the thickness under any portion of the tiles shall not be less than 5 mm.

Mortar shall be spread, tamped and corrected to proper levels and allowed to harden sufficiently to offer a fairly rigid cushion for the tiles to be set and to enable the mason to place wooden plank across and squat on it.

Over this mortar bedding neat grey cement slurry of honey like consistency shall be spread at the rate of 3.3 kg of cement per square meter over such an area as would accommodate about twenty tiles.

Tiles shall be soaked in water washed clean and shall be fixed in this grout one after another, each tile gently being tapped with a wooden mallet till it is properly bedded and in level with the adjoining tiles. The joints shall be kept as thin as possible and in straight lines or to suit the required pattern.

The surface of the flooring during laying shall be frequently checked with a straight edge about 2 m long, so as to obtain a true surface with the required slope.

Where full size tiles cannot be fixed these shall be cut (sawn) to the required size, and their edge rubbed smooth to ensure straight and true joints.

Tiles which are fixed in the floor adjoining the wall shall enter not less than 10 mm under the plaster, skirting or dado. After tiles have been laid surplus cement slurry shall be cleaned off.

14.15.5. Pointing and finishing - The joints shall be cleaned off the grey cement slurry with wire / coir brush or trowel to a depth of 2 mm to 3 mm and all dust and loose mortar removed. Joints shall then be flush pointed with white cement added with pigment if required to match the colour of tiles. The floor shall then be kept wet for 7 days. After curing, the surface shall be washed and finished clean. The finished floor shall not sound hollow when tapped with a wooden mallet.

14.15.6. Measurements - Length and breadth shall be measured correct to a cm before laying skirting, dado or wall plaster and the area calculated in square meter correct to two places of decimal. Where coves are used at the junctions, the length and breadth shall be measured between the lower edges of the coves.

No deductions shall be made not extra paid for voids not exceeding 0.20 square metre. Deductions for ends of dissimilar materials or other articles embedded shall not be made for areas not exceeding 0.10 square meter.

Areas, where glazed tiles or different types of decorative tiles are used will be measured

separately.

14.15.7. Rate - The rate for flooring shall include the cost of all materials and labour involved in all the operations described above. Nothing extra shall be paid for the use of cut (sawn) tiles in the work.

Extra over and above the normal rate for white tiles shall be paid where coloured or any other type of decorative tiles have been used.

14.16. SPECIFICATIONS FOR GLAZED TILES IN SKIRTING AND DADO

14.16.1. The tiles shall be of approved make and shall generally conform to IS: 777. The tiles shall be of earthenware covered by a glaze thoroughly matured and fitted to the body. The tiles shall be sound, true to shape, flat and free from flaws and other manufacturing defects affecting their utility.

The top surface of the tiles shall be glazed. The underside of the tiles shall not have glaze on more than 5% of the area that the tile may adhere properly to the base. The edges of the tiles shall be free from glaze; however, any glaze if unavoidable shall be permissible on only up to 50 per cent of the surface area of edges.

The glaze shall be free from welts, chips, craze, specks, crawling or other imperfections detracting from the appearance when viewed from a distance of one meter. The glaze shall be either glossy or matt as specified. The glaze shall be either glossy or matt as specified. The glaze shall be white in colour except in the case of coloured tiles when colours shall be specified by the engineer. There may be more than one colour on a tile.

14.16.1(a) Dimensions and tolerances - Glazed earthenware tiles shall be made square or rectangular in sizes such as 149 x 149 mm and 99 x 99mm or 99 x 199 mm or as specified and shall

Half tiles for use as full tiles shall have dimensions which shall be such as to make the half tiles when jointed (with 1 mm joint) match with dimensions of full tiles. Tiles may be manufactured in sizes other than those specified above.

Note: Commonly manufactured sizes include 108 x 108 mm, 152 x 152 mm, 200 x 200 mm, 200 x 150 mm and 200 x 100 mm.

The thickness of the tiles shall be 5 mm or 6 mm as specified.

The dimensions of fittings associated with the glazed tiles namely cove base, round edge tile, angles corner cups, ridge and legs, cornices and capping beads shall be of the shape and dimensions as required and the thickness of fittings shall be the same as the thickness of tiles given above.

14.16.1 (b) Tolerances

Facial dimensions – The lengths of all the four sides of the tile shall be measured to the nearest 0.1 mm. The average value of lengths / breadth shall not vary more than ± 0.8 mm from the above specified dimension.

The variation of individual dimensions from average value of length / breadth shall not exceed ± 0.5 mm. Tolerances on thickness shall be ± 0.4 mm.

Tiles shall be checked for squareness and warpage as described thereafter.

Method of checking squareness of tiles

Fig. A – Trueness of Shape (Squareness) [Clause 14.16.1(c)]

14.16.1 (c) Trueness of shape (Squareness) - Any variation from a right angle in the angle contained by any two adjoining sides shall be limited so that if a builder's steel square is placed against the angle, the distance between the inner edge of the square and the adjacent side of the tile or fitting shall not be more than 0.5 mm per 100 mm run.

14.16.1 (d) Warpage - The tiles when tested for warpage on the edges and on the diagonal as per Appendix – A of IS: 777 shall not have warpage exceeding the value as specified below

Size of tile (mm)	Warpage (mm)
149 x 149	- 0.4 + 0.7
99 x 99	- 0.3 + 0.5

14.16.1 (e) Performance requirements water absorption - The average water absorption of the tiles when tested and evaluated in accordance with IS: 777 shall not exceed 20 per cent.

Crazing - Tiles subjected to two cycles of crazing test as per IS: 777 shall not show any sign of crazing.

Impact resistance - Tiles when tested for impact resistance as per IS: 777 shall remain intact, apart from surface marking.

Chemical resistance - When tested as per IS: 777, the glazed surface of tiles and / or the fittings having a white or cream coloured glossy glaze shall show no modification.

14.16.2. Preparation of surfaces - The joints shall be raked out to a depth of at least 15 mm in masonry walls.

In case of concrete walls, the surface shall be hacked and roughened with wire brushes. The surface shall be cleaned thoroughly, washed with water and kept wet before skirting is commenced.

14.16.3. Laying - 12 mm thick plaster of cement mortar 1:3 (1cement: 3 coarse sand) mix as specified shall be applied and allowed to harden. The plaster shall be roughened with wire brushes or by scratching diagonal at closed intervals.

The tiles should be soaked in water, washed clean, and a coat of cement slurry applied liberally at the back of tiles and set in the bedding mortar. The tiles shall be tamped and corrected to proper plane and lines. The tiles shall be set in the required pattern and jointed. The joints shall be as fine as possible. Top of skirting or dado shall be truly horizontal and joints truly vertical except where otherwise indicated. Skirting and dado shall rest on the top of the flooring. Where full size tiles cannot be fixed these shall be cut (sawn) to the required size and their edges rubbed smooth.

14.16.4. Curing and finishing - The joints shall be cleaned off the grey cement grout with wire / coir brush or trowel to a depth of 2 mm to 3 mm and all dust and loose mortar removed. Joints shall then be flush pointed with white cement added with pigments if required to match the colour of tiles. The work shall then be kept wet for 7 days.

After curing, the surface shall be washed and finished clean. The finished work shall not sound hollow when tapped with a wooden mallet.

14.16.5. Measurements - Length shall be measured correct to a cm. Height shall be measured correct to a cm in the case of dado and 5 mm in the case of riser and skirting. The area shall be calculated in square meter, correct to two places of decimal. Length and height shall be measured along the finished face of the skirting or dado including curves where specials such as coves, internal and external angles and beads are used. Where cornices are used the area of dado shall be measured excluding the cornices. Nothing extra will be paid for cutting (sawn) the tiles to sizes.

In addition to payment for areas of skirting and dado, specials such as coves, internal and external angles and beads shall be measured separately and paid for in running meters. Cornices shall also be similarly measured for payment in running meters. Areas where coloured tiles or different types of decorative tiles are used will be measured separately to be paid extra over and above the normal rate for white tiles.

14.16.6. Rates - The rate shall include the cost of all materials and labour involved in all the operations described above. The specials such as coves, internal and external angles and beading shall be measured and paid for separately. The rate shall not include cost of cornices which shall be measured and paid for in running meters separately.

14.17. SPECIFICATIONS FOR GLAZED TILE SPECIALS

14.17.1. Specials - The specials consist of coves, internal and external angles, beads cornices and their corner pieces.

Cover beads and angles shall be of thickness not less than the thickness of the tiles with which they are used. The size of coves, beads, angles refer to the greatest width of the special measured in a straight line. The stipulated size of cornices is their height. The lengths of specials shall be 15 cm, 10 cm or other standard size available conforming to the size of tiles available.

In other respects the general specifications as described in 14.15.1 shall be applicable.

14.17.2. Preparation of surface, laying, curing and finishing shall be as specified in 14.16.2, 14.16.3, 14.16.4 as far as applicable.

14.17.3. Measurements - Special tiles to form coved internal angles of any radius, rounded external angles, architraves moulding, ceiling ribs, cornices and the like shall each be measured in running meters correct to a cm. Railing members and vertical members shall each be so described. Ends, angles and internal sections shall be enumerated separately.

14.17.4. Rate - It shall include the cost of all materials and labour involved in all the operations described above. Nothing extra shall be paid for corner pieces at junctions of

coves, beads, cornices etc. or for using cut lengths of specials.

3. RELEVANT BIS CODE FOR TECHNICAL SPECIFICATION

S. No.	IS Code	Description
		E. PLASTERING AND POINTING
1	IS: 269	Specification for 33 Grade Ordinary Portland Cement.
2	IS: 712	Specification for Building Limes.
3	IS:1542	Specification for Sand for Plaster.
4	IS:1630	Specification for Mason's Tools for plaster work and pointing work.
5	IS:1661	Code of Practice for application of cement lime plaster finishes.
6	IS:2402	Code of Practice for external rendered finishes.
7	IS:8041	Specification for Rapid Hardening Portland Cement.
8	IS:8112	Specification for 43 Grade Ordinary Portland Cement.
9	IS:12600	Specification for Low Heat Portland Cement.
		F. PAINTING
1	IS: 63	Whiting for Paints.
2	IS:110	Reading mixed paint, brushing, gray filler for Enamels, for use over primers.
3	IS:426	Specification for paste filler for color coats.
4	IS:428	Specification for Distemper, Oil Emulsion, color as required.
5	IS:710	Specification for Marine Plywood.
6	IS:1477 (Part I)	Code of Practice for painting of ferrous metals in buildings - Pretreatment.
7	IS:1477 (Part II)	Code of Practice for painting of ferrous metals in buildings - Painting.
8	IS:2338 (Part I)	Code of Practice for finishing of wood and wood based materials - Operations and Workmanship for finishing.
9	IS:2338 (Part II)	Code of Practice for finishing of wood and wood based materials - Schedules.
10	IS:2395 (Part I)	Code of Practice for painting concrete masonry and plaster surfaces - Operation and workmanship.
11	IS:2395 (Part II)	Code of Practice for painting concrete masonry and plaster surfaces - Schedules.
12	IS:2524 (Part I)	Code of Practice for painting of non-ferrous metals in buildings - Pre-treatment.
13	IS:2524 (Part II)	Code of Practice for painting of non-ferrous metals in buildings - Painting.
14	IS:3140	Code of Practice for painting asbestos cement building products.

15	IS:5410	Specification for cement paints, colour as required.

IS NO.	TITLE
292 :1983	Specification for leaded brass ingots and castings
318:1981	Specification for leaded tin bronze ingots and castings
319:1989	Specification for free cutting leaded brass bars, roads and sections
407:1989	Specification for brass tubes for general purpose
410:1977	Specification for cold rolled brass sheets, strip and foil
554:1985	Dimensions for pipe threads where pressure – tight joints are made on threads
742:1981	Specification for zinc base alloys die casting
781:1984	Specification for cast copper alloys screw down bib taps and stop valves for water services
1264:1989	Specification for brass gravity die castings (ingots and castings)
1795:1982	Specification for pillar taps for water supply purpose
2643 : 1975	Dimensions for pipe threads for fastening purpose
4454 (part 4): 1975	Steel wires for cold formed springs : part 4 stainless spring steel wire for normal corrosion resistance (first revision)
4694 : 1968	Basic dimension of square threads
4827:1983	Electroplated coatings of nickel and chromium on copper and copper alloys
4828:1983	Electroplated coatings of copper nickel and chromium on zinc alloys
4905:1986	Methods for random sampling
5192:1975	Specification for vulcanized natural rubber based compounds
6912:1975	Specifications for copper and copper alloys forging stock and forgings
6912:1985	ISO metric trapezoidal screw threads : Part I Basic profile and maximum material profile (first revision)
7008(part 1) :1988	ISO metric trapezoidal screw threads: Part 2 Pitch diameter combinations (first revision)
7008(part 2):1988	ISO metric trapezoidal screw threads: Part 2 Pitch diameter combinations (first revision)
7008(part 3):1988	ISO metric trapezoidal screw threads :Part 3 Basic dimensions (first revision)
7008(part 4):1988	ISO metric trapezoidal screw threads: part 4 Tolerances (first revision)
7450 : 1974	Specification for vulcanized styrene – butadiene rubber (SBR) based compounds

7608 :1975	Specification for phosphor bronze wire (for general engineering Purposes)
7814 : 1985	Specification for phosphor bronze sheets and strip
8376 : 1988	Electroplated coatings of nickel and chromium on plastics for decorative purpose
9844:1981	Method of testing corrosion resistance of electroplated and anodized of electroplated and anodized aluminum coatings by neutral salt spray test
9975 :1981	Specification for "O" rings
10446 : 1983	Glossary of terms relating to water supply and sanitation
10773:1983	Copper tubes for refrigeration purposes

SL. NO.	IS. NO.	Subject
1	458-2003	Precast concrete pipes (with and without reinforcement) (3rd Revision) (Amendment 2)
2	651-1992	Specification for salt glazed stoneware pipes and fittings(5th revision)
3	1726-1991	Specification for cast iron manhole covers and frames(3rd revision)
4	1729-2002	Specification for sand cast iron spigot and socket soil waste and ventilating pipes, fitting and accessories1st revision) (Amendments 4) (Reaffirmed 19

CONCRETE WORK --- LIST OF BUREAU OF INDIAN STANDARDS

Sl No	IS No.	Subject
1	306-1983	Tin bronze ingots and castings (3rd revision) Reaffirmed 1993.
2	383-1970	Coarse and fine aggregate from Natural source for concrete (2nd revision) Reaffirmed 1990.
3	456-2000	Code of practice for plain and reinforced concrete (3rd revision) (Amendments 2) Reaffirmed 1991.
4	516-1959	Method of sampling and analysis of concrete. Reaffirmed 1991.
6	1200 (Part II) 1974	Method of measurement of building and civil engineering work Part 2 (concrete works). (3rd revision) (Amendments 2) Reaffirmed 1991.
7	1322-1993	Bitumen felt for water proofing and damp proofing (4th revision) (previously 13220-1982)
8	1791-1985	Batch type concrete mixers. (2nd revision) Reaffirmed 1990.
9	2386-1963	Method of test for aggregate for concrete work. a) Part 1 particle size and shape (Amendments 2) Reaffirmed 1990
		b) Part 2 Estimation of deleterious materials and organic impurities (Amendments 1) Reaffirmed 1990.
		c) Part 3 Specific gravity, density, voids, absorption and builking – Reaffirmed 1990.l
		d) Part 4 Mechanical properties (Amendments 3) Reaffirmed

		1990.
10	2505-1980	General requirements for concrete vibrators immersion type. Reaffirmed 1993.
11	2505-1985	General requirements for screed board concrete vibrators. (1st revision) Reaffirmed 1990.
12	2645-1975	Integral cement water proofing components (1st revision) (Amendments 1) Reaffirmed 1992.
13	2686-1977	Cinder as fine aggregate for use in lime concrete (1st revision) (Amendments 1) Reaffirmed 1992.
14	3068-1986	Broken butnt (clay) coarse aggregate for use in lime concrete. (2nd revision) Reaffirmed 1991.
15	3812-1981	Flyash for use as pozzolana and admixtures (1st revision) Reaffirmed 1992.
16	4643-1984	Section wrenches for fire bridge use (1st revision) Reaffirmed 1992.
17	4656-1968	Form vibrators for concrete. Reaffirmed 1991.
18	7861 (Part 1) 1981	Code of practice for extreme weather concreting (Part 1) recommended practice for hot weather concreting (Amendments 1) Reaffirmed 1990.
19	7861 (Part 2) 1975	Code of practice for cold weather concreting (Part 2) Recommended practice for cold weather concreting (Amendments 1) Reaffirmed 1992.
20	9103-1979	Admixture for concrete Reaffirmed 1990.

LIST OF BUREAU OF INDIAN STANDARDS (IS)

IS: 737-1986	Wrought aluminium and aluminium alloy, steel and strip for general engineering purpose. (3rd Revision)
IS: 1121-(Part I) 1974	Methods of test for determination of properties and strengths of Natural building stones (Part I-compressive strength). (1st Revision) (Amendment I)
IS: 1122-1974	Methods of test for determination of specific gravity of natural Building stones. (1st Revision)
IS: 1123-1975	Methods of identification of natural building stones. (1st Revision)
IS: 1124-1974	Methods of test for determination of water absorption, apparent Specific gravity and porosity of natural building stones. (1st Revision)
IS: 1125-1974	Methods of test for determination of weathering of natural building stones (1st Revision)
IS: 1126-1974	Methods of test for determination of durability of natural Building stones. (1st Revision) (Amendment I)
IS: 1128-1974	Lime stones (slab & tiles). (1st Revision)
IS: 1129-1972	Recommendations for dressing of natural building stones. (1st Revision) Reaffirmed 1993
IS: 1200 (Part 4) -1976	Methods of measurements of building and Civil engineering works: Part 4 : Stone masonry. (3rd Revision) Reaffirmed 1992
IS: 1597 (Part 1)-1992	Code of practice for construction of rubble stone masonry : Part 1 : Rubble Stone masonry (1st Revision)

IS: 1597 (Part 2)-1992	Code of practice for construction of ashlar stone masonry : Part 2 : Ashlar masonry (1st Revision)
IS: 1805-1973	Glossary of terms relating to stones, quarrying and dressing. (1st Revision)
IS: 2185-(Part1)-1979	Concrete masonry units: Part 1: Hollow and solid concrete blocks. (2nd Revision) (Amendment 1) 2005
IS: 2572-1963	Code of practice for construction of hollow concrete blocks Masonry. 2005
IS: 3620-1979	Laterite stone block for masonry. (1st Revision) 1993
IS: 3622-1977	Sand stone (slab & tiles) (1st Revision)
IS: 4101-(Part 1)-1967	Code of practice for external facings and veneers: Part 1: Stone facing, Reaffirmed 1990
IS: 4101-(Part 2) 1967	Code of practice for external facings and veneers: Part 2: Cement concrete facing. 1990
IS: 12440-1988	Precast concrete stone masonry blocks.
IS: 269-1989	33 grade Ordinary Portland Cement. (4th Revision) (Amendments 3)
IS: 1489-1991	Part 1: Portland Pozzolana Cement: Part 1: Fly ash based (3rd Revision) Part 2: Portland Pozzolana Cement: Part 2: Calcined Clay based. (3rd Revision)
IS: 6909-1990	Specification for Super sulphated Cement. (Amendments 2)
IS: 8041-1990	Rapid hardening Portland cement. (2nd Revision) (Amendments 2)
IS: 8043-1991	Hydrophobic Portland cement. (2nd Revision) (Amendments 2)
IS: 3812-1981	Fly ash for as Pozzolana and admixture. (1st Revision) Part I & II 2003
IS: 383-1970	Coarse and fine aggregate from natural sources for concrete. (2nd Revision) Reaffirmed 1990
IS: 453-1993	Double acting spring hinges. (3rd Revision)
IS: 1122-1974	Method of test of determination of true specific gravity of natural building stones. (1st Revision) Reaffirmed 1993
IS: 1124-1974	Method of test for determination of water absorption, apparent Specific gravity and porosity of natural building stones. (1st Revision) Reaffirmed 1990.
IS: 1130-1969	Marble (blocks, slabs and tiles). Reaffirmed 1993
IS: 4101(Part-1) - 1967	Code as practice for external facing and veneers: Part 1 Stone facing. Reaffirmed 1990.

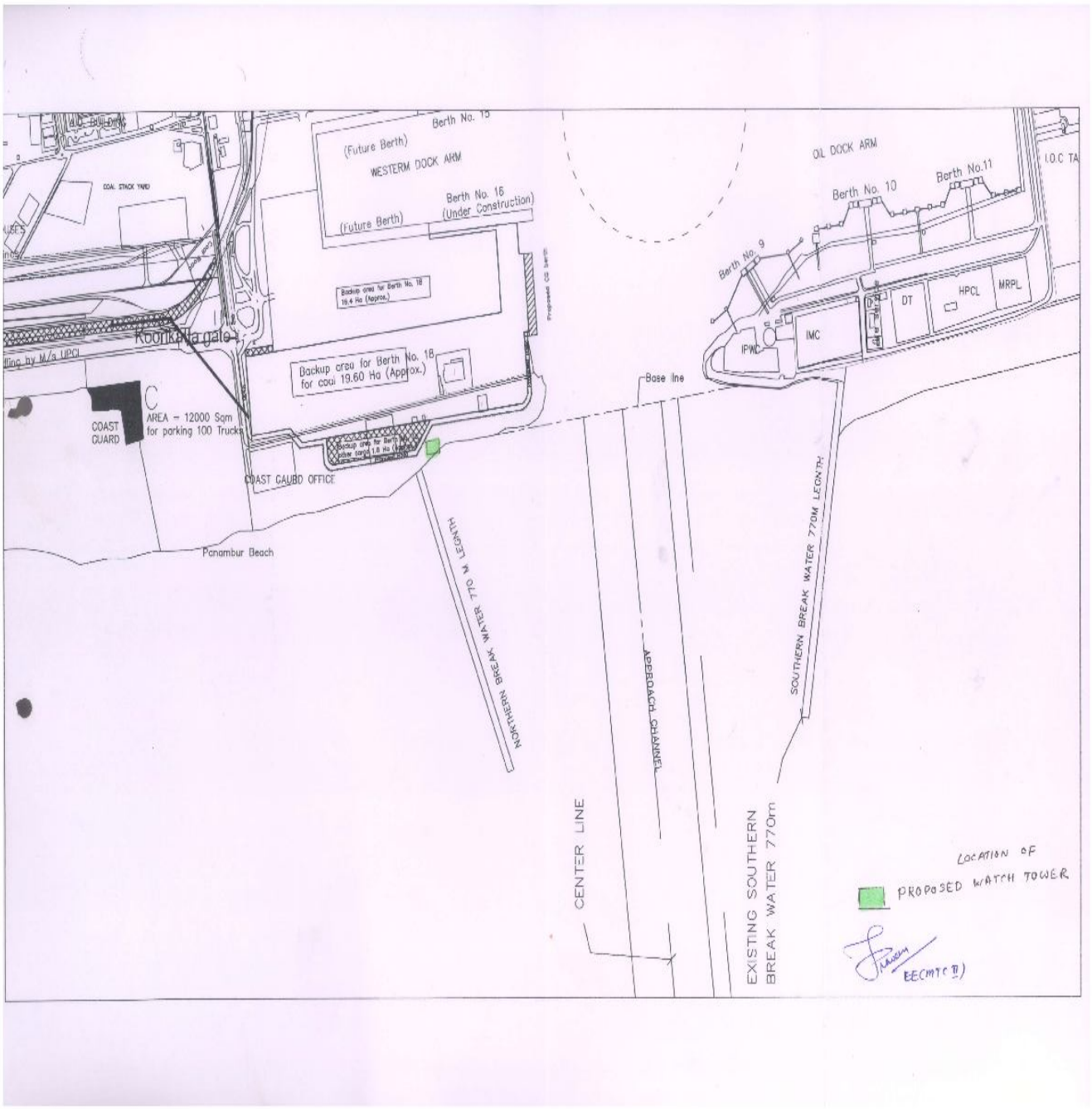
SECTION V

DRAWINGS

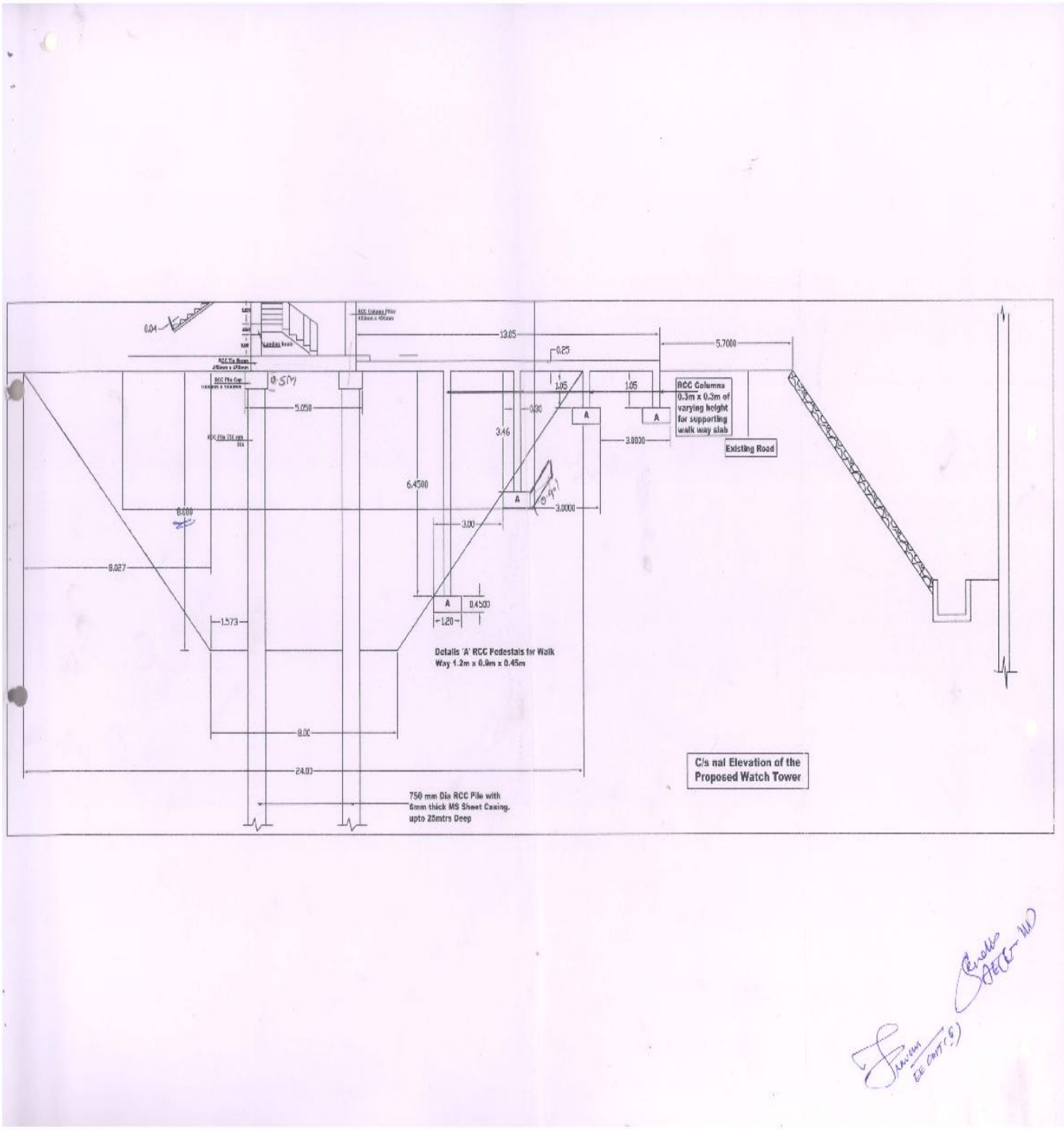
Brief Description of drawing

The Works are shown in the following drawings that are issued as a part of the Tender Documents:

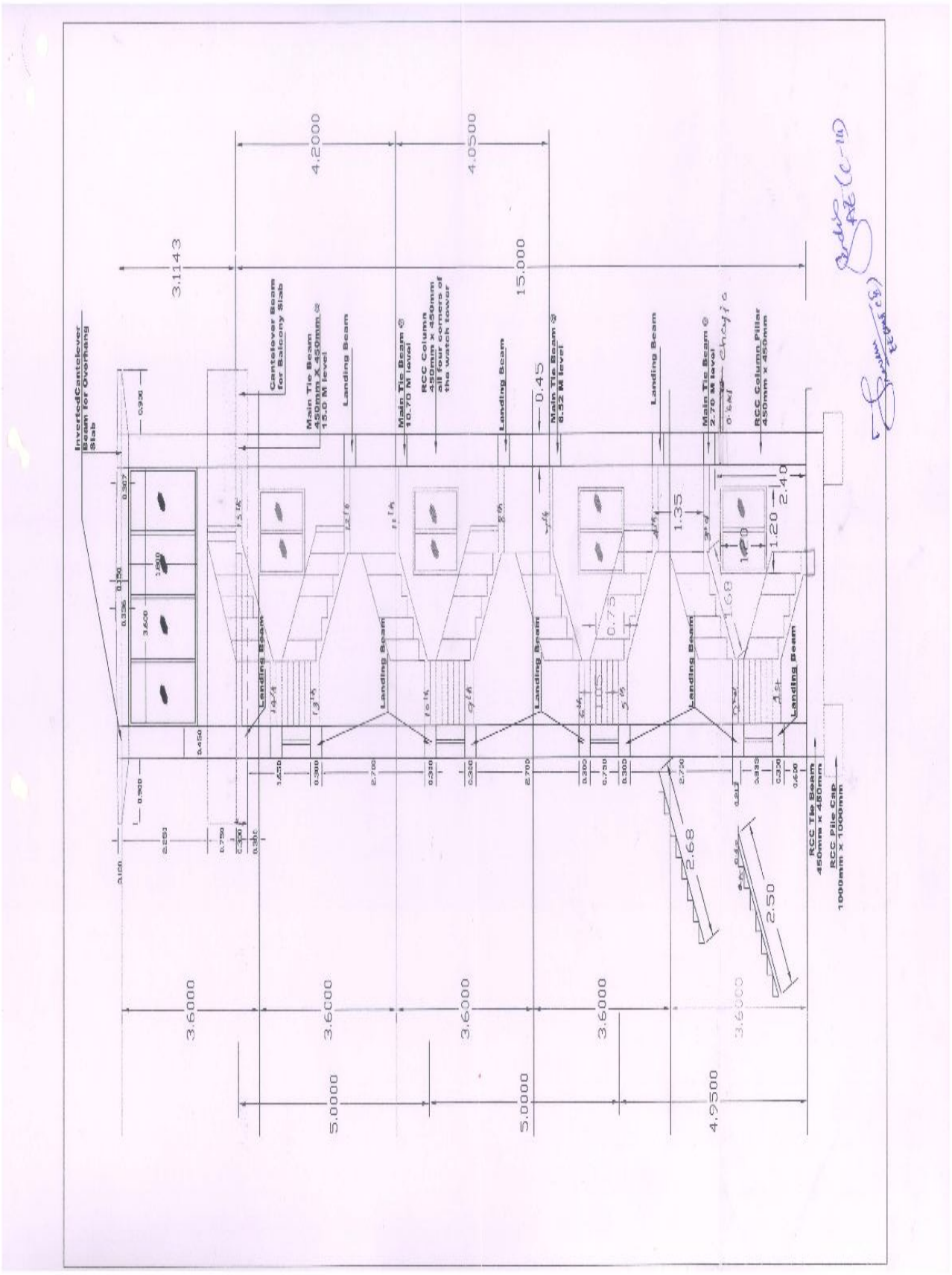
Sl. No	Drawing No.	Description
1	19/64-LP	LOCATION
2	19/64-01	Cross sectional Elevation of the proposed watch tower
3	19/64	-02
4.	19/64-03	Plant at Ground Levels of the Proposed Watch Tower
5.	19/64-04	TYPICAL PLAN at Intermediate Levels of the Proposed Watch Tower
6.	19/64-05	Plan at Top Floor Level of the Proposed Watch Tower
7.	19/64-06	Plan at Top Roof Slab Level of the Proposed Watch Tower



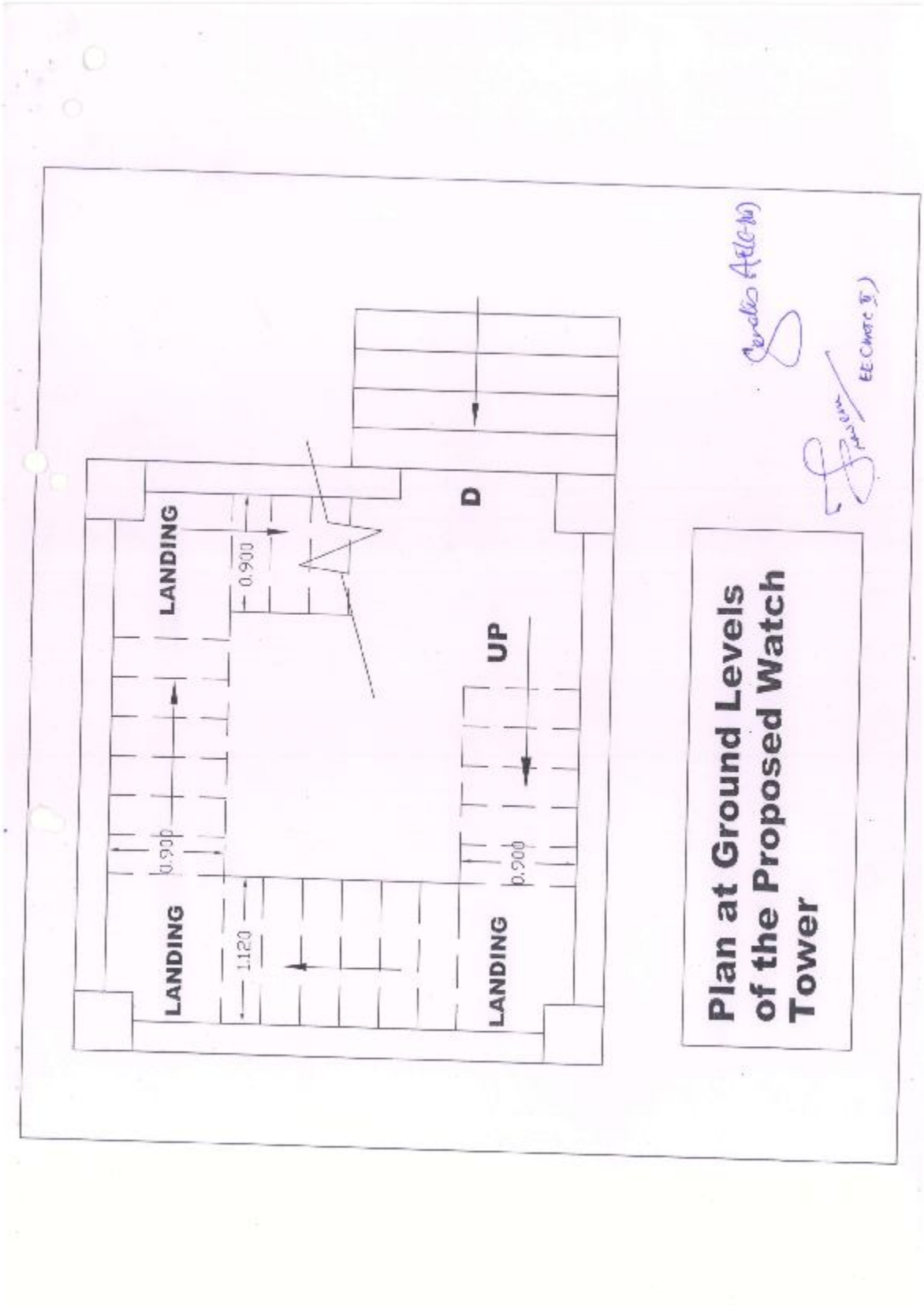
19/64-LP	LOCATION



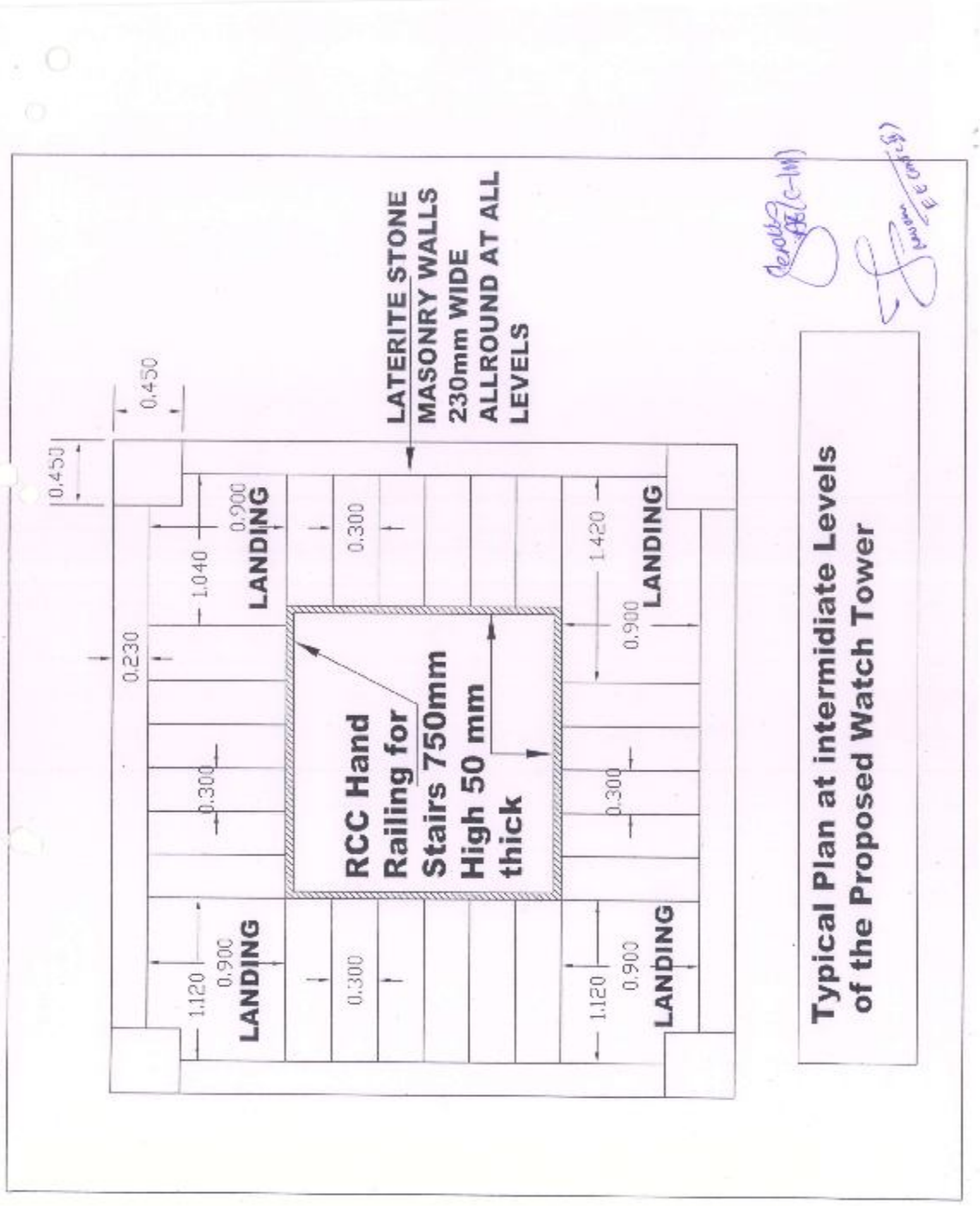
19/64-01	Cross sectional Elevation of the proposed watch tower


Inverted Cantelever Beam for Overhang Slab
Cantelever Beam for Balcony Slab
Main Tie Beam 450mm X 450mm @ 15.0 M level
Landing Beam
Main Tie Beam @ 10.70 M level
RCC Column 450mm x 450mm at four corners of the watch tower
Landing Beam
Main Tie Beam @ 6.52 M level
Landing Beam
Main Tie Beam @ 2.70 M level
RCC Column Pillar 450mm x 450mm
RCC Tie Beam 450mm x 450mm
RCC Pile Cap 1000mm x 1000mm
4.2000
4.0500
3.1143
15.000
0.45
1.35
2.40
1.20
1.68
0.75
2.68
2.50
3.6000
5.0000
4.9500

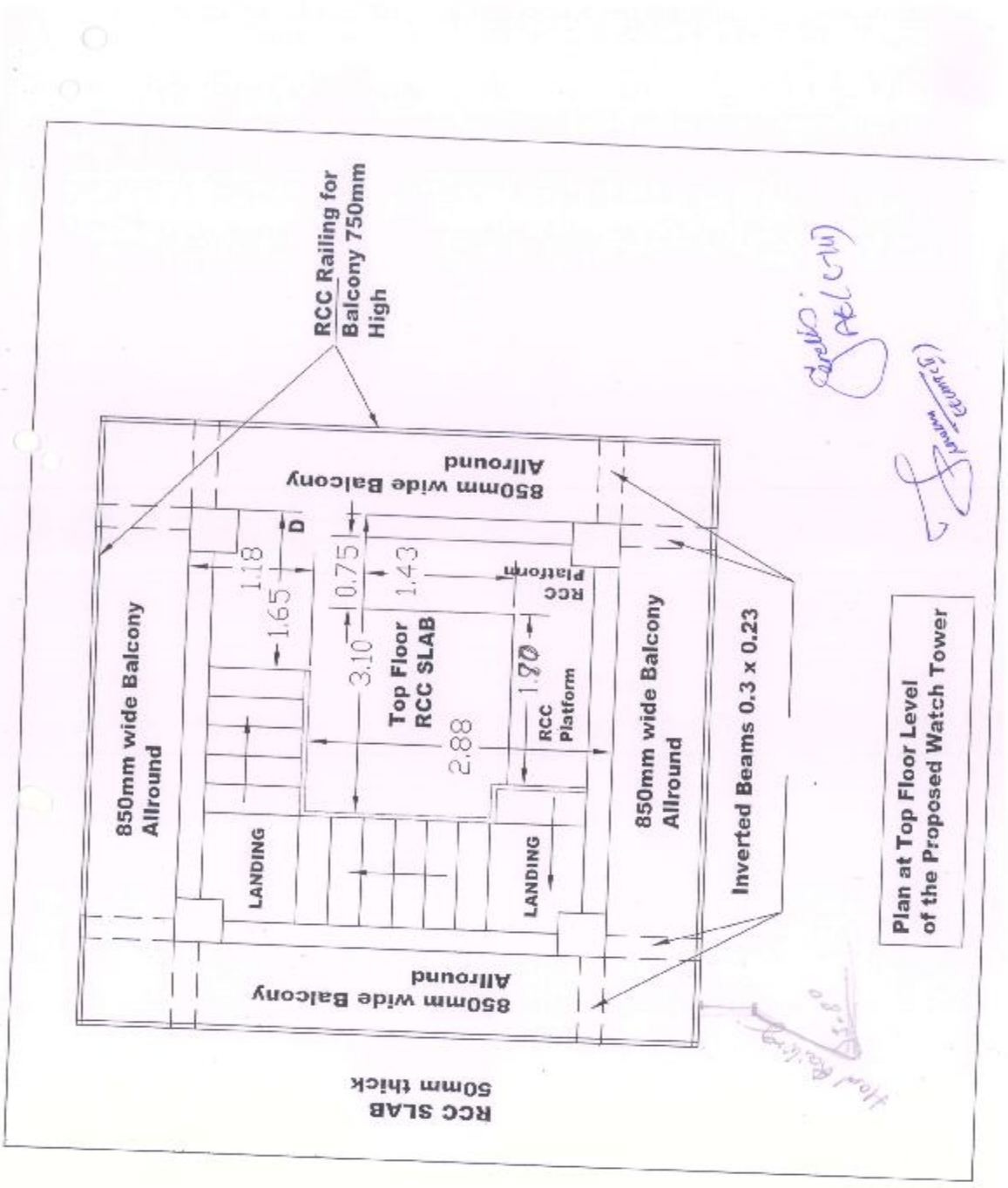
19/64	02



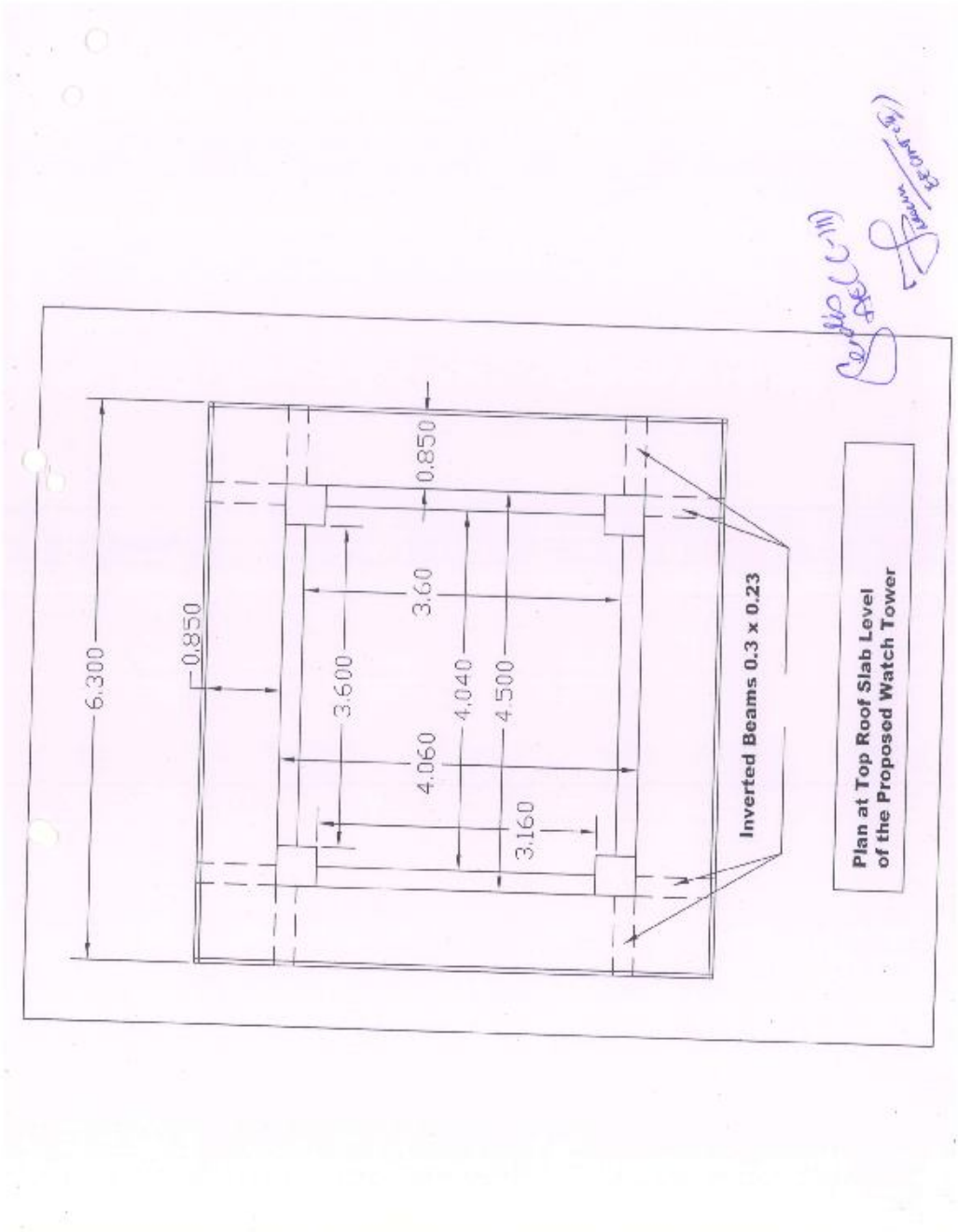
19/64	Plant at Ground Levels of the Proposed Watch Tower



19/64-04	TYPICAL PLAN at Intermediate Levels of the Proposed Watch Tower



19/64-05	Plan at Top Floor Level of the Proposed Watch Tower



19/64-06	Plan at Top Roof Slab Level of the Proposed Watch Tower

NEW MANGALORE PORT AURHORITY

Panambur, Mangalore

CONSTRUCTION OF SECURITY WATCH TOWER NEAR NORTHERN BREAK WATER AT NMPA

TENDER DOCUMENT
Volume – III

TABLE OF CONTENTS

VOLUME III

SECTION VI

(i) PREAMBLE TO BILL OF QUANTITIES

1. General Instructions

1.1 General

1.1.1 This Bill of Quantities must be read with the Drawings, Conditions of Contract and the Specifications, and the Contractor shall be deemed to have examined the Drawings, Specifications, Conditions of Contract and to have acquainted himself with the detailed descriptions of the Works to be done, and the way in which they are to be carried out.

1.1.2 Notwithstanding that the work has been sectionalized every part of it shall be deemed to be supplementary to and complementary of every other part and shall be read with it or into it so far as it may practicable to do so.

1.1.3 The detailed descriptions of work and materials given in the Specifications are not necessarily being repeated in the Bill of Quantities.

1.1.4 The Contractor shall be deemed to have visited the Site before preparing his tender and to have examined for himself the conditions under which the work will proceed and all other matters affecting the carrying out of the works and cost thereof.

1.1.5 The Tenderer will be held to have familiarized himself with all local conditions, in so far as they affect the work, means of access and the locality of existing services, in order to execute the Works measured and described hereinafter. No claims for want of knowledge in this respect will be reimbursed.

1.2 Rates and Prices to be Inclusive

1.2.1 Rates and prices set against items are to be the all inclusive value of the finished work shown on the Drawings and/or described in the Specification or which can reasonably be inferred there from and are to cover the cost of provision of plant, labour, supervision, materials, test charges, freight, transportation, erection, installation, performance of work, care of works, insurance, maintenance, overheads and profits and every incidental and contingent cost and charges whatsoever including all taxes if any excluding GST and every

kind of temporary work executed or used in connection therewith (except those items in respect of which provision has been separately made in the general condition of contract) and all the Contractor's obligations under the Contract and all matters and things necessary for the proper completion and maintenance of the Works.

1.2.2 The rates and prices set down against the items are to be the full inclusive value of the finished work shown on the Drawing and/or described in the Specification or which can reasonably be inferred the reform and to cover the cost of every description of Temporary Works executed or used in connection therewith (except those items in respect of which specific provision has been separately made in these Bills of Quantities) and all the Contractor's obligations under the Contract including testing, giving samples and all matters and things necessary for the proper execution, completion and maintenance of the Works.

1.2.3 The Specifications are intended to cover the supply of material and the execution of all work necessary to complete the works. Should there be any details of construction or material which have not been referred to in the Specifications or in the Bill of Quantities and Drawings, but the necessity for which may reasonably be implied or inferred there from, or which are usual or essential to the completion of all works in all trades, the same shall be deemed to be included in the rates and prices entered in the Bill of Quantities. The rates and prices are to cover the item as described in the Bill of Quantities and if there is inconsistency in the description between the Bill of Quantities, Specifications or Drawings, the interpretation will be done according to General Conditions of Contract.

1.2.4 The quantities given in the Bill are approximate and are given to provide a common basis for tendering. They are not to be taken as a guarantee that the quantities scheduled will be carried out or required or that they will not be exceeded. The Employer / Engineer reserves the right to delete any item and / or increase / reduce quantities indicated in the Bills of Quantities at any time. Payment will be made according to the actual quantities of work ordered and carried out in the contract. However, the rates quoted shall be valid for any extent of variation in quantity of each individual item provided that the total contract value does not get altered by more than indicated in

conditions of contract. No claim whatsoever for extra payment due to variation of quantities within the above said limit would be entertained.

1.2.5 The drawings for tender purposes are indicative only of the work to be carried out. However, the Tenderer must allow within his price for the items of work included in the Tender Documents for the details which will appear on subsequent drawings developed for construction purposes. Rate and price shall include any additional design/ detailing to be carried out by contractor.

1.2.6 The rates and prices shall include (except where separate items are given) for the provision and operation of the following items, for compliance with the Conditions of Contract, Special Conditions, the specifications and Tender drawings:

i) Supervision and labour for the Works;
ii) All materials, installation/erection, handling and transportation;
iii) All Contractor's Equipment;
iv) All testing, commissioning, insurance, maintenance, security, welfare facilities, overheads and profit and every incidental and contingent costs and charges whatsoever including;
v) All temporary fencing, watching, lighting, sanitary accommodation, general security arrangements, welfare facilities and first aid provision;
vi) Provision and maintenance of Contractor's site offices, cabins, huts, maintenance and storage areas;
vii) All taxes if any excluding GST on the transfer of property in goods in the execution of works, Excise Duty, Duties, etc. (other than Customs Duty for materials to be permanently incorporated into the Works);
viii) All necessary temporary services including fresh water, compressed air lines, electrical cabling and switchgear, telephone, walkie-talkie and facsimile facilities;
ix) The maintenance of all Contractor's services;
x) All insurances for the Works;
xi) Allowance for complying with all environmental aspects as specified;
xii) Detail design of components of temporary works, wherever necessary as directed by Engineer.

1.4 Method of Measurement

1.4.1 Measurement of Work shall be in accordance with IS 1200 and shall be net off the dimensions of the works shown on the drawings except as mentioned below:

1.4.2 Units of Measurement: The units of measurement used in this Bill of

Quantities are in metric units as follows:

i) Linear: Linear metre, centimeter or millimeter abbreviated to 'Rm', 'cm' or 'mm' respectively.
ii) Superficial: Square metre or Square centimeter abbreviated to 'Sq.M' or 'sq.cm' respectively.
iii) Volumetric: Cubic metre abbreviated to 'cu.m'. Litre abbreviated to 'L'
iv) Weight: Tonne = 1000 Kilograms, abbreviated to 'T', / 'MT' Kilogram abbreviated to 'kg'
v) Numbers: Numbers abbreviated to Nos. or No.
vi) Lump sum: Lump sum abbreviated to 'L.S.'

1.5 Currency

1.5.1 All monetary reference herein and the Bill of Quantities shall be priced in Indian Rupee Currency.

2. Civil Works

2.2 Precast Concrete

2.2.1 Shuttering for precast concrete shall not be measured and paid for separately.

2.2.2 Effort for placement of precast concrete at the final locations shall not be measured unless a specific item is provided in the Bill of Quantities.

2.2.3 The precast concrete units shall be measured as shown on the detailed drawings.

2.3 In-situ Concrete

2.3.1 Shuttering for In-situ concrete shall not be measured and paid for separately.

2.3.2 No deduction will be made for chamfers smaller than 50 sq.cm. sectional area, reinforcement bolts and other embedded parts unless larger than 0.1 sq.m. sectional area and 0.03 cu.m. in volume. No extra volume will be measured for splays or fillets smaller than 50 sq.cm. sectional area.

2.3.3 The rates for reinforced concrete shall include for all batching, mixing, transporting, hoisting or lowering to any height / depth, placing in position and compaction in work of any sectional area or thickness including shuttering, forming necessary construction joints, shear keys and stop ends, and for curing and protecting etc. all as specified.

2.3.4 The rates shall include for preparing construction joints, shear keys and surfaces against which next stage concrete is to be cast and

building in fittings including pipes and bolts except where specifically billed separately. No separate payment will be made for making openings/pockets/pits of any size and shape. Where surfaces are to receive finishes the rates shall include for leaving the surface rough or for hacking and roughening the surface to form a key.

2.3.5 Unless otherwise noted, rates shall include for inserting pipes and other inserts in position accurately, concreting while they are in position and also for protecting the same as the work proceeds.

2.3.6 Unless otherwise noted, the rates for concrete items shall include for finishing the top surface to levels and slopes and surface finish as specified. Rates for concrete shall include for finishing the slab to specified slope towards drains, etc.

2.4 Reinforcement

2.4.1 Steel reinforcement will be measured by weight and fixed in accordance with Drawings and Specifications. The weight of reinforcement bars -whether plain, deformed or ribbed etc., -of various diameters will be calculated in accordance with Table 1 of IS:1732 'Dimensions for Round and Square Steel Bars for Structural and General Engineering Purposes'.

2.4.2 The rates shall include for laps, cutting and waste, straightening short and long lengths, bending, fixing, rolling margin and the provision of spacer bars or support, chairs, binding wire, saddles, forks and all dense concrete spacer blocks, etc., including preparing bending schedules from the Drawings.

2.4.3 The rates shall include for all necessary descaling, wire brushing and cleaning to remove all rust and mill scale, dirt, grease and other deleterious matter before fixing and whilst still exposed during construction.

2.5 Structural and Miscellaneous Steel work

2.5.1 Rates for structural steel work and iron work shall include supply, fabrication, delivery and erection/embedment in concrete at Site and all charges for welding, cutting, bending, bolting, site connections, fixing to foundations.

2.5.2 The rates for Structural Steelwork shall include:

i) Supply, fabrication, delivery and erection

ii) Rolling margin, cutting and waste, weld metal, bolts, fixings and fittings
iii) Hoisting, drilling, bolting or welding and fixing in the manner specified or indicated in the drawing
iv) Fabrication drawings
v) Welding trials and tests
vi) Erection trials
vii) Protective treatment (painting, hot dip galvanizing etc), including making good any damage if provided in the BOQ item.

2.5.3 Metalwork items are described in the Bills of Quantities and the Tenderer is to include for all the fittings, etc., described. All items shall include the necessary fabrication, joints, angles, intersections and ends, all bolts or fixing lugs, all hoisting and scaffolding required and casting in fixings or later cutting out or forming pockets for same, grouting, supporting and making good.

2.5.4 Rates are to include for all necessary scaffolding, working over water and at any height staging and hoisting and tarpaulin or other protective covers and the cleaning and removal of paint stains and spots, etc.

3.4.1 The Contractor's unit rates and prices shall include all equipment, apparatus, material indicated in the Drawings, and/or Specifications in connection with the item in question and also associated labour as well as all additional equipment, apparatus, material, consumables usually necessary to complete the system even though not specifically shown, described or otherwise referred to and also associated labour.

3.4.2 The rate for providing and fixing above items shall include all fittings, fixtures, base and sole plates, anchor bolts, including epoxy grouting, etc. all complete as specified, including the necessary additional supervision to ensure accurate alignment

3. Abbreviations

4.1.1 The following abbreviations are used in the Specifications and Bill of Quantities:

IS :	Indian Standard
BS :	British Standard
Qty. :	Quantity
mm :	Millimeters
cm :	Centimeters
M / m :	Meters
LM :	linear metre
LS :	lump sum
Rs. :	Rupees
P. :	Paise
Nos. :	Numbers

do :	Ditto
MS :	mild steel
T :	Tones
Kg :	Kilogram
EO :	Extra over (previous sum unless specified otherwise)
sq.m. / m^2 / sqmt	square metre
sq.cm. :	square centimeters
mm^2 :	Square Millimetre
Cu.m. / cum:	cubic meters
YST :	yield stress
dia :	Diameter
wt. :	Weight
Drg.No.:	drawing number
max. :	Maximum
min :	Minimum
approx :	Approximately
n.e.:	not exceeding
incl:	Including
circ:	Circular
set :	set / sets
c/c	centre to centre
@ :	at the rate of
Qtl	Quintal

ii) BILL OF QUANTITIES

NAME OF WORK: CONSTRUCTION OF SECURITY WATCH TOWER NEAR NORTHERN BREAK WATER AT NMPA					
Item No.	**DESCRIPTION OF ITEM**	**QTY**	**UNIT**	**RATE IN figures / WORDS**	**AMOUNT (Rs. Ps.)**
1	Shifting of the Big Rock Stones of various size unable to shift Manually including sorting the dismantled material, Shifting and placing the Stones in the adjacent areas along the sea wall. disposal of unserviceable material and stacking the serviceable material with all lifts and lead at the settled areas on the seawall and Northern Break Water upto a lead of 500m as directed by the department.	521.00	CUM	1323.12	6,89,345.52
2	Earth work excavation by manual means for drains, canals, waste weir, draft, approach channels, key trenches, foundation of bridges and such similar works in all kinds of soils, as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, removal of stumps and other deleterious matter, Excavated surface leveled and sides neatly dressed disposing off the excavated stuff or sorting & stacking the selected stuff for reuse in a radius of 50 m and lift up to 1.5 m including cost of labour, tools & other appurtenances required to complete the work. In all kinds of soils Depth upto 1.5 m	198.00	CUM	186.00	36828.00
3	Providing Steel Liner 10 mm thick for Curbs and 6 mm thick for Steining of Wells including Fabricating and Setting out as per Detailed Drawing including providing and fixing in position MS sheet 6mm thick casing, including cutting, rolling, welding , painting anti rust coating, transportation, loading, unloading, labour charges, fabrication, driving charges and placing in position for casting of 750mm dia RCC Pile	4760.00	KG	102.62	488471.20

	foundation including all incidental charges etc., complete as directed by the Department.				
4	Bored cast-in-situ M35 grade R.C.C. Pile excluding Reinforcement complete as per Drawing and Technical Specifications and removal of excavated earth with all lifts and lead upto 1000 m. (Pile diameter-750 mm). Ref. to MoRT&H Spec. 1100,1600 & 1700	100.00	M	8468.00	8,46,800.00
5.0	Providing and laying in position Reinforced cement concrete for all Super structures of building, Road works, Water works, Irrigation works & super structure works of bridges up-to 3.50 m height. The granite/ trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in layers, well compacted using needle vibrators. The cost includes all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications including providing & removing formwork, centering & scaffolding. (The cost of steel reinforcement to be paid separately) M30 Design Mix Using 20 mm nominal size graded crushed coarse aggregates.**0-3.6m Beams & Lintels of Building, Roof (Straight & Arched)**	17.00	CUM	8426.40	143248.80
5.01	Providing and laying in position Reinforced cement concrete for all Super structures of building, Road works, Water works, Irrigation works & super structure works of bridges up to 3.50 m height. The granite/ trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in layers, well compacted using needle vibrators. The cost includes all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances	9.00	CUM	7724.20	69,517.80

	required to complete the work as per technical specifications including providing & removing formwork, centering & scaffolding. (The cost of steel reinforcement to be paid separately) M30 Design Mix Using 20 mm nominal size graded crushed coarse aggregates.**0-3.6m COLUMNS & PIERS**				
5.02	Providing and laying in position Reinforced cement concrete for all Super structures of building, Road works, Water works, Irrigation works & super structure works of bridges up to 3.50 m height. The granite/ trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in layers, well compacted using needle vibrators. The cost includes all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications including providing & removing formwork, centering & scaffolding. (The cost of steel reinforcement to be paid separately) M30 Design Mix Using 20 mm nominal size graded crushed coarse aggregates. **3.6-7.2M BEAMS & LINTELS OF BUILDING, ROOF (STRAIGHT & ARCHED)**	2.70	CUM	8510.66	22978.78
5.03	Providing and laying in position Reinforced cement concrete for all Super structures of building, Road works, Water works, Irrigation works & super structure works of bridges upto 3.50 m height. The granite/ trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in layers, well compacted using needle vibrators. The cost includes all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications including providing & removing formwork,	3.00	CUM	7801.44	23404.32

	centering & scaffolding. (The cost of steel reinforcement to be paid separately) M30 Design Mix Using 20 mm nominal size graded crushed coarse aggregates. **3.6M- 7.2m Columns & Piers**				
5.04	Providing and laying in position Reinforced cement concrete for all Super structures of building, Road works, Water works, Irrigation works & super structure works of bridges upto 3.50 m height. The granite/ trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in layers, well compacted using needle vibrators. The cost includes all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications including providing & removing formwork, centering & scaffolding. (The cost of steel reinforcement to be paid separately) M30 Design Mix Using 20 mm nominal size graded crushed coarse aggregates. **7.2M-10.8M BEAMS & LINTELS OF BUILDING, ROOF (STRAIGHT & ARCHED)**	3.20	CUM	8594.93	27503.78
5.05	Providing and laying in position Reinforced cement concrete for all Super structures of building, Road works, Water works, Irrigation works & super structure works of bridges upto 3.50 m height. The granite/ trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in layers, well compacted using needle vibrators. The cost includes all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications including providing & removing formwork, centering & scaffolding. (The cost of steel reinforcement to be paid	3.00	CUM	7878.68	23636.04

	separately) M30 Design Mix Using 20 mm nominal size graded crushed coarse aggregates. **7.2M-10.8M Columns& Piers**				
5.06	Providing and laying in position Reinforced cement concrete for all Super structures of building, Road works, Water works, Irrigation works & super structure works of bridges upto 3.50 m height. The granite/ trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in layers, well compacted using needle vibrators. The cost includes all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications including providing & removing formwork, centering & scaffolding. (The cost of steel reinforcement to be paid separately) M30 Design Mix Using 20 mm nominal size graded crushed coarse aggregates.**10.8m& 14.4m BEAMS & LINTELS OF BUILDING, ROOF(STRAIGHT & ARCHED)**	2.30	cum	8679.19	19962.14
5.07	Providing and laying in position Reinforced cement concrete for all Super structures of building, Road works, Water works, Irrigation works & super structure works of bridges upto 3.50 m height. The granite/ trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in layers, well compacted using needle vibrators. The cost includes all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications including providing & removing formwork, centering & scaffolding. (The cost of steel reinforcement to be paid separately) M30 Design Mix Using 20	3.00	CUM	7955.93	23867.79

	mm nominal size graded crushed coarse aggregates.**10.8m& 14.4m COLOUMNS & PIERS**				
5.08	Providing and laying in position Reinforced cement concrete for all Super structures of building, Road works, Water works, Irrigation works & super structure works of bridges upto 3.50 m height. The granite/ trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in layers, well compacted using needle vibrators. The cost includes all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications including providing & removing formwork, centering & scaffolding. (The cost of steel reinforcement to be paid separately) M30 Design Mix Using 20 mm nominal size graded crushed coarse aggregates. **14.4M-18.00M BEAMS & LINTELS OF BUILDING, ROOF(STRAIGHT & ARCHED)**	21.50	CUM	8763.46	188414.39
5.09	Providing and laying in position Reinforced cement concrete for all Super structures of building, Road works, Water works, Irrigation works & super structure works of bridges upto 3.50 m height. The granite/ trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in layers, well compacted using needle vibrators. The cost includes all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications including providing & removing formwork, centering & scaffolding. (The cost of steel reinforcement to be paid separately) M30 Design Mix Using 20 mm nominal size graded crushed coarse aggregates. **14.4M-18.00M**	3.00	CUM	8033.17	24099.51

	COLOUMNS & PIERS				
6.0	Providing and Constructing laterite stone masonry including cost and conveyance of all materials, curing etc., complete as per specification IS3620/1979 having compressive strength not less than 3.5 N/mm2 for saturated dry samples, for Super Structure in CM 1:6 **0-3.6M**	10.00	CUM	5945.00	59450.00
6.01	Providing and Constructing laterite stone masonry including cost and conveyance of all materials, curing etc., complete as per specification IS3620/1979 having compressive strength not less than 3.5 N/mm2 for saturated dry samples, for Super Structure in CM 1:6 **3.6M-7.2M**	10.00	CUM	6004.45	60044.50
6.02	Providing and Constructing laterite stone masonry including cost and conveyance of all materials, curing etc., complete as per specification IS3620/1979 having compressive strength not less than 3.5 N/mm2 for saturated dry samples, for Super Structure in CM 1:6 **7.2M-10.8M**	4.00	CUM	6063.90	24255.60
6.03	Providing and Constructing laterite stone masonry including cost and conveyance of all materials, curing etc., complete as per specification IS3620/1979 having compressive strength not less than 3.5 N/mm2 for saturated dry samples, for Super Structure in CM 1:6 **10.8M-14.4M**	10.00	CUM	6123.35	61233.50
6.04	Providing and Constructing laterite stone masonry including cost and conveyance of all materials, curing etc., complete as per specification IS3620/1979 having compressive strength not less than 3.5 N/mm2 for saturated dry samples, for Super Structure in CM 1:6 **14.4M-18M**	11.00	CUM	6182.80	68010.80

7.0	Providing Lath Plaster with cement mortar 1:3, 5cms thick with 6mm dia. mild steel bars at 20cms c to c both horizontally and vertically fixed with chicken mesh for drop m chejjas, facia to cupboards including cost of all materials, labour, providing and removing form work usage charges, curing complete as per specifications. **0-3.6M**	32.00	SQM	1202.00	38464.00
7.01	Providing Lath Plaster with cement mortar 1:3, 5cms thick with 6mm dia mild steel bars at 20cms c to c both horizontally and vertically fixed with chicken mesh for drop mchejjas, facia to cupboards including cost of all materials, labour, providing and removing form work usage charges, curing complete as per specifications. **3.6M-7.2M**	6.00	SQM	1214.02	7284.12
7.02	Providing Lath Plaster with cement mortar 1:3, 5cms thick with 6mm dia mild steel bars at 20cms c to c both horizontally and vertically fixed with chicken mesh for drop mchejjas, facia to cupboards including cost of all materials, labour, providing and removing form work use age charges, curing complete as per specifications. **7.2M-10.8M**	8.00	SQM	1226.04	9808.32
7.03	Providing Lath Plaster with cement mortar 1:3, 5cms thick with 6mm dia mild steel bars at 20cms c to c both horizontally and vertically fixed with chicken mesh for drop mchejjas, facia to cupboards including cost of all materials, labour, providing and removing form work usage charges, curing complete as per specifications. **10.8M-14.4M**	7.00	SQM	1238.06	8666.42
7.04	Providing Lath Plaster with cement mortar 1:3, 5cms thick with 6mm dia mild steel bars at 20cms c to c both horizontally and vertically fixed with chicken mesh for drop mchejjas, facia to cupboards including cost of all materials, labour, providing and removing form work usage charges, curing complete as per specifications. **14.4M-18M**	28.00	SQM	1250.08	35002.24

8	Providing and fixing M.S. grills of required pattern in frames of windows etc. with M.S. flats, square or round bars etc. including priming coat with approved steel primer all complete. Fixed to steel windows by welding.	340.00	KG	131.00	44540.00
9	Providing and fixing in position collapsible steel shutters with vertical channels 20x10x2 mm and braced with flat iron diagonals 20x5 mm size, with top and bottom rail of T-iron 40x40x6 mm, with 40 mm dia steel pulleys, complete with bolts, nuts, locking arrangement, stoppers, handles, including applying a priming coat of approved steel primer including cost of materials ,labour, usage charges of machinery complete as per specifications and as per directions of the Engineer-in-Charge.	2.00	SQM	6563.00	13126.00
10	KSRB 1.10 Providing and fixing in position aluminum windows and ventilators as per approved drawings with sliding shutters using double track window frame section of size 61.85x31.75mm. With 1.2mm thick, bottom section weight 0.695 kg/m, sides and top sections 1.3 mm. thick weight 0.659 kg/m; and shutter comprising top and bottom section of size 40mmx18mm, 1.25mm thick 0.417 kg./m; shutter outer side 40mmx18mm, 1.25mm.thick weight 0.417 kg/m, shutter interlock section 40mmx26.7mm, 1.1mm thick, weight 0.469 kg/m. the shutters mounted on nylon rollers with approved quality of fixtures such as aluminum handles tower bolts etc., and providing and fixing 5.5mm thick plain glass for shutters fitted with rubber beading aluminum sections including cutting to required length, joints mitred subdividing the frame tenonned and riveted in the assembled frame stiffened with end clips at corners angles etc., and fixed to the walls, Including cutting masonry or concrete and making good the original surface using cement mortar, aluminium sections pretreated for removal of any Specification No. KBS using aluminium section powdered coated to a minimum of 60-70 microns with	31.00	SQM	4375.00	135625.00

	exterior durable pure polyester grade powder of approved quality.				
11	Providing Mathi/Nandi wood frames of doors, windows, clerestory windows, ventilators and other frames, wrought, framed or assembled including making plaster groves (excluding cost of cement concrete and side clamps), but including cost of materials, labour, usage charges complete as per specifications.	0.30	CUM	75344.00	22603.20
12	Providing and fixing in position fully panelled Mathi/Nandi wood shutters for doors with stiles and rails of 40mm. thick with bottom and lock rails 180mm wide top rail and stiles 100mm wide as per drawing and panels of 25mm thick including cost of materials, labour, usage charges complete as per specifications. (including cost of fixtures)	4.50	SQM	4556.00	20502.00
13.0	Providing 20 mm cement plaster of mix 1:4 (1 cement: 4 fine sand) to brick/stone masonary including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **0-3.6M**	114.00	SQM	307.00	34998.00
13.01	Providing 20 mm cement plaster of mix 1:4 (1 cement: 4 fine sand) to brick/stone masonary including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **3.6M-7.2M Height**	63.00	SQM	310.07	19534.41
13.02	Providing 20 mm cement plaster of mix 1:4 (1 cement: 4 fine sand) to brick/stone masonary including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **7.2-10.8MHeight**	63.00	SQM	313.14	19727.82

13.03	Providing 20 mm cement plaster of mix 1:4 (1 cement: 4 fine sand) to brick/stone masonry including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **10.8-14.4M**	63.00	SQM	316.21	19921.23
13.04	Providing 20 mm cement plaster of mix 1:4 (1 cement: 4 fine sand) to brick/stone masonary including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **14.4-18.0MHeight**	226.00	SQM	319.28	72157.28
14.01	Providing 15 mm cement plaster on the rough side of single or half brick wall of mix 1:4 (1 cement: 4 fine sand) including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **0-3.6MHeight**	106.00	SQM	253.00	26818.00
14.02	Providing 15 mm cement plaster on the rough side of single or half brick wall of mix 1:4 (1 cement: 4 fine sand) including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **3.6M-7.2MHeight**	31.00	SQM	255.53	7921.43
14.03	Providing 15 mm cement plaster on the rough side of single or half brick wall of mix 1:4 (1 cement: 4 fine sand) including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **7.2-10.8mHeight**	95.00	SQM	258.06	24515.70

14.04	Providing 15 mm cement plaster on the rough side of single or half brick wall of mix 1:4 (1 cement: 4 fine sand) including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **10.8-14.4MHeight**	125.00	SQM	260.59	32573.75
14.05	Providing 15 mm cement plaster on the rough side of single or half brick wall of mix 1:4 (1 cement: 4 fine sand) including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **14.4-18.0mHeight**	86.00	Sqm	263.12	22628.32
15.0	Providing 12 mm cement plaster finished with a floating coat of neat cement of mix 1:3 (1 cement: 3 fine sand) to brick masonry including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **0-3.6m**	11.00	SQM	282.00	3102.00
15.01	Providing 12 mm cement plaster finished with a floating coat of neat cement of mix 1:3 (1 cement: 3 fine sand) to brick masonry including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **3.6-7.2M**	11.00	SQM	284.82	3133.02
15.02	Providing 12 mm cement plaster finished with a floating coat of neat cement of mix 1:3 (1 cement: 3 fine sand) to brick masonry including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **7.2-10.8M**	11.00	SQM	287.64	3164.04

15.03	Providing 12 mm cement plaster finished with a floating coat of neat cement of mix 1:3 (1 cement: 3 fine sand) to brick masonry including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **10.8-14.4m**	70.00	SQM	290.46	20332.20
15.04	Providing 12 mm cement plaster finished with a floating coat of neat cement of mix 1:3 (1 cement: 3 fine sand) to brick masonry including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge. **14.4-18.0m**	70.00	SQM	293.28	20529.60
16.0	Applying one coat of water thinnable cement primer on wall surface : Water thinnable cement primer to give an even shade after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **0-3.6M**	114.00	SQM	40.00	4560.00
16.01	Applying one coat of water thinnable cement primer on wall surface : Water thinnable cement primer to give an even shade after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **3.6-7.2M**	63.00	SQM	40.40	2545.20
16.02	Applying one coat of water thinnable cement primer on wall surface : Water thinnable cement primer to give an even shade after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **7.2-10.8M**	63.00	SQM	40.80	2570.40

16.03	Applying one coat of water thinnable cement primer on wall surface : Water thinnable cement primer to give an even shade after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **10.8-14.4M**	63.00	SQM	41.20	2595.60
16.04	Applying one coat of water thinnable cement primer on wall surface : Water thinnable cement primer to give an even shade after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **14.4-18.0M**	226.00	SQM	41.60	9401.60
17.0	Finishing walls with water proofing cement paint of required shade : New work (Two coats applied @ 4.84 kg/10 m²) to give an even shade after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **0-3.6M**	114.00	SQM	66.00	7524.00
17.01	Finishing walls with water proofing cement paint of required shade : New work (Two coats applied @ 4.84 kg/10 m²) to give an even shade after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **3.6-7.2M**	63.00	SQM	66.66	4199.58
17.02	Finishing walls with water proofing cement paint of required shade : New work (Two coats applied @ 4.84 kg/10 m²) to give an even shade after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions	63.00	SQM	67.32	4241.16

	of Engineer-in-charge. **7.2-10.8M**				
17.03	Finishing walls with water proofing cement paint of required shade : New work (Two coats applied @ 4.84 kg/10 m²) to give an even shade after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **10.8-14.4M**	63.00	SQM	67.98	4282.74
17.04	Finishing walls with water proofing cement paint of required shade : New work (Two coats applied @ 4.84 kg/10 m²) to give an even shade after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **14.4-18.0M**	226.00	SQM	68.64	15,512.64
18.0	Distempering with oil bound washable distemper to give an even shade: New work (two coats) over and including water thinnable priming coat with cement primer after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **0-3.6M**	106.00	SQM	105.00	11130.00
18.01	Distempering with oil bound washable distemper to give an even shade: New work (two coats) over and including water thinnable priming coat with cement primer after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **3.6-7.2M**	31.00	Sqm	106.05	3287.55
18.02	Distempering with oil bound washable distemper to give an even shade: New work (two coats) over and including water thinnable priming coat with cement primer after thoroughly brooming the surface to remove all	95.00	Sqm	107.10	10174.50

	dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **7.2-10.8M**				
18.03	Distempering with oil bound washable distemper to give an even shade : New work (two coats) over and including water thinnable priming coat with cement primer after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **10.8-14.4M**	125.00	SQM	108.15	13518.75
18.04	Distempering with oil bound washable distemper to give an even shade : New work (two coats) over and including water thinnable priming coat with cement primer after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **14.4-18.0M**	86.00	SQM	109.20	9391.20
19.0	Providing White washing with lime to give an even shade :New work (three coats) with lime of approved quality, including cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **0-3.6M**	11.00	SQM	19.00	209.00
19.01	Providing White washing with lime to give an even shade :New work (three coats) with lime of approved quality, including cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **3.6-7.2M**	11.00	SQM	19.19	211.09
19.02	Providing White washing with lime to give an even shade :New work (three coats) with lime of approved quality, including cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **7.2M-10.8M**	11.00	SQM	19.38	213.18

19.03	Providing White washing with lime to give an even shade: New work (three coats) with lime of approved quality, including cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **10.8-14.4M**	70.00	SQM	19.57	1369.90
19.04	Providing White washing with lime to give an even shade: New work (three coats) with lime of approved quality, including cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge. **14.4-18.0M**	70.00	SQM	19.76	1383.20
20	Providing TMT bars of grade Fe-550 steel reinforcement for RCC work, cutting, bending, placing in position, binding and anchoring to adjacent members wherever necessary complete as per Design including cost of material, labour, usage charges complete as per specifications. (The laps and wastages shall not be measured separately)	12620.00	Kgs	88.00	1110560.00
21	Refilling available earth around trenches/pipelines, cables in layers not exceeding 20 cms in depth, compacting each deposited layer by ramming after watering with a lead upto 50 m and lift upto 1.5 m. Including cost of all labour complete as per specifications.	521.00	CUM	122.00	63562.00
22	Providing and laying Cement concrete flooring 40 mm thick with 20 mm nominal size stone aggregate using 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate) finished with a floating coat of neat cement, including cement slurry complete.	100.00	SQM	415.00	41500.00
				TOTAL Rs	**48,91,693.86**
	Excess/Less (In Percentage in two decimals)				
	Quoted Amount in Figures				

(Quoted amount in Words Rupees ……..

Note: GST as applicable shall be claimed as separate line item in tax invoice and the same will be paid separately.

1. Contractor shall file the applicable returns with tax department in time and submit the same as documentary evidence

SIGNATURE OF THE BIDDER

(iii) FORM OF TENDER

NAME OF CONTRACT.....

To
Executive Engineer (Civil)
New Mangalore Port AURHORITY
Panambur
Mangalore - 575 010

Sir

1. We have examined the Conditions of Contract, Specification, Drawings, Bill of Quantities, and Addenda Nos---------- for the execution of the above-named Works, and we the undersigned, offer to execute and complete such Works and remedy any defects therein in conformity with the Conditions of Contract, Specifications, Drawings and Bill of Quantities and Addenda

2 We acknowledge that the Appendix forms part of our Tender.

3. We undertake, if our Tender is accepted, to commence the Works as soon as is reasonably possible after the receipt of the Engineer's notice to commence, and to complete the whole of the Works comprised in the Contract within the time stated in the Appendix to Tender.

4. We agree to abide by this Tender for the period of 120 days from the last date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

5. Unless and until a formal Agreement is prepared and executed, this Tender together with your written acceptance thereof shall constitute a binding Contract between us.

6 We understand that you are not bound to accept the lowest or any tender you may receive.

Dated this_____ day of _____ 201___

Signature _____ in the Capacity of _____ duly authorised to sign Tenders for and on behalf of ___ _____ __ __ _____ ____ _____ _____

(IN BLOCK LETTERS)

Address:_____
_____

_____
_____

Witnesses

1. Signature : _____
Name : _____
Address : _____
_____
_____
_____

2. Signature : _____
Name : _____
Address : _____
_____
_____
_____

SECTION VII

SCHEDULE – A

ROYALTY
SCHEDULE II

(See sub rule (1) of Rule 36)

Sl. No.	Name of the Mineral	Present Rate of Royalty	Royalty to be revised	
			Export	Domestic
1	Ornamental and Decorative Building Stones as defined under clause(m) of Rule 2 A)Dyke Rock (i)Black granites: (a)Chamarajanagar District:	15% of Sale Value or of Average Selling Price on advalorembasisor Rs.4,500 per m3 which is higher.	Rs.1,200 per MT	Rs.600 per MT
	(b)All other Districts other than(a)above	15% of Sale Value or of Average Selling Price on advalorem basis orRs.1,500 per m3 which is higher.	Rs.1700 per MT	Rs.400 per MT
	(ii)Other varieties of dyke other than black granites(Entire State)	15% of Sale Value or of Average Selling Price on advulorembasis or Rs.1,500per m3 which is higher.	Rs.500 per MT	Rs.375 per MT
	(B)(I)Pink and Red Granites (Ilkal Pink Variety) (i) Hungunda and BadamiTaluk of Bagalkot District, Kustagi of Koppal District.	15%of Sale Value or of Average Selling Price on advalorembasis or Rs.1,200	Rs.1,000 per MT	Rs.400perMT
	(ii) Pink and Red Granites, Gneissess and their structural verities (other than Ilkal Pink Variety)	15% of Sale Value or Average Selling Price on advalorem basis or Rs.1,800 Variety) per m3 which is higher	Rs.600 per MT	Rs.350 per MT

	C)Grey and White Granites and their varieties: (i) Very fine grained Grey granite (SiragreyVariety) Price on Chintanmi, SiddlaghattaofChikkaballapuraDistrictHoskote of Bangalore District.	15% of SaleValue or of Average Selling Price on advalorembasisor Rs.1,350 per m3 which is higher.	Rs.500 per MT	Rs.350 per MT
	(ii) Greyandwhitegranites and textural varieties having shades of grey, balckand white colours (other than (i) above Entire State.	15% of SaleValue or of Average Selling Price on advalorembasisor Rs.1,050 per m3 which is higher.	Rs.375 per MT	Rs.250 per MT
	(iii) Grey granite of DevanahalliTaluk of Bangalore Rural District and Chikkaballapurtaluk of Chikkaballapur District	15% of SaleValue or of Average Selling Price on advalorembasisor Rs.600 per m3 which is higher.	Rs.300 per MT	Rs.200 per MT
2	Felsite and its varieties suitable for use as Ornamental Stone-Entire State	15% of SaleValue or of Average Selling Price on advalorembasisor Rs.1800 per m3 which is higher.	Rs.900 per MT	
3	Quartzite and sand stone and their varieties suitable for use as Ornamental Stone-Entire State	15% of Sale Value or of Average Selling Price on advalorembasisor Rs.1800 per m3 which is higher.	Rs.900 per MT	
4	Marable and Crystalline Limestone as ornamental Stone-Entire State	15% of Sale Value or of Average Selling Price on advalorembasisor Rs.1800 per m3 which is higher.	Rs.1000 per MT	
5	Bentonite-Entire State	Rs.400 per MT	Rs.500 per MT	
6	Fuller Earth-Entire	Rs.125 per MT	Rs.125 per MT	

	State		
7	Buff colour (waste) the permits notexceed20% of permit issued For Fullers Earth	Rs.60 per MT	Rs.70 per MT
8	Limestone under the title "Shahabad Stone"	Rs.70 per 10 Sqmeters or Rs.70 per MT	Rs.50 per 10 Sqmeters or Rs.50 per MT
9	Limestone(non-cement) when used for building stone-Entire State	Rs.25 per MT	Rs.60 per MT
10	Ordinary Building Stone(Entire State as defined under clause(g) of Rule2(1)	Rs.60 per MT	Rs.70 per MT
11	Limeshell-Entire State	100 per MT	120 per MT
12	Lime Kankar(non cement) Entire State	50 per MT	80 per MT
13	Agate, Chalcedony, Flint-Entire State	240 per MT	300 per MT
14	Ordinary Sand-Entire State	60 Per MT	80 Per MT
15	Steatite and sand stone used formakinghousehold utensils / articles-Entire State.	40 Per MT	80 Per MT
16	(i)Murram (All types of soils)-Entire State	20 per MT	40 per MT
	(ii)Clay used for manufacturing tile sand bricks	40 per MT	60 per MT
17	Waste rocks generated in ornamental stone quarry-which is suitable for ornamental purpose Entire State (See explanation under Rule36)	300 per MT or 850 CUM	300perMT
18	Irregular shaped waste rock generated in Ornamental stone quarry, which is not suitable for ornamental purpose (used for making aggregates and m-sand) Entire State.	60 per MT	40 per MT

19	Waste rocks generated in Shahabad stone quarry-Entire State (See explanation under Rule-36)	60 per MT	40 per MT
20	Finished Kerb stones/cubes not exceeding 30 cms each face-Entire State.	110per MT	150 per MT
21	Barytes (i) A Grade (Grey colour (ii) B Grade (Greycolour) (iii) C, D Grade &Waste	6.5% of average selling price or of sale value whichever is higher on ad-valorem basis	400 per MT 300 per MT 200 per MT
22	Calcite	15% of average selling price or of sale value whichever is higher on ad-valorem basis	80 per MT
23	China clay and Kaolin (including Ball clay, White shell, Fireclay and white clay) i)Crude/Raw ii)Processed	8% of average selling price or of sale value whichever is higheronad-valorem basis. 12% of average selling price or of sale value whichever is higher on ad-valorem basis	80 Per MT 600 per MT
24	Corundum	12% of average sellingpriceor of sale value whichever is higher on ad-valorem basis	15% of Sale Value or of Average Selling Price on ad valorem basis which is higher.
25	Dolomite	Rs.75 per MT	100 per MT
26	Dunite and Pyroxenite	Rs. 30 per MT	60 per MT
27	Felsite (Other than for ornamental purpose)	12% of average selling price or of sale value whichever is higher on ad-	120 per MT

		valorem basis	
28	Gypsum	20% of average selling price or of sale value whichever is higher on ad-valorem basis	150 per MT
29	Jasper	12% of average selling price or of sale value whichever is higher on ad-valorem basis	150 per MT
30	Quartz, feldspar	15% of average selling price or of sale value whichever is higher on ad-valorem basis	100 per MT
31	Mica i. Crude ii. Waste	4% of average selling price or of sale value whichever is higher on ad-valorem basis	1500 per MT 500 per MT
32	Quartzite & Fuchsite Quartzite not suitable for use as Ornamental /Gemstones	12% of average selling price or of sale value whichever is higher on ad-valorem basis	100 per MT
33	Laterite i) /dispatched for use in cement or chemical industries or Abrasive or Refractory purpose (below threshold value as specified by IBM from time to time) ii) For use as building stone (below threshold value as specified by IBM)	Rs.60 per MT	160 per MT 60 per MT

34	Ochre	Rs.24 per MT	60 per MT
35	Pyrophyllite	20% of average selling price or of sale value whichever is higher on ad-valorem basis	200 per MT
36	Shale	Rs.60 per MT	150 per MT
37	Slate	Rs.45 per MT	150 per MT
38	Silica Sand	10% of average selling price or of sale value whichever is higher on ad-valorem basis	100 per MT
39	Steatite or Soapstone (Other than for house hold articles)	18%of average selling price or of sale value whichever is higher on ad-valorem basis	200perMT
	Talc	--	200perMT
40	All other minerals (which is not specified in schedule-II) Entire State	30% of sale value on ad-valorem basis	30% of Sale Value or of Average Selling Price on ad-valorem basis which is higher.

As per order of Deputy Director mines and Geological department dated 11-11-2021. The prevailing rates as per the updated order of the Geological Department during the course of the project will be applicable.

Note: Except where otherwise stated, the contractor shall pay to the authority all tonnage and other royalties, rent and other payments or compensation if any, for getting stone, sand, gravel, clay or other materials by him and his subordinates and his subcontractors and required for the works, at the rates and such conditions as notified by the State Government. The contractor should submit the Mineral Dispatch Permit (MDP) in original for the quantity executed by the contractor for the requisite quantity of material incorporated in works for which MDP is issued by the authorized supplier. If contractor fails to submit the MDP in original the amount will be deducted at 5 times the royalty charges from the contractor's bills as per prevailing orders issued by the Authority.

SECTION VII

SCHEDULE – B

MINIMUM RATES OF WAGES

ABSTRACT OF MINIMUM RATES OF WAGES FROM RELEVANT NOTIFICATIONS

MINIMUM RATES OF WAGES APPLICABLE IN THE BEAT OF ALC(C), MANGALORE WITH EFFECT FROM ***01.10.2023***

Minimum Wages applicable "Construction or maintenance of roads, runways or in building operations including laying down underground electric, wireless, radio, television, telephone and overseas communication cables and similar other underground cabling work, electric lines, water supply lines and sewerage pipelines"-

Category			
	Area: A	Area: B	Area: C
Unskilled	751.00	628.00	504.00
Semiskilled/ Unskilled Supervisory	832.00	709.00	589.00
Skilled/Clerical	915.00	832.00	709.00
Highly Skilled	992.00	915.00	832.00

(Kindly Note: Area A: Bangalore (UA), Area B: Mangalore (UA), Mysore (UA), Belgaum (UA), Hubli-Dharwad, Area C: All other places in Karnataka not specified above as per Ministry of Labour and Employment F.No. 1/8(3)/2023-LS-II dated 26.09.2023.)

"Employment of Sweeping and Cleaning excluding activities prohibited under the Employment of Manual Scavengers and Construction of Dry latrines (Prohibition) Act, 1933".

Area	**Rates of wages Rs.**
'A'	736.00
'B'	616.00
'C'	494.00

"Employment of Watch and Ward"-Rates of wages for employees employed in watch and ward – Govt. of India, Ministry of Labour

	Without arms	**With arms**
Area	**Rates of wages Rs.**	**Rates of wages Rs.**
'A'	915.00	992.00
'B'	832.00	915.00
'C'	709.00	832.00

For further details log on to Ministry of Employment